

VALUE OF SOIL RELEASE AGENTS IN RELATION TO MAJOR
WATER-BORNE STAINS ON COTTON AND COTTON-POLYESTER
BLENDED FABRICS TREATED WITH CONVENTIONAL AND
WET FIXATION DURABLE PRESS FINISHES

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BY

DOROTHY WITHROW MCALISTER, B.S., M.S.

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We hereby recommend that the dissertation prepared under
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TO MAJOR WATER-BORNE STAINS ON COTTON AND COTTON-
POLYESTER BLENDED FABRICS TREATED WITH CONVENTIONAL
AND WET FIXATION DURABLE PRESS FINISHES

be accepted as fulfilling this part of the requirements for the Degree of
Doctor of Philosophy.

Committee:

Rachelle Beery Mack
Chairman
Esther R. Broome
Jessie W. Bateman
Bernadine Johnson
Thelma A. Brown

Accepted:

J. L. Morrison
Dean of Graduate Studies

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I N T R O D U C T I O N

The purpose of this study was to investigate the staining tendencies and ease of stain removal from durable press fabrics, and to determine the effect of four soil releasing compounds on cotton and cotton-polyester blends with different fabric softeners. With the great success of durable press, soil release became an area of growing importance. Cotton and blends of cotton-polyester which are resin-treated to impart durable press properties readily absorb many natural oily inorganic soils and certain food stains. All stains can be classified into aqueous-borne and oil-borne categories.

Major finishing research and development programs of the textile industry responded in 1966 to the objective of imparting greater ease of soil removal from permanent press finished garments with available detergents and consumer home laundering practices. This property of greater ease of soil removal in laundering is known as "Soil Release." The first volume use of this treatment was in the spring of 1968.

The cotton-polyester blends are popular for soil release treatment since the cotton fiber will readily absorb cross-linking resinous materials and the polyester keeps abrasion resistance reduced in the cotton by the cross-linking at

acceptable levels. A report from the Chemical Weekly (12) states that polyester fiber is naturally hydrophobic and oleophilic and has great affinity for oils and little for water. The oily soils tend to cling to the surfaces of polyester fiber and these oily soils embed particles of dirt. Durable press treatment involves cross-linking the hydrophilic cellulosic fibers with a resin. This decreases their wettability, increases their oleophilicity, and makes them similar to polyester in susceptibility to soil and stains. Most of the success of soil release formulations depend on acrylic resins, fluoro-chemicals, or a hydrophilic polymer.

The major objective of this investigation was to determine the effectiveness of stain removal from cotton and cotton-polyester blend fabrics treated by means of different chemical formulas to impart fabric softener, durable press, and soil release characteristics. The specific objectives of this study were as follows:

- 1) To ascertain plain weave fabrics of similar thread count and weight per square yard, which had been bleached, mercerized, and finished in a natural state.
- 2) To group the experimental fabrics into divisions on the basis of fiber content:
 - a) 100 per cent cotton,
 - b) 70 per cent cotton--30 per cent polyester,

- c) 50 per cent cotton--50 per cent polyester, and
 - d) 35 per cent cotton--65 per cent polyester.
- 3) To subject the experimental fabrics to the following commercial finishing treatments:
- a) Dimethylol dihydroxy ethylene urea (DMDHEU) Permafresh 183, conventional and wet fixation durable press processes;
 - b) High density polypropylene (Valspex P-167); Normal polyethylene (Mykon SF), fabric softeners; and
 - c) Rhoplex SR-488, Dual-Action Scotchgard FC-218, Mission Valley and Cirrasol PT soil releasing agents.
- 4) To determine the weight loss of the experimental fabrics after designated laundering intervals.
- 5) To investigate the result of staining the experimental fabrics by applying the following stains:
- a) Welch's grape juice,
 - b) French's mustard,
 - c) Catsup,
 - d) Coffee with cream, and
 - e) Lipstick.
- 6) To determine the efficiency of stain removal after laundering the experimental specimens.

R E V I E W O F L I T E R A T U R E

Soil and stain removal became a serious problem when hydrophobic fibers, particularly polyesters, were blended with cotton and treated with cross-linking agents to produce durable press properties. The blended fabric made of cotton and synthetic oleophilic fibers, resulted in a product that encouraged soiling which made cleaning difficult. Soil release systems do not prevent soil and stain from entering fabric; they allow it to leave faster according to the editors of the American Fabrics Magazine (8). All fibers will soil, but most can be laundered with good results because water and detergents can penetrate the fiber. This is not necessarily true with polyester or with cotton when treated for permanent press performance.

Public interest has centered around the soiling problem of fabrics since the advent of soil release finishes. The soil release finishes on the market today are mostly aimed to release, by washing, various stains and spots, especially polyester-cotton durable press fabrics. Shi-mauchi (32) reported two approaches to soil release finishes--the stained fabric has the ability to come clean in laundering because of the soil release finish and the anti-soil

redeposition finish aimed to prevent redeposition of soils on fabrics during the wash cycle.

Various means of attacking the problem of soil and stain resistant properties of textiles have been developed due to the recent intensified interest. The resistance to staining is primarily a function of water and oil repellency. Parsons (19) explained that water-borne stains are not difficult to remove generally. An exception is mustard which is a water-borne stain with an additive of food coloring. When the stain comes in contact with the fiber before water, the stain is most difficult to remove. A good soil release system prevents the intimate contact dissolving the soil or stain and aids the detergent penetration in rolling up the soil for easy removal in laundering.

All stains were classified by Parsons (19) into either water-borne or oil-borne categories. The water-borne stains are typified as mustard, catsup, tea, coffee, and soft drinks. A study was conducted using French's mustard for the standard water-borne stain--the stain was obviously visible because of the food coloring present. Other staining materials which have been employed for stain release tests are colored water-based substances such as grape juice and coffee. These actually dye the fiber and therefore the stain is fixed and its removal is not necessarily facilitated by soil release treatments.

Collins (7) reported a study of the differences between repellency and resistance to staining of fabrics. Factors observed included the temperature of the soil, contact pressure, viscosity, presence of surfactant, and electrolyte components. They reported that the temperature of the soil on contact with the fabric will greatly influence the effect of the stain. The results of an experiment with coffee revealed a much greater stain on the fabric with hot coffee than coffee at room temperature which resulted in essentially no staining.

Pengree (22) described two classifications of soil release treatments--an oleophobic dual action treatment based on fluorocarbon and modified acrylic polymers. The fluorine-containing polymers have been used in large quantities for treating textiles to impart water and oil resistant properties. Although this treatment does provide resistance to staining, the stains are exceedingly difficult to remove once they have penetrated into the fabric.

The second class of soil release treatments are based on hydrophilic substances. These are either chemically bonded to the fiber or are mechanically bonded. Their function is performed by the highly hydrophilic surface which imparts anti-static properties. Neither will it absorb suspended soil in the washer to the extent that normal durable press fabrics do.

Numerous surveys show that most consumers are aware that stains are a problem to remove from durable press treated fabrics. One large soap company revealed that the majority of consumers follow poor laundry practices. Olson (18) reported that in studies conducted the main faults were the improper amount of detergent used, insufficient use of hot water, the use of hard water without any conditioner, or the omission of pre-treating the stains before laundering. This author listed six expected benefits from soil release finishes:

- 1) Normal type soil is easily released in one laundering without special pre-treatment of stains.
- 2) White fabrics retain whiteness, with no graying or discoloration occurring with repeated use.
- 3) Durable press features are not lessened because of the presence of a soil release finish.
- 4) Durability of the soil release finish is dependent on specific end use of an item.
- 5) No undesirable side effects are revealed because of the presence of a soil release finish with no significant change in hand, aesthetic qualities, or comfort, and no possibility of skin irritation.
- 6) Fabricators of end use items are expected to offer the same qualities as the main fabric.

Finishes used to reduce soiling act as direct barriers. Apparently, the finish occupies sites on the fiber

that would otherwise be occupied by the soil. A smooth surface is created and the soil does not penetrate.

Collins, Bacon, and Smith (7) reported three different conditions by which staining of textiles can occur: redeposition, dry soiling, and spot soiling. The most apparent and troublesome is spot soiling--a condition occurring from staining in a localized area. Practical stain resistance is dependent upon both the fabric and the staining situation. The mobility of the soil greatly influences staining. The time of contact between the spot and the fabric, as well as the pressure applied in contact, are major factors influencing the degree of staining. These authors reported that fabrics must possess water and oil repellency for optimum stain resistance even with soils having water as the continuous phase. Fabrics with equal repellency ratings do not always exhibit the same degree of anti-soiling properties.

Stain removal is somewhat dependent on the nature of the stain. Stains have been classified according to Thomas (38) as fruit, vegetable, grease and oil, medicinal, and chemical. If stains can be accurately identified, they are more easily removed. Stain identification is aided by the appearance, feel, smell, color, and location of the stain. Often, the use of the textile item also provides a clue to the identity of the stain.

There are three principles of stain removal, the first being lubrication. Soap and synthetic detergents cause the stain particles to become smoother and more slippery, so that they will dislodge and wash away with mechanical agitation. A second stain removal principle is the use of specific chemicals for specific stains which have resulted from dyestuffs, mildew, foods, some medicines, or other sources. The third method of stain removal is that of bleaching to render the stains soluble or colorless.

According to Smith and Mack (33) most of the soil on fabrics is easily removed by a good formula of soap and water with the exception of small amounts of certain tenacious types of soil, which are classified as stains.

Stains produced by certain foods, by mildew, by some medicinal materials, and by dyes do not yield readily to the action of washing detergents. They may require additional special treatments, usually with chemical bleaching agents, to bring about their removal. . . . bleaches are used primarily to remove stains and not to maintain whiteness of fabrics.

Three general approaches have been studied and reported by Queen, Schrum, and Lewis (24) which improve the stain release properties of durable press garments. The first of these involves the careful selection of resins, softeners, hand builders, and surfactants used in the finishing formulation.

Secondly, acrylics which contain a large number of carboxyl groups are the most widely used materials for improving stain release properties. These finishes are

generally more effective on light and medium weight fabrics. The acrylic-based stain release finishes form a film on the fabrics, yarns, and fibers. This protective coating prevents stains from becoming firmly fixed and at the same time permits water and detergents to penetrate the film aiding in the removal of loosely held stains.

The third approach, as described by Queen, Schrum, and Lewis (24), to improve stain release performance is the use of special fluorochemical stain emulsions. These finishes impart excellent oil repellency and fair water repellency to the treated fabrics; they are generally used on post-cured fabrics.

Hoffman (10) pointed out that most of the finishes developed have attempted to modify the fiber surface to make it more oleophobic or hydrophilic. Much research as to which resin-treated polyester or cotton fibers used in blends contributes more toward soil retention. Kelly (14) explained that the failure of the fabrics to release the stains was due to the oleophilic nature of the polyesters and an equally tenacious ability of the reactant used to produce durable press fabrics to retain oily stains.

The modern finishes are as much responsible for the problem of staining and soiling as the nature of the polyester fibers. American Fabrics Magazine (8) explained that permanent press finishes depend on such high concentrations

of resins that the natural character of cotton is camouflaged and becomes "polyesterized" and has the tendency to retain stains.

Tsuzuki and Yabuuchi (39) reported that stains are chiefly brought about by the cotton, not by the polyester used in blends of fabrics. From a study of stain release using cotton, viscose rayon, cupra rayon, and Tetoron, it was concluded that stain removability is affected by the surface irregularity, cross-section of component fibers, fiber assemblage, and weave construction.

The problem of soil removal had been left to the detergent manufacturers who modified their products to meet the changing needs of the new textiles until the introduction of soil release finishes which were designed to easily remove soil in the laundering process. Prescott and Stearns (23) explained that soil may consist of a carrying medium which is commonly air, water, or an oily material. The materials that are carried in these soiling media vary in their absorbing and scattering properties. The visual noticeability depends on the contrast of the color of the stain and the fabric. The ease of removal depends on the substantivity of the stains. "Soil is an objectionable, tenacious added material. Stain is visual soil and is the object of most soil release systems."

Hoffman (10) reported that the soil release concept in relation to permanent press involves many variables, such

as yarn and fabric construction, which determine the number and size of capillary spaces, and the multiplicity of finishes used. Capillary attraction is a factor in soil retention as liquid travels faster through a yarn which contained no soil release finish, where the contact angle is smaller than in a yarn which had been modified with a soil release finish to make it less attractive to liquid. Liquid soil and stains penetrate into the yarn as thin films creeping through the capillaries. Yarn construction has a definite relationship to the ease of soil removal. The tighter the yarn twist, the greater the number of capillaries; the smaller the capillaries, the more difficult soil removal becomes.

The rate of stain removal from fabrics during laundering appears to be influenced by geometric factors with smooth fiber surfaces favoring more rapid release of stains. Pinault (21) reported that stain removal is affected by the surface irregularity and cross section of component fibers, the character of fiber assembly, and weave construction. It is common to observe that the stained fabrics become more difficult to clean with the increased passage of time between staining and laundering.

Stains held up on the surface of a fabric are easily removed by laundering according to Read and Culling (25). As dynamic forces are encountered, such as spills or pushing a liquid into a fabric, aqueous stains remain from

significant penetration between yarns, but oily stains penetrate between the yarns. Protection against stains on treated fabrics depends on maximum coverage of fibers in yarns.

One of the most important problems in maintaining satisfactory textile appearance is the removal of soil that accumulates during wear, handling, and storage. Kennedy and Stout (15) recognized soiling to be a complex phenomenon involving fiber, fabric structure, soil, and finish interrelationships.

Studies by Prescott and Stearns (23) revealed that materials carried in soiling media vary widely in their absorbing and scattering properties. Dyes are at one extreme, and when molecularly dispersed they have zero scattering power but maximum absorption. Chalk is the other extreme which has high scattering but very low absorption. Food particles, as in catsup, have medium scattering and medium absorption properties. The visual noticeability depends on the contrast of the color of the stain and that of the fabric.

The various fabric finishes have been designed to improve the feel, appearance, and ease of fabric maintenance. The area of soiling had been of little interest to the textile finisher until the success of durable press. The blends of polyester and resin-treated cotton became scavengers for soil and stains.

Perry (20) noted three means by which the soiling of textiles can occur: a) soiling by physical contact in which soil is transferred by atmospheric contaminants or by rubbing against dirty surfaces; b) static attraction or hydrophobic fibers resulting in an attraction of soil and particles; and c) soiling by redeposition from laundering is due to the transference of soil from fabric to water and subsequently the transference back to the fabric.

Wet soil redeposition in laundering blends of polyester and cotton fabrics result in gradual graying of whites. Ghionis and Browne (9) explained that poor wetting decreases the efficiency of soil retention caused by the hydrophobic properties of both the polyester and the cross-linked cotton.

The results of a study, that was carried out in the Southern Research Regional Laboratories on the effect of finishes on wet soil redeposition was presented by Ghionis and Browne (9). It was found that softeners with long aliphatic chains and some polymeric hand builders contribute appreciably to wet soil redeposition. Beneficial effects have been found from the use of fluorocarbon, silicone and finishing chemicals containing polar groups.

Smith and Sherman (34) reviewed the response of soiled textiles to laundering, the relationship between cleaning effectiveness, the variables of surface properties, and the physical characteristics of textiles. Three primary types

of soil were of concern: a) fluid stain, with low and high values of viscosity; b) dry particulate matter; and c) a combination of one or more fluids with particulate matter. Soils vary in the manner in which they are distributed within the fabric and the interaction with the fibers in response to the laundering process.

Hoffman (10) related that removal of stains from a fabric depends on many factors such as the efficiency of detergent, the nature of the stain, the length of time the stain has been on the fabric, and the treatment of the stain prior to staining. Chemists have examined methods to modify the hydrophobic surface of synthetic fibers to make the surface hydrophilic. In the absence of finishing agents, liquid stains will spread over large areas. Finishing agents lower the surface energy of the fabric surface and aid in eliminating wicking.

Read and Culling (25) defined stain repellency, stain-proof, staining, and stain release as follows:

Stain repellency is the ability of the treated fabric to withstand penetration by liquid soil under static conditions; conditions under which liquid soils are not forced into the fabric by external forces other than the capillary forces and the weight of the drop.

Stainproof is defined as a fabric treated sufficiently for stain repellency which is impervious to liquid that cause staining, simple wiping or blotting, restores the stained surface to its original appearance.

Staining is defined as the introduction of a non-reversible change in the appearance of a textile caused

by the presence or influence of a liquid and taking place over part but not all the surface.

Stain release refers to the ease and degree of removal of stains during spot cleaning, washing or during dry cleaning. The removal of both oily and aqueous stains is covered under stain release.

The dyeing problems encountered with durable press finishes are accentuated by the addition of soil release finishes. Schnider and Schouten (29) reported a study performed on disperse, vat and sulfur dyes in conjunction with various soil release agents of polyester and cotton blends. Fastness properties of vat and sulfur dyes were changed to some extent because of the soil release treatment on durable press treated fabrics. Soil release finishes are sensitive to atmospheric fading because of their ability to promote fading by ozone and nitrous gases. The degree is dependent on the type of soil release agent and catalyst used.

The finisher may modify the surface character in a manner that will influence the response of the fabric to soiling and soil removal. Sherman, Smith, and Briger (31) reported an investigation of the normal stain release response of unfinished cotton, resin-stabilized cotton with and without hand modifiers, film-forming finishes, and unfinished polyester fabrics. Factors such as fiber finish, fabric composition, and construction affect the ease with which soil may be removed in laundering. Fabrics containing suitable fluorochemical finishes perform greater service to oil

repellency, compared to water, in an aqueous environment. The chemical structure of conventional fluorochemical textile finishes give satisfactory surface characteristics which are highly desirable with respect to stain resistance during use. These finishes are unsatisfactory from the standpoint of release on laundering of oil stains forced into the fabrics by pressure, even though such stains were readily removable by dry cleaning.

Means of improving the soil release through chemical treatments of polyester and cotton blends and of cotton were studied by Reeves, Beninate, Perkins, and Drake (26). Fabrics used in the study were untreated and treated with resin carboxymethyl cellulose. The resistance to aqueous soiling of untreated cotton was compared to that of the cross-linked cotton that contained the carboxymethyl cellulose fixed on the surface of the fibers. The soil was applied to an aliquot of each sample before the fabrics were laundered and sampled after five, 15 and 25 launderings. The untreated cotton and the cross-linked samples, which contained carboxymethyl cellulose, soiled less after repeated launderings than they soiled before laundering. The samples containing carboxymethyl cellulose were significantly more soil resistant than the cross-linked samples without this treatment.

The use of finishes for imparting durable oil and water repellency to textiles is a rapidly expanding area of

chemical finishing as reported by Collins, Bacon, and Smith (7). Stain resistance was intensified because of the development of durable press fabrics which tend to favor fiber composites, fabric construction and finishing formulation but caused textiles to retain stains rather tenaciously during laundering. The efficiency of laundering in effecting stain release from textiles is a most complex function involving many variables. The relationship between cleaning effectiveness involves surface properties and the physical characteristics of textiles. The nature of the soil, the manner in which the soil was distributed in the fabric, the surface energy of the textile fibers, and the overall fabric construction are problems of stain removal.

Read and Culling (25) reported that a high level of fluorochemical on many fabrics produces a durable finish which is essentially stain proof to many water-borne stains and restricts most oil stains to light spots at the points of contact. Stains forced into fluorochemical finished fabrics show poor stain release toward washing. The best protection against stains on fluorochemical treated fabrics, is achieved by maximum coverage of fibers in yarns. Poor coverage will allow areas to act as "pin holes" to allow the liquid soil access to the less repellent areas of yarns. As previously mentioned, fabric construction and other variables enter into the final performance of the fabric.

Fluorochemicals are compatible with the various resins, catalysts, softeners, and builders used to make durable press fabrics, and they may be applied in a one-step process with the durable press finish. They are designed primarily for the polyester and cotton blends and will not affect any of the desired qualities of the durable press material, such as color, hand, or strength. Blumenstein (5) explained that the substitution of the fluorine atom for hydrogen in certain organic compounds imparts the property of intense surface repellency both against water and oil. This is the basis of Scotchgard and Zepel finishes, which are applied from an emulsion and cured to produce films having high repellency for water and oil. These finishes perform a dual role of stain repellency and also soil releasing agents. The stain resistance it provides permits easy removal by blotting of most stains during use. The stains which are allowed to remain on the fabrics until laundering are readily accessible to the detergent solution because of their superficial attachment to the yarn surface. This dual purpose finishing agent is accomplished in a very effective fashion by incorporating within a single molecule both fluorochemical and hydrophilic segments which confer the desired surface energy in air or in an aqueous environment. Present fluorochemicals are the most effective materials known; however, neither they nor any other material can make

a typical porous textile completely stainproof under the most severe conditions.

Blumenstein (5) explained that silicone is another organic structure of a hydrocarbon in which the carbon has been substituted by the silicone atom to form a water repellent finish. The polymers are padded onto the fabric from an emulsion in the presence of metallic catalysts that react by cross-linking the insoluble molecules to form films on the fiber surface. Silicones are applied to outer wear, rain wear, and also to upholstery fabric and impart resistance to water-borne stains. In durable press finishes a small percentage of silicone overcomes some of the harshness of the finish and raises the tear strength of the fabric.

Problems observed on many fabrics having stain release properties were reported by Queen, Schrum, and Lewis (24). Poor sewability, strength, and abrasion resistance often is related to the inability of coated yarns and fibers to move in the fabric. Lubricating softeners, such as polyethylene, often are applied to improve the sewability of conventional durable press polyester and cotton. Laboratory studies revealed that needles used to sew many stain release finished fabrics developed much higher temperatures than those used to sew conventional durable press fabrics. The hot needles literally melt the polyester fiber in the fabric, causing it to deposit in the eye and groove of the

needle. The deposits are often responsible for thread breakage during sewing.

Textile lubricants serve to reduce the friction between the textile material. Volko, Derby, Lenz, and Shanley (40) reported that softeners make the fabric more pliable and smooth to the touch; they are essentially the same as textile lubricants. They serve to reduce the friction between the textile fabrics, the threads, the fibers, or between the fabric and the hand of the observer.

Schrum and Queen (30) explained that polyethylene has become an important fabric softener since the introduction of durable press. The cellulose fiber used in durable press is severely damaged by the necessary cross-linking resins. Reduced strength and wear life is a result of the highly cross-linked fiber. Softeners and hand builders are a necessity on durable press fabrics, primarily for the fabric's aesthetic acceptability.

According to a Technical Data Bulletin of Sun Chemical Corporation (36), Mykon SF is a non-ionic emulsion of polyethylene which has good softening and lubricating properties when used with resin finishes applied to cellulose fabrics. It produces considerable improvement of crease resistance, tear strength, sewing efficiency, and abrasion resistance without an appreciable reduction in tensile strength. Because of its non-ionic nature it is compatible with all resins and all types of catalysts.

The Chemical Division of United Merchants and Manufacturers, Inc. (37) described Valspex P-167 as a high density polypropylene fabric softener being compatible with durable press and soil release finishes. It produces superior abrasion resistance and tensile strength as well as being an anti-abrasion additive in the deferred curing finish techniques. The polymer on which Valspex P-167 is based has a higher melting point and molecular weight than the polymers from conventional polyethylene emulsions which result in greater durability to alkaline hydrolysis.

Mohamed (16) conducted a study to determine the soiling tendencies and the effectiveness of soil resistant and soil releasing finishes on durable press fabrics. The 100 per cent cotton and the blends of cotton and Dacron experimental fabrics were finished with DMDHEU and DMPU. Some of the fabrics were finished with and some without soil resistant and soil releasing agents of: Scotchgard FC-218, Zepel, Norene Silicone, Cirrasol PT, and Valspex P-167. The specimens from the untreated as well as treated fabrics were soiled with an oil-borne soil padded into the fabric and then subjected to 25 launderings in an automatic home washing machine.

The untreated fabric generally accepted less soil than did most of the fabrics treated with either DMDHEU or DMPU or in combination with various soil control agents.

Cirrasol PT treated fabrics released more soil than did the other treated or untreated fabrics.

A study of staining properties of fabric treated with durable press finishes and soil release finishes was conducted by Kelly (13). The finishes were applied to cotton and blends of cotton and polyester. The durable press treated fabrics with DMDHEU were used alone and with the following soil release finishes: Mission Valley, Scotchgard FC-218, and Visa. The stains applied to the experimental fabrics after a series of launderings from one through 25 times were: grape juice, mustard, catsup, used motor oil, mineral oil, coffee with cream, Desitin, lipstick, and hair oil. It was observed that stain repellency decreased as the number of launderings increased.

Weights of the experimental fabrics were taken after each five laundering periods to determine the loss of finishes from the specimens. It was observed that Mission Valley and Visa finished fabrics lost more weight than did the other fabrics with durable press finish or the untreated fabrics.

Collins, Bacon, and Smith (7) reported that a high degree of water repellency alone is not sufficient to assure optimum stain resistance toward aqueous soils. Finishes which provide both water and oil repellency are superior to those imparting only aqueous repellency. Studies of various

soils and greases in the soiling of fabrics showed considerably less variation in staining behavior than was shown between aqueous soils.

Tsuzuki and Yabuuchi (39) reported having tested the behavior of fabrics composed of different fibers as related to stain removal during washing. Results showed that the stain removability of a fabric is affected by the hydrophilic nature of the fiber, the surface irregularity, and cross section of component fibers, as well as the character of the fiber assembly. He stressed the fact that through mercerization the surface of the cotton attains increased smoothness, and soil removal is improved.

Spot staining causes the most problems in the use and care of fabrics as pointed out by Smith and Sherman (34). The problems of staining and stain release involves the wetting or absorption phenomenon in which the contacting fluid flows out to form a film over the surface of the fabric. Stain release is a desorption process in which the staining fluid is displaced from the fabric surface by an aqueous fluid, usually a detergent solution in water. Best soil and stain release results are obtained when the fabric demonstrates both good hydrophilicity and good oleophobicity under laundering conditions. All of the soil release finishes are believed to function largely by conferring a more polar surface to the fabric. Stain repellent finishes are

made from such compounds as: fluorochemicals, waxlike derivatives, trazine compounds, and pyridinium compounds. The most recent repellents for oil and aqueous based stains have been fluorocarbon compounds.

Pinault (21) related that soil-retardant finishes now in use fall into two broad classes. In one class, sub-microscopic particles of colloidal silica or alumina are applied to the fiber to fill the surface pores, which are the main gathering places for soil. In the other class, a finish is applied that will reduce the positive static charge on the fiber, which attracts negatively charged soil. These finishes are therefore anti-static as well as soil retardants.

Smith and Sherman (35) studied the effects of cleansing in the laundering process which may be viewed as the progressive displacement of fluids from fiber surfaces by an aqueous detergent solution. The probability that the soil particle will be removed from its host site would seem to depend upon whether the mechanical energy furnished by the laundering process is sufficient to overcome the original "geometric bonding." Fiber crossover points, which tend to recur most frequently in tight, high twist, spun yarns which act as soil retentive areas during laundering.

Ghionis and Browne (9) reported that a hydrophilic surface finish Cirrasol PT has been developed by ICI in

cooperation with Celanese. The finish reacts with the polyester producing a hydrophilic surface due to the presence of ether-linked oxygen in its molecule which has two free electron pairs. Cirrasol PT (11) according to a technical bulletin is an aqueous emulsion which is applied by the pad-cure process. Commercial conditions and temperature necessary for curing cross-linking finishes are suitable for curing this finish.

Perry (20) observed that generally treatment with Cirrasol PT has little effect on soil and spots which are water based. The oil-based spots vary in their ease of removal depending on the composition of the soil. Any stain which has been allowed to stand on fabric for a prolonged period of time or which has been subjected to heating is more difficult to remove. Application of this finish prevents the redeposition of soil from dirty wash water. It increases the surface moisture absorbency of the treated fibers and allows any static charge to be dissipated which reduces the attraction for dirt and soil. Cirrasol PT imparts softening properties to the fabric and the use of other softeners are unnecessary. The use of waxy or hydrophilic softeners and hand builders may destroy the effectiveness of the Cirrasol PT treatment.

Another approach to soil release is Rhoplex SR-488, a finish which imparts anti-static properties to cotton and polyester fabrics with durable press finish. It is an

aqueous emulsion of an acrylic polymer applied by padding as a top finish to pre-cured durable press fabrics. The finish causes no appreciable change in the appearance of white or colored fabric. A Textile and Paper Chemicals Bulletin (28) stated that soil release properties imparted by Rhoplex SR-488 are durable to multiple home launderings and to dry cleanings. Crease recovery is unaffected, but tear strength may be reduced depending on the amount of cellulose fiber in the fabric.

Tremendous technical strides have been made since the soil release concept was introduced. According to Chemical Week (12), soil release agents work by chemical and physical means. The chemicals that transform a polyester-cellulose blend into a durable press fabric make it susceptible to permanent staining and discoloration. The soil release agents do not prevent dirt from impregnating the fabric; they aid in its removal. Optical brighteners in the detergent and fibers have helped to overcome much of the discoloration problem. Most soil release formulations prevent both direct and redeposited soil from staining the fabric. They help to reduce the generation of static electricity and minimize electrostatic collection of dirt.

Delays in laundering a soiled or stained article greatly increases the difficulty in stain removal. Pinault (21) pointed out that most manufacturers limit their claims

of effective soil release to 20 or 30 launderings. Non-ionic finishes inhibit soil pickup but are not durable. A hydrophilic, anionic surface gives the best all around results in soil release and soil redeposition.

Moreau and Drake explained (17) that cleanability and soil release have become major concerns of the textile industry, especially in the area of durable press fabrics. The major fault of durable press fabrics is the difficulty of soil and stain removal according to the author of an article from Resin Review (27). Blending polyester fiber with cellulose, then cross-linking the cellulose and adding waxy or fatty softeners produce a hydrophobic fabric, one which is most difficult to clean.

Berch, Peper, and Ross (4) reported laboratory methods for measuring stains and soiling of fabrics and pointed out the fact that a wide variety of natural or synthetic stains and soils can be applied to fabrics to measure the degree of soiling and the effectiveness of soil release agents. Laboratory tests indicate that stains are more difficult to remove when permitted to age on the fabrics.

Surveys indicate that consumers are concerned over the staining problem of durable press according to Wham (41). He further pointed out that the problem in removing stains exists because hydrophobic soils strongly attach themselves

to hydrophobic fibers such as polyesters and also to cellulosic fibers such as cotton made hydrophobic by the cross-linking resins.

P L A N O F P R O C E D U R E

DESCRIPTION OF EXPERIMENTAL FABRICS

The 140 plain woven white fabrics used in this study were similar in yarn counts and weights per square yard. These were composed of 100 per cent cotton and blends of 70 per cent cotton-30 per cent polyester, 50 per cent cotton-50 per cent polyester, and 35 per cent cotton-65 per cent polyester. The bleached, mercerized fabrics were finished commercially with durable press, softeners, and soil release finishes.

The fabrics were divided into seven categories with 20 fabrics in each. These were sent to a finishing plant for the application of the following finishes. Dimethylol dihydroxy ethylene urea with Permafresh 183 (6), which was described according to a technical bulletin as the cross-linking agent for the fabrics receiving durable press finish with magnesium chloride as the catalyst. Three groups of fabrics were given the conventional application of DMDHEU while three other groups received the wet fixation treatment. One group of fabrics was finished with only soil release impregnation. Soil releasing agents selected for

this study were Mission Valley, Scotchgard FC-218, Rhoplex SR-488, and Cirrasol PT.

Kelly (13) has conducted a study on the comparison of stain removal efficiency of untreated, durable press, and durable press with soil release fabrics. Data analyzed in the present study will seek to compare one group of fabrics treated with Scotchgard and one group of untreated fabrics obtained from the Kelly study.

The research procedures for this study were conducted in the Cotton Finishing and Utilization Laboratories at Texas Woman's University, Denton, Texas. An alphabetical and numerical code was used to identify the test fabrics. The following denotes some of the physical properties of each of the fabrics.

YARN COUNT

ASTM Designation: D1910-64 (1) was followed to determine the yarn count of the 140 experimental fabrics. No counts were taken closer to the selvage than one-tenth of the width of the fabric or within one yard of the torn end.

Five counts were taken in one inch of fabric at five different places in the warp and filling directions; and their mean average reported as warp and filling yarn

count respectively. The Alfred Suter Pick Counter was the device used in this process. The fabric areas counted in each direction were calculated and reported as mean yarn count to the nearest 0.1 of a yarn for each test fabric.

WEIGHT OF EXPERIMENTAL FABRICS

Fabric weight per square yard was determined by weighing a six inch square of fabric, cut on grain, from each of the 140 test fabrics, in accordance with ASTM Designation D1910-64 Sections 37 and 38 (2). Specimens were subjected to standard conditions of temperature and relative humidity overnight and then weighed on a one-pan analytical balance. The weight per square yard was calculated by converting the weight for six inch squares to square yard measurement using the following formula:

$$\begin{array}{l} \text{Weight in ozs.} \\ \text{per sq. yd.} \end{array} = \frac{\text{Weight of the specimen in gm.} \times 45.72^*}{\text{Area of specimen in sq. ins.}}$$

Summary A gives a detailed description of the physical characteristics of the experimental fabrics used in the present study.

$$*45.72 = \frac{\text{Number of sq. ins. in a sq. yd.}}{\text{Number of gm. in an oz.}}$$

S U M M A R Y A

PHYSICAL PROPERTIES OF EXPERIMENTAL FABRICS WITH DMDHEU DURABLE PRESS FINISH AND PERMAFRESH 183, HIGH DENSITY POLYPROPYLENE, AND VALSPEX (P-167) FABRIC SOFTENER

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	141.0	56.2	4.04
B	70-30 Cotton-Polyester	140.2	60.2	3.57
C	50-50 Cotton-Polyester	142.4	58.4	2.99
D	35-65 Cotton-Polyester	129.0	71.4	2.83

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	141.8	57.0	4.20
B	70-30 Cotton-Polyester	144.0	58.0	3.68
C	50-50 Cotton-Polyester	143.0	57.6	3.05
D	35-65 Cotton-Polyester	136.8	67.6	2.84

S U M M A R Y A, ContinuedFABRICS FINISHED WITH DMDHEU AND VALSPEX (P-167)PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	140.8	56.2	4.26
B	70-30 Cotton-Polyester	141.2	60.0	3.80
C	50-50 Cotton-Polyester	141.8	59.0	3.20
D	35-65 Cotton-Polyester	132.6	70.0	2.93

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	143.4	57.6	3.83
B	70-30 Cotton-Polyester	141.0	60.6	3.68
C	50-50 Cotton-Polyester	143.2	60.6	3.11
D	35-65 Cotton-Polyester	135.2	71.0	2.94

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	140.6	56.4	4.18
B	70-30 Cotton-Polyester	139.0	60.6	3.56
C	50-50 Cotton-Polyester	141.0	59.2	3.10
D	35-65 Cotton-Polyester	136.6	71.2	2.98

S U M M A R Y A, Continued

PHYSICAL PROPERTIES OF EXPERIMENTAL FABRICS WITH DMDHEU
DURABLE PRESS FINISH AND PERMAFRESH 183, NORMAL
POLYETHYLENE, AND MYKON SF FABRIC SOFTENER

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	140.8	56.6	3.96
B	70-30 Cotton-Polyester	143.0	60.4	3.56
C	50-50 Cotton-Polyester	143.0	58.4	3.05
D	35-65 Cotton-Polyester	131.8	69.2	2.81

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	139.8	56.4	4.11
B	70-30 Cotton-Polyester	141.4	59.2	3.58
C	50-50 Cotton-Polyester	141.2	58.8	3.02
D	35-65 Cotton-Polyester	130.8	70.4	2.82

S U M M A R Y A, ContinuedFABRICS FINISHED WITH DMDHEU AND MYKON SFPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	140.8	55.6	4.18
B	70-30 Cotton-Polyester	140.6	59.6	3.65
C	50-50 Cotton-Polyester	140.6	59.4	3.05
D	35-65 Cotton-Polyester	128.8	70.6	2.82

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	140.0	56.4	4.02
B	70-30 Cotton-Polyester	140.2	59.6	3.60
C	50-50 Cotton-Polyester	140.4	57.6	3.07
D	35-65 Cotton-Polyester	130.8	71.0	3.05

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	140.8	55.4	4.10
B	70-30 Cotton-Polyester	140.2	59.4	3.60
C	50-50 Cotton-Polyester	141.0	57.0	3.07
D	35-65 Cotton-Polyester	128.8	69.6	2.88

S U M M A R Y A, Continued

PHYSICAL PROPERTIES OF EXPERIMENTAL FABRICS WITH DMDHEU
DURABLE PRESS FINISH WITH PERMAFRESH 183 AND
NO FABRIC SOFTENER

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	140.4	55.6	4.16
B	70-30 Cotton-Polyester	143.8	59.8	3.58
C	50-50 Cotton-Polyester	141.2	59.0	3.14
D	35-65 Cotton-Polyester	127.0	70.4	2.89

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	140.2	56.2	4.24
B	70-30 Cotton-Polyester	140.0	59.6	3.71
C	50-50 Cotton-Polyester	140.8	58.6	3.04
D	35-65 Cotton-Polyester	127.6	71.4	2.92

S U M M A R Y A, ContinuedFABRICS FINISHED WITH DMDHEU AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	139.8	56.0	4.15
B	70-30 Cotton-Polyester	139.6	59.4	3.60
C	50-50 Cotton-Polyester	142.0	58.6	3.09
D	35-65 Cotton-Polyester	127.0	71.4	2.90

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	139.4	57.2	4.18
B	70-30 Cotton-Polyester	139.2	58.0	3.57
C	50-50 Cotton-Polyester	141.6	58.2	3.19
D	35-65 Cotton-Polyester	126.0	71.0	2.87

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	140.6	55.6	4.17
B	70-30 Cotton-Polyester	139.2	60.0	3.57
C	50-50 Cotton-Polyester	139.6	57.4	3.03
D	35-65 Cotton-Polyester	126.6	72.0	2.68

S U M M A R Y A, Continued

PHYSICAL PROPERTIES OF EXPERIMENTAL FABRICS FINISHED WITH WET
FIXATION DURABLE PRESS AND HIGH DENSITY POLYPROPYLENE,
VALSPEX P-167 FABRIC SOFTENER

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	140.0	57.4	4.26
B	70-30 Cotton-Polyester	138.2	58.0	3.49
C	50-50 Cotton-Polyester	140.0	58.0	3.06
D	35-65 Cotton-Polyester	128.8	70.2	2.84

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	140.8	56.6	4.14
B	70-30 Cotton-Polyester	139.6	58.6	3.50
C	50-50 Cotton-Polyester	139.6	57.6	2.99
D	35-65 Cotton-Polyester	128.6	70.4	2.83

S U M M A R Y A, Continued

FABRICS FINISHED WITH WET FIXATION DURABLE PRESS
AND VALSPEX P-167

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	141.4	57.0	4.16
B	70-30 Cotton-Polyester	139.2	58.6	3.47
C	50-50 Cotton-Polyester	144.0	57.8	3.01
D	35-65 Cotton-Polyester	130.2	70.4	2.85

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	141.0	56.6	4.10
B	70-30 Cotton-Polyester	139.8	59.4	3.58
C	50-50 Cotton-Polyester	141.0	57.4	3.14
D	35-65 Cotton-Polyester	129.8	70.0	2.87

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	145.0	54.4	4.02
B	70-30 Cotton-Polyester	142.0	65.4	3.59
C	50-50 Cotton-Polyester	142.6	57.4	3.07
D	35-65 Cotton-Polyester	130.0	70.4	2.94

S U M M A R Y A, Continued

PHYSICAL PROPERTIES OF EXPERIMENTAL FABRICS FINISHED WITH
WET FIXATION DURABLE PRESS AND NORMAL POLYETHYLENE,
MYKON SF FABRIC SOFTENER

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	142.8	56.6	4.13
B	70-30 Cotton-Polyester	143.2	57.6	3.50
C	50-50 Cotton-Polyester	143.8	57.4	2.99
D	35-65 Cotton-Polyester	123.6	69.8	2.80

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	143.6	57.6	3.86
B	70-30 Cotton-Polyester	142.2	58.8	3.59
C	50-50 Cotton-Polyester	142.0	57.2	2.97
D	35-65 Cotton-Polyester	129.4	69.6	2.78

S U M M A R Y A, ContinuedFABRICS FINISHED WITH WET FIXATION DURABLE PRESS
AND MYKON SFPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	139.8	57.2	4.06
B	70-30 Cotton-Polyester	140.8	57.6	3.66
C	50-50 Cotton-Polyester	140.4	57.6	3.07
D	35-65 Cotton-Polyester	129.8	70.6	2.82

PART IV: RHOPLEX SR-483 STAIN REMOVAL AGENT

A	100% Cotton	140.0	57.0	4.02
B	70-30 Cotton-Polyester	140.4	56.6	3.65
C	50-50 Cotton-Polyester	143.2	57.6	3.14
D	35-65 Cotton-Polyester	129.8	69.8	2.84

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	141.0	56.2	4.04
B	70-30 Cotton-Polyester	141.0	58.8	3.53
C	50-50 Cotton-Polyester	141.6	58.0	3.07
D	35-65 Cotton-Polyester	129.8	69.8	2.89

S U M M A R Y A, Continued

PHYSICAL PROPERTIES OF EXPERIMENTAL FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND
NO FABRIC SOFTENER

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	142.0	56.8	4.11
B	70-30 Cotton-Polyester	141.6	57.8	3.59
C	50-50 Cotton-Polyester	144.0	58.4	2.95
D	35-65 Cotton-Polyester	128.6	70.4	2.80

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	144.2	56.0	4.19
B	70-30 Cotton-Polyester	140.2	59.4	3.50
C	50-50 Cotton-Polyester	144.2	55.4	3.00
D	35-65 Cotton-Polyester	129.8	71.0	2.82

S U M M A R Y A, Continued

FABRICS FINISHED WITH WET FIXATION DURABLE PRESS
AND NO FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	144.0	57.0	4.45
B	70-30 Cotton-Polyester	141.2	59.4	3.61
C	50-50 Cotton-Polyester	144.6	57.2	3.10
D	35-65 Cotton-Polyester	129.6	70.2	2.91

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	142.2	56.4	4.06
B	70-30 Cotton-Polyester	143.0	59.4	3.62
C	50-50 Cotton-Polyester	144.2	57.4	3.02
D	35-65 Cotton-Polyester	129.2	69.6	2.82

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	144.0	57.6	4.20
B	70-30 Cotton-Polyester	139.4	58.6	3.60
C	50-50 Cotton-Polyester	143.6	58.0	3.05
D	35-65 Cotton-Polyester	130.8	70.3	2.81

S U M M A R Y A, ContinuedPHYSICAL PROPERTIES OF EXPERIMENTAL FABRICS WITH NO
DURABLE PRESS AND NO FABRIC SOFTENERPART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	143.8	56.0	3.96
B	70-30 Cotton-Polyester	145.0	58.0	3.58
C	50-50 Cotton-Polyester	144.0	57.4	2.97
D	35-65 Cotton-Polyester	130.0	70.8	2.86

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	140.0	55.0	4.02
B	70-30 Cotton-Polyester	140.0	59.4	3.68
C	50-50 Cotton-Polyester	141.5	57.6	2.95
D	35-65 Cotton-Polyester	128.4	69.6	2.81

S U M M A R Y A, Continued

FABRICS FINISHED WITH NO DURABLE PRESS
AND NO FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Yarn Count		Ozs. per Sq. Yard
		Warp	Filling	
A	100% Cotton	143.4	57.8	4.03
B	70-30 Cotton-Polyester	140.8	58.8	3.55
C	50-50 Cotton-Polyester	143.0	57.6	3.06
D	35-65 Cotton-Polyester	129.2	69.9	2.88

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	141.5	54.4	3.92
B	70-30 Cotton-Polyester	140.6	59.4	3.56
C	50-50 Cotton-Polyester	140.8	57.8	3.08
D	35-65 Cotton-Polyester	128.4	69.5	2.76

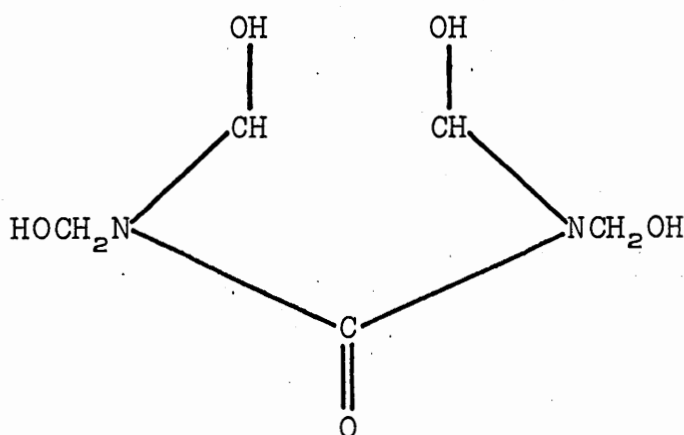
PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	141.0	55.2	4.16
B	70-30 Cotton-Polyester	141.5	57.2	3.52
C	50-50 Cotton-Polyester	144.2	56.6	2.96
D	35-65 Cotton-Polyester	129.8	69.8	2.82

DESCRIPTION OF FINISHES

DURABLE PRESS FINISHES

Dimethylol dihydroxy ethylene urea (DMDHEU) and Permafresh 183 were selected as the cross-linking agents for the durable press finish using the conventional and wet fixation techniques of application. Synthrapol KB, a non-ionic wetting agent, was employed with magnesium chloride serving as the catalyst. The wet-fixation method differs from the conventional techniques in that a resin or reactant or mixture of the two is durably fixed while the cotton is in the wet or "swollen" state.



Dimethylol dihydroxy ethylene urea

FABRIC SOFTENERS

Valspex P-167, a high density polypropylene emulsion, is a polymer recommended as an anti-soiling agent as

well as an anti-abrasion additive used in conjunction with durable press finishes. This treatment gives a soft hand to the fabric in addition to improving abrasion resistance and strength. Valspex P-167 is produced by Valchem United Merchants, Incorporated.

Mykon SF is a non-ionic emulsion of polyethylene that has good softening and lubricating properties. It is particularly effective when used with resin finishes that are applied to cellulosic fabrics. A marked improvement of crease resistance, tear strength, and abrasion resistance is produced without an appreciable reduction in tensile strength. Mykon SF is a product of Sun Chemical Corporation.

SOIL RELEASE FINISHES

Mission Valley Soil Release Finish is a product of Mission Valley Mills, Incorporated, at New Braunfels, Texas. This finish imparts a high degree of fabric resistance to aqueous and oily stains.

Scotchgard FC-218 is a fluorochemical compatible with various resins, catalysts, softeners, and builders used to make durable press fabrics. It is designed primarily for the cotton and polyester blends to impart oil repellency to most types of fabrics, and it is a product of the Minnesota Mining and Manufacturing Company.

Rhoplex SR-488 is an agent that makes a fabric hydrophilic. It is an aqueous emulsion of an acrylic polymer. Fabrics treated with this soil release finish have the ability to shed spots and stains with excellent efficiency on laundering. This emulsion will impart soil release properties to white, dyed, or printed fabrics as well as to blends of cotton and polyester. Rhoplex is a product of Rohm and Haas Company.

Cirrasol PT is a finish which imparts a hydrophilic surface to polyester and polyester cotton blends; it provided protection against soil redeposition during laundering. This finish improves the ease of removal of oil-based stains and soils; it also protects against static buildup. Cirrasol has been developed by Imperial Chemical Industries, Incorporated, in cooperation with the Celanese Corporation of America.

PREPARATION OF FABRIC SPECIMENS

Twenty-seven specimens were cut on grain from each of the 140 test fabrics. The specimens were cut eighteen inches square, marked with an alphabetical and numerical code, and hemmed on all edges to prevent the loss of yarns during the laundering process. No specimen was cut closer to the selvage than one-tenth of the width of the fabric or within one yard of a torn end.

WEIGHT OF EXPERIMENTAL FABRICS

Specimens from each of the test fabrics were weighed initially and after each fifth washing-drying interval. They were placed overnight in the Constant Temperature and Humidity Room, having standard conditions $70^{\circ} \pm 2^{\circ}$ F. temperature and 65 ± 2 per cent relative humidity. They were placed on racks to insure even distribution of moisture and temperature. Specimen weights were recorded initially and after five, 10, 15, 20, and 25 laundering-drying periods. Two samples were removed from the set of 27 after the initial weights, one to serve as the initial specimen and the other as a standard in evaluating the stained specimens. Per cent change in weight for the specimen was calculated using the following formula in which A equals the original weight of the specimen, and B equals the weight after laundering:

$$\frac{A - B}{A} \times 100$$

LAUNDERING PROCEDURE

The samples of the experimental fabrics were subjected to a series of launderings ranging from one through 25 in a top-loading, RCA Whirlpool washing machine, Imperial Mark XII, 1966 model. The machine was equipped with a permanent press setting which was the cycle utilized for the present study.

The specimens were washed in water at 140° F. and rinsed with water at 95° F. Enough Intensified Tide was added to make a running suds and was agitated for a few seconds to permit uniform distribution of the cleansing agent before adding a four pound load. The specimens were removed from the washing machine immediately following the laundering cycle and dried in a RCA Whirlpool Imperial Mark XII automatic dryer at the permanent press setting.

After each washing-drying period one sample was removed; one sample was laundered and dried once. The second sample was laundered and dried twice before removing. The same procedure was followed through the washing-drying intervals until the last sample was laundered and dried 25 times before being removed.

STAINING PROCEDURE

The following stains were selected for the present study because they are representative of common staining media:

- 1) Welch's grape juice,
- 2) French's mustard,
- 3) Catsup,
- 4) Hot coffee with cream, and
- 5) Lipstick.

Aqueous-borne stains generally are not difficult to remove, the exception being mustard and catsup which were used in this investigation. They each are water-borne stains carrying, in most instances, food coloring. When the oleaginous phase comes in contact with the fiber before water, stains which are difficult to remove are produced. These sometimes actually dye the fiber and therefore the stain is fixed and its removal is not necessarily facilitated by soil release treatment. Hot coffee reacts more permanently as a staining media than does cold coffee. Lipstick and other beauty preparations are the most stubborn stains experienced in the Linen Supply Industry.

The investigation of the present study involved the careful placement of five stains on the experimental fabrics. These stains are representative of a large number of common staining types.

The amount of each staining agent required to weigh one-tenth of a gram was determined before starting the staining procedure. A glass cylinder, three inches long and three-quarters of an inch in diameter, and medicine droppers were used to apply the stains to the test specimens. The five staining areas were indicated by lightly drawn pencilled circles on the samples, these were then positioned on a three inch glass square placed over blotter paper. Stains were applied by holding the medicine dropper directly over the upper

end of the glass cylinder with the base positioned on the pencilled circle on each of the specimens. The areas were numbered so that the staining position could be located after laundering. The entire set of 27 samples from each test fabric were stained first with grape juice, followed by mustard, catsup, coffee with cream, and lipstick until all five stains were applied.

The stains were allowed to remain on the experimental fabrics for a five-day period, permitting time for the stains to age. Mission Valley and Scotchgard FC-218 finishes tended to cause the stains to bead up on the fabric surface. These stains were blotted after remaining on a horizontal plane overnight so that the stained area could dry and age before the laundering time.

The stained specimens were laundered once after they were permitted to age for the five-day period. Following the final laundering each stain was evaluated for stain removal using the Deering Milliken Photographic Standards. After the evaluation of the stain removal the experimental procedure was completed.

STAINING OBSERVATIONS

The test fabrics were placed individually on a horizontal plane under the overhead lighting device as described in AATCC 88A-1964T (3) for observation of the following:

- 1) Shape of stain (oval, round),
- 2) Wicking (slight, moderate, extreme, very extreme),
- 3) Change in color,
- 4) Color divisions,
- 5) Absorption time of fabric, and
- 6) Number of launderings before staining.

STAIN REMOVAL EVALUATION

The stained specimens were given one additional laundering and tumble dried before rating under overhead lighting. Evaluation of stain removal after laundering was determined with the Deering Milliken Photographic Standards. The stained laundered specimens were placed on a white background, to provide a contrast between the stain and background area, in a horizontal position to evaluate the removal of the stains used in the present study. The unlaundered initial sample was stained to serve as a standard in evaluating the stain removal. It was hung above and behind the sample being evaluated.

The panelists independently rated the stain removal. The mean scores and rank orders of these ratings are recorded in Summary C through G. The Deering Milliken Photographic Standard was placed at a 60° angle behind and on the same plane as the stained specimen being evaluated. The sample was placed on a table top 30 inches from the floor and the

panelists stood directly in front of the sample to rate the stain removal. The stain removal ratings were as follows: complete release of stain - 5, almost complete release - 4, moderate release - 3, slight release - 2, and no release - 1.

P R E S E N T A T I O N O F D A T A W I T H
D I S C U S S I O N O F F I N D I N G S

The data presented in this report are the results of an evaluation of stain removal from 140 plain woven white fabrics composed of: 100 per cent cotton, as well as blends of 70 per cent cotton-30 per cent polyester, 50 per cent cotton-50 per cent polyester, and 35 per cent cotton-65 per cent polyester. These experimental fabrics were divided into seven categories with 20 fabrics in each. Three groups of the fabrics were treated with the conventional application of dimethylol dihydroxyethylene urea with Permafresh 183, and magnesium chloride serving as the catalyst. Three other groups of the fabrics received the wet fixation treatment of durable press. Fabric softeners of high density polypropylene, Valspex P-167, and normal polyethylene, Mykon SF, were used on one set of fabrics including all of the fiber combinations from each of the different durable press finished fabrics. One group of fabrics from each category received only impregnation of stain release. Fabrics containing each of the four fiber combinations from each category were treated with Mission Valley, Scotchgard FC-218, Rhoplex SR-488, and Cirrasol PT stain release agents, respectively.

Findings relative to an analysis of the experimental fabrics under consideration in this study are recorded in Tables I through VI in the Appendix and are presented as a basis for this discussion. The performance tests made on the experimental fabrics included yarn count, weight per square yard, stain removal, and change in weight to determine the loss of finish.

YARN COUNT

Yarn counts of the 140 experimental fabrics both in the warp and filling directions are shown in Summary A. The 35-65 cotton-polyester blended fabrics were found to have greater variations with lower warp and higher filling count than did the other fabrics. The warp yarn counts varied from 127.0 to 136.8 yarns per inch, whereas, the filling counts ranged from 67.6 to 71.4 yarns per inch. Yarn counts of the other fiber combinations of the experimental fabrics compared favorably.

WEIGHT PER SQUARE YARD

The heaviest fabric found in this study was the 100 per cent cotton which ranged in weight from 3.83 to 4.45 ounces per square yard. Blends of cotton and polyester followed a specific trend with a decline in weight as the

percentage of cotton decreased. The experimental fabrics ranged in weight from 2.68 to 4.45 ounces per square yard. These data are indicative of an increase in weight due to the application of Scotchgard FC-218 and Mission Valley soil release in combination with durable press and fabric softeners. A trend was noted that fabrics of 100 per cent cotton, 70-30 cotton-polyester, and 50-50 cotton-polyester having durable press treatment increased in weight.

WEIGHT CHANGE OF EXPERIMENTAL FABRICS
DURING THE LAUNDERING PROCEDURE

Information concerning the percentages in weight change of experimental fabrics are presented in Summary B. The initial weight of the fabrics were compared with weights after the intervals of five, 10, 15, 20, and 25 laundering periods. These weights are an indication of the finish removed following the various laundering intervals to which the fabrics were subjected.

The experimental fabrics showed a weight loss from 5.70 per cent to a gain of 6.63 per cent. Fabrics having received the conventional application of dimethylol dihydroxyethylene urea durable press with Permafresh 183 lost more weight than did the fabrics with wet fixation treatment of durable press. All the fabrics exhibited a weight loss after 10 launderings with the exception of fabrics treated with wet

fixation durable press without fabric softeners and these exhibited a slight increase in weight. Fabrics treated with conventional durable press and Mykon SF fabric softener showed the greatest weight loss followed closely by fabrics with the same durable press treatment and Valspex P-167 fabric softener.

Fabrics with wet fixation treatment of durable press without fabric softener experienced consistent weight gains after each of the laundering intervals to which they were exposed. These data are indicative of a decrease in weight due to the application of durable press finish in combination with fabric softeners and stain release agents.

A maximum loss of weight was experienced by the 100 per cent cotton fabrics having the conventional application of durable press and Mykon SF fabric softener. The two types of durable press treatments applied to the experimental fabrics showed considerable difference in weight loss. Experimental fabrics with the conventional durable press treatment revealed greater weight loss than fabrics without durable press or fabrics receiving the wet fixation treatment of durable press. The application of Rhoplex stain release to the all cotton fabrics exhibited less weight loss than fabrics treated with Mission Valley, Scotchgard FC-218, or Cirrasol PT respectively. The all cotton fabrics revealed greater weight loss without stain release agents.

Slight gains were evident for the all cotton fabrics with wet fixation durable press and no fabric softener following each of the laundering series. The same trend was also experienced by those fabrics without durable press or fabric softeners except following the tenth laundering when a reverse order was displayed.

The per cent of weight loss by the all cotton experimental fabrics at intervals from five through 25 laundering periods revealed that the greatest loss in weight occurred after 15 launderings. From these data it is evident that less weight was lost following the twenty-fifth laundering interval, however, this loss was only slightly less than that which was reported for the first five laundering periods.

The fabrics composed of 70-30 cotton-polyester blends were found to possess the greatest amount of weight loss displayed by the experimental fabrics. The highest per cent of weight loss occurred after the tenth laundering interval, with the minimum loss evident after the twenty-fifth laundering period. Fabrics with no durable press and no fabric softeners consistently showed gains in weight following the fifth, fifteenth, and twenty-fifth laundering periods with a reverse trend experienced after the tenth and twentieth laundering intervals. The same fabric with wet fixation durable press and no fabric softener exhibited weight gains after all laundering periods with the exception of the first

five. Maximum weight loss for the 70-30 cotton-polyester was experienced after the first 10 launderings.

Rhoplex SR-488 stain release agent applied to the 70-30 cotton-polyester blends exhibited greater loss in weight than other stain release agents applied to the same type fabric. The wet fixation durable press treatment in combination with fabric softeners showed the greatest per cent of weight loss by this blend. There was noticeable change in weight loss with durable press treated fabrics having high density polypropylene, Valspex P-167 and normal polyethylene, Mykon SF fabric softeners. Fabrics without softeners exhibited less weight loss than did fabrics with durable press and fabric softeners. Fabrics having the conventional durable press with Valspex P-167 fabric softener surpassed the other finishes with reference to weight loss.

From a study of the 50-50 cotton-polyester blends it was evident that the conventional durable press treatment with softeners experienced the greatest per cent of weight loss. Fabrics with this finish displayed a progressive loss of weight throughout the laundering series. After the tenth laundering, the fabric treated with conventional durable press and Mykon SF showed maximum weight loss.

The data revealed that the 50-50 cotton-polyester blended fabrics without durable press and fabric softeners, but with Mission Valley stain release agent experienced

greater gains in weight than did the same blend with durable press finish or with different stain release agents. These fabrics with wet fixation treatment of durable press experienced only slight decrease in weight following the total number of laundering periods.

The two types of durable press finishes applied to the 50-50 cotton-polyester blended fabrics showed considerable difference in the per cent of weight loss, however each revealed a gradual loss of weight throughout the laundering intervals. The same fiber blend without durable press and fabric softener gained weight through the first five launderings, with a reverse order following the tenth laundering. A continuous gain in weight was evident following the remainder of the laundering periods. The weight increase varied from each of the different laundering periods with the greatest per cent of weight increase occurring after the fifth laundering interval.

The 35-65 cotton-polyester blends exceeded the other blends in minimum weight loss in all intervals during the laundering series. A gradual weight loss was revealed throughout the laundering series with the greatest per cent of weight loss occurring following the twenty-fifth laundering interval. Scotchgard FC-218 treatment demonstrated the greatest weight loss for this blend fabric. There was greater per cent weight loss following the twenty-fifth laundering period than at any other period.

The durable press finished fabric revealed the largest weight loss with the conventional application of durable press in combination with Mykon SF fabric softener exceeding the others. The untreated 35-65 cotton-polyester experienced gains in weight throughout the laundering series, with the exception following the tenth laundering which showed a slight loss.

When the composite data of weights were compared with reference to the per cent of weight loss, these comparisons revealed the fact that more weight was lost following the tenth laundering than any of the other laundering intervals. The 70-30 cotton-polyester blended fabrics lost more weight and the 35-65 cotton-polyester blended fabrics lost the smallest amount of weight with the other blends falling in between these extremes. The untreated fabrics surpassed the others with reference to weight increase.

S U M M A R Y B

PER CENT CHANGE IN WEIGHT OF FABRICS WITH NO DURABLE PRESS
AND NO FABRIC SOFTENER AFTER DESIGNATED
NUMBER OF LAUNDERINGS

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	+1.23	-2.12	+0.24	-1.95	-0.27
B	70-30 Cotton-Polyester	-0.62	-5.70	+0.34	-1.62	-1.04
C	50-50 Cotton-Polyester	+2.28	-2.36	-0.22	-0.86	+0.12
D	35-65 Cotton-Polyester	+1.90	-1.31	+1.42	+0.90	+1.23

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	+0.05	+0.34	+0.81	+0.67	+1.55
B	70-30 Cotton-Polyester	+3.70	-0.68	+0.36	+1.68	+2.76
C	50-50 Cotton-Polyester	+0.52	-0.38	+0.02	-0.04	+1.27
D	35-65 Cotton-Polyester	-0.36	+1.75	+1.25	+1.54	+1.92

S U M M A R Y B, ContinuedFABRICS WITH NO DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	+1.09	+0.76	+0.41	+0.41	+1.16
B	70-30 Cotton-Polyester	-1.41	-1.55	-2.71	-1.24	-2.45
C	50-50 Cotton-Polyester	+0.69	-1.67	-1.32	-1.56	-2.60
D	35-65 Cotton-Polyester	-2.58	-1.33	+0.60	-0.84	-0.70

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	-1.74	-1.14	-1.91	-0.02	-0.70
B	70-30 Cotton-Polyester	+0.20	-0.22	+0.59	+0.04	+0.47
C	50-50 Cotton-Polyester	+4.48	+4.31	+4.48	+4.62	+3.62
D	35-65 Cotton-Polyester	+2.14	+0.05	+1.49	+1.46	+1.55

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	+1.71	+2.38	+1.76	+1.66	-0.69
B	70-30 Cotton-Polyester	+2.73	+1.76	+1.68	-0.38	+0.92
C	50-50 Cotton-Polyester	+0.30	+0.09	+2.48	-2.14	-1.12
D	35-65 Cotton-Polyester	+1.12	-0.37	+0.40	+0.40	+0.86

S U M M A R Y B, Continued

PER CENT CHANGE IN WEIGHT OF FABRICS WITH DMDHEU DURABLE PRESS
AND VALSPEX (P-167) FABRIC SOFTENER AFTER DESIGNATED NUMBER
OF LAUNDERINGS

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	-4.43	-3.88	-3.38	-3.04	-3.53
B	70-30 Cotton-Polyester	-2.82	-1.23	-2.00	-1.58	-1.80
C	50-50 Cotton-Polyester	-1.55	-0.59	-1.51	-0.31	-1.10
D	35-65 Cotton-Polyester	-2.06	-1.72	-1.30	-1.03	-2.71

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	-3.25	-1.36	-0.20	-2.95	-0.63
B	70-30 Cotton-Polyester	-2.58	-5.14	-4.66	-0.86	-4.18
C	50-50 Cotton-Polyester	-2.64	-1.43	-2.37	-1.73	-0.96
D	35-65 Cotton-Polyester	-5.03	-3.14	-0.67	-2.99	-2.00

S U M M A R Y B, ContinuedFABRICS WITH DMDHEU DURABLE PRESS AND VALSPEX SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	+0.16	+0.44	-1.06	-0.18	-0.12
B	70-30 Cotton-Polyester	+1.46	-0.51	+1.72	+1.59	-2.08
C	50-50 Cotton-Polyester	-1.91	-1.58	-2.70	-2.77	-2.18
D	35-65 Cotton-Polyester	-0.22	-3.80	-0.51	-3.28	-2.17

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	-0.62	-0.81	-2.85	-0.60	-0.17
B	70-30 Cotton-Polyester	-1.02	-1.28	-0.74	-0.75	-0.80
C	50-50 Cotton-Polyester	-1.87	-2.66	-0.51	-1.78	-1.87
D	35-65 Cotton-Polyester	+0.19	-0.95	+4.30	-0.20	-0.48

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	-5.22	-4.03	-5.55	-3.81	-2.58
B	70-30 Cotton-Polyester	-0.64	-3.94	-2.63	-1.88	-1.65
C	50-50 Cotton-Polyester	-0.73	-1.21	-0.71	-0.23	-0.30
D	35-65 Cotton-Polyester	-1.52	-0.91	-0.86	-0.61	-2.68

S U M M A R Y B, Continued

PER CENT CHANGE IN WEIGHT OF FABRICS WITH DMDHEU DURABLE PRESS
AND MYKON SF FABRIC SOFTENER AFTER DESIGNATED
NUMBER OF LAUNDERINGS

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	-0.80	-1.89	-3.12	-2.29	-0.72
B	70-30 Cotton-Polyester	-0.19	-0.68	-0.35	-0.90	-1.11
C	50-50 Cotton-Polyester	-1.14	-3.66	-1.62	-1.77	-0.17
D	35-65 Cotton-Polyester	+1.11	+2.29	+1.13	+1.78	+2.10

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	-1.03	-1.50	-2.85	-3.53	-1.92
B	70-30 Cotton-Polyester	-0.28	+0.15	-0.69	-2.05	-0.38
C	50-50 Cotton-Polyester	-3.56	-2.65	-1.91	-2.02	-2.16
D	35-65 Cotton-Polyester	-0.17	-2.64	-1.72	-1.78	-2.23

S U M M A R Y B, ContinuedFABRICS WITH DMDHEU DURABLE PRESS AND MYKON SF SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	-4.00	-4.65	-4.51	-4.78	-3.42
B	70-30 Cotton-Polyester	-2.64	-1.78	-2.58	-2.99	-0.07
C	50-50 Cotton-Polyester	+0.15	-2.42	+2.00	+2.15	+0.77
D	35-65 Cotton-Polyester	-3.82	-2.41	-2.38	-2.98	-3.32

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	-2.81	-1.50	-3.92	-2.34	-2.71
B	70-30 Cotton-Polyester	-6.22	-2.14	-6.63	-0.59	-3.70
C	50-50 Cotton-Polyester	-1.97	-2.00	-1.90	-2.31	-2.48
D	35-65 Cotton-Polyester	-2.46	-4.06	-1.90	-3.10	-2.23

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	-2.13	-1.89	-1.81	-2.26	-2.72
B	70-30 Cotton-Polyester	-0.30	-1.08	-0.67	-1.20	-1.56
C	50-50 Cotton-Polyester	-0.62	-1.81	-1.12	-0.63	-2.08
D	35-65 Cotton-Polyester	-0.76	-2.31	-2.84	-2.37	-1.35

S U M M A R Y B, Continued

PER CENT CHANGE IN WEIGHT OF FABRICS WITH DMDHEU DURABLE PRESS
AND NO FABRIC SOFTENER AFTER DESIGNATED
NUMBER OF LAUNDERINGS

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	+0.33	-0.50	-0.63	+1.52	+0.22
B	70-30 Cotton-Polyester	+0.34	+0.26	+0.34	-1.26	-0.42
C	50-50 Cotton-Polyester	-2.75	-1.35	-4.97	-1.09	-3.18
D	35-65 Cotton-Polyester	+0.78	-1.39	-2.00	+0.85	+0.01

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	+0.92	-0.61	-2.92	-0.88	-2.02
B	70-30 Cotton-Polyester	-1.73	-5.45	-3.16	-1.45	-3.01
C	50-50 Cotton-Polyester	-1.62	-1.92	-2.02	-0.66	-1.57
D	35-65 Cotton-Polyester	-0.98	-2.03	-2.74	-1.57	+0.36

S U M M A R Y B, ContinuedFABRICS WITH DMDHEU DURABLE PRESS AND NO SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	-0.09	-1.36	-1.68	+0.46	-2.44
B	70-30 Cotton-Polyester	+0.95	+2.20	+0.71	+3.28	+1.66
C	50-50 Cotton-Polyester	-0.20	-0.12	-0.74	-1.53	-0.91
D	35-65 Cotton-Polyester	-1.29	-1.69	-1.92	-1.09	-1.86

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	-2.21	-3.72	-0.34	-3.27	-4.53
B	70-30 Cotton-Polyester	-1.57	-3.08	-1.59	-2.69	-3.43
C	50-50 Cotton-Polyester	-2.19	-3.87	-0.12	-2.92	-2.88
D	35-65 Cotton-Polyester	-1.74	-1.77	-1.68	-0.94	-1.39

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	+2.24	+0.82	-1.10	-2.65	-0.12
B	70-30 Cotton-Polyester	+1.53	+1.07	+2.61	+2.40	+2.42
C	50-50 Cotton-Polyester	+0.99	+0.47	+1.67	+1.14	+0.80
D	35-65 Cotton-Polyester	+1.75	+0.90	+0.92	-0.07	-0.08

S U M M A R Y B, Continued

PER CENT CHANGE IN WEIGHT OF FABRICS WITH WET FIXATION DURABLE
PRESS AND VALSPEX (P-167) FABRIC SOFTENER AFTER DESIGNATED
NUMBER OF LAUNDERINGS

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	-0.79	-1.64	+1.06	+0.76	-0.74
B	70-30 Cotton-Polyester	-1.50	-0.30	+2.25	-0.32	+2.07
C	50-50 Cotton-Polyester	+0.42	+0.16	+0.89	+1.95	+2.47
D	35-65 Cotton-Polyester	-0.80	+0.46	-1.40	+1.49	+1.70

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	-1.88	-4.78	-1.78	-2.45	-2.42
B	70-30 Cotton-Polyester	-1.43	+0.24	-2.23	+0.58	-0.61
C	50-50 Cotton-Polyester	-1.20	-1.21	+0.01	-2.58	-0.44
D	35-65 Cotton-Polyester	-0.34	+0.15	-1.91	-2.12	-0.54

S U M M A R Y B, ContinuedFABRICS WITH WET FIXATION DURABLE PRESS AND VALSPEX SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	-2.23	-2.50	-0.10	-1.85	-0.13
B	70-30 Cotton-Polyester	-0.50	-3.51	-0.32	-3.36	-3.33
C	50-50 Cotton-Polyester	-0.71	-1.45	-0.33	-0.02	-0.37
D	35-65 Cotton-Polyester	-0.60	+0.22	+0.90	-0.02	-1.82

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	+0.46	+0.49	+0.97	+1.08	+1.82
B	70-30 Cotton-Polyester	-0.84	+0.09	-2.21	-0.21	+0.19
C	50-50 Cotton-Polyester	-0.91	-0.29	-0.67	+0.40	+0.62
D	35-65 Cotton-Polyester	-0.70	+0.22	+0.68	+0.45	+1.09

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	+0.50	+0.38	-0.96	-1.58	-0.59
B	70-30 Cotton-Polyester	-0.67	-2.45	-1.68	-3.28	-0.51
C	50-50 Cotton-Polyester	-2.71	-0.44	-1.85	-2.03	-1.62
D	35-65 Cotton-Polyester	-0.38	-0.45	-0.57	-0.16	-2.06

S U M M A R Y B, Continued

PER CENT CHANGE IN WEIGHT OF FABRICS WITH WET FIXATION DURABLE
PRESS AND MYKON SF FABRIC SOFTENER AFTER DESIGNATED
NUMBER OF LAUNDERINGS

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	+2.43	+3.31	-0.73	+1.62	+0.24
B	70-30 Cotton-Polyester	+0.44	-0.86	-2.08	-0.32	-0.75
C	50-50 Cotton-Polyester	+0.48	+0.45	+0.62	+1.45	+1.06
D	35-65 Cotton-Polyester	+0.32	-1.84	-0.99	-0.52	+0.04

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	+3.54	+0.97	+1.03	+1.29	+0.78
B	70-30 Cotton-Polyester	+0.10	+0.56	+0.41	-3.83	+0.81
C	50-50 Cotton-Polyester	-1.97	-2.79	-0.02	-1.04	-0.93
D	35-65 Cotton-Polyester	-0.49	-0.80	-1.41	-0.71	-0.56

S U M M A R Y B, ContinuedFABRICS WITH WET FIXATION DURABLE PRESS AND MYKON SF SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	+2.00	+1.71	+1.59	+0.13	+2.66
B	70-30 Cotton-Polyester	-4.31	-2.51	-0.54	-0.77	-1.51
C	50-50 Cotton-Polyester	+0.33	+0.11	+0.80	-0.82	-1.51
D	35-65 Cotton-Polyester	+0.90	+1.02	+0.58	+0.78	-0.48

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	+2.81	+0.05	-0.60	+0.92	+1.20
B	70-30 Cotton-Polyester	-1.60	-4.57	-0.76	-1.43	-0.95
C	50-50 Cotton-Polyester	-1.78	-0.13	-1.83	+1.36	+1.78
D	35-65 Cotton-Polyester	+1.03	+0.76	+0.66	+0.56	+0.16

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	-2.59	-2.56	-1.63	-2.47	+2.48
B	70-30 Cotton-Polyester	-0.02	-0.27	-0.28	-2.21	-0.71
C	50-50 Cotton-Polyester	-0.24	-0.52	-0.16	-0.70	-0.02
D	35-65 Cotton-Polyester	-0.56	-0.39	+2.75	-0.23	+0.11

S U M M A R Y B, Continued

PER CENT CHANGE IN WEIGHT OF FABRICS WITH WET FIXATION DURABLE
PRESS AND NO FABRIC SOFTENER AFTER DESIGNATED
NUMBER OF LAUNDERINGS

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	-0.74	-0.93	-0.88	-1.90	+0.40
B	70-30 Cotton-Polyester	-0.53	-0.02	+1.10	+2.61	-1.04
C	50-50 Cotton-Polyester	+0.05	+1.74	+1.49	-0.42	+1.20
D	35-65 Cotton-Polyester	-0.08	+2.10	+0.31	-0.50	+0.14

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	+1.91	+2.04	+0.17	+1.93	+0.36
B	70-30 Cotton-Polyester	+0.97	+4.02	-0.55	+4.69	+2.17
C	50-50 Cotton-Polyester	-0.71	-0.69	+0.69	-1.31	+0.24
D	35-65 Cotton-Polyester	+0.10	+1.72	-0.02	+1.66	+3.30

S U M M A R Y B, ContinuedFABRICS WITH WET FIXATION DURABLE PRESS AND NO SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Number of Launderings				
		5	10	15	20	25
A	100% Cotton	-0.58	-0.31	-0.09	-0.57	+1.02
B	70-30 Cotton-Polyester	-2.74	-0.08	-0.28	+0.37	+0.27
C	50-50 Cotton-Polyester	+0.70	+0.46	-4.14	-1.30	-1.86
D	35-65 Cotton-Polyester	+0.21	-0.83	+0.38	-0.20	-0.46

PART IV: RHOPLEX SR-488 STAIN REMOVAL AGENT

A	100% Cotton	+0.96	+0.43	+3.60	+1.51	+3.42
B	70-30 Cotton-Polyester	-3.21	-1.08	-0.21	-1.60	+1.19
C	50-50 Cotton-Polyester	-0.71	+0.13	+0.73	-0.41	-0.00
D	35-65 Cotton-Polyester	-0.24	+0.86	+0.15	+1.12	-0.47

PART V: CIRRASOL PT STAIN REMOVAL AGENT

A	100% Cotton	-0.65	+0.31	+2.74	+2.46	+2.42
B	70-30 Cotton-Polyester	-0.16	+0.12	+0.31	+1.18	+0.74
C	50-50 Cotton-Polyester	-1.37	-1.14	-1.36	-0.64	-0.91
D	35-65 Cotton-Polyester	-0.32	+2.57	+0.52	-0.64	+0.22

EVALUATION OF STAIN REMOVAL FROM
THE EXPERIMENTAL FABRICS

After the samples of the experimental fabrics had been subjected to a series of launderings ranging from one through 25, stains were applied. The five staining areas on the test specimens were positioned on a three inch glass square placed over blotter paper. A glass cylinder, three inches long and three-quarters of an inch in diameter with open ends was positioned on each area to be stained. Stains weighing one-tenth of a gram were applied by holding a medicine dropper directly over the upper end of the glass cylinder and permitting the staining material to fall on the specimen. An entire set of 27 samples from each of the different test fabrics were stained with grape juice, mustard, catsup, coffee with cream, and lipstick, respectively.

Fabrics with Mission Valley and Scotchgard soil release agents exhibited stain repellency causing the staining material to be held up on the fabric surface, until some of the finish was lost during the laundering procedure. The water-borne liquid staining materials were not readily absorbed by the initial fabrics. It was noted that as the number of launderings increased before staining the greater absorption of staining materials by the test specimens.

Summary C through G which follow depict the mean and total scores and rank orders of scores for the stain

removal from the experimental fabrics at each laundering interval. These data are the result of ratings presented in Tables II through VI in the Appendix. The Deering Milliken Photographic Standards were used to obtain the following rating points: complete stain release 5.0, almost complete stain release 4.0, moderate stain release 3.0, slight stain release 2.0, and no stain release 1.0. A summary of total scores for each fabric after the designated number of laundering periods is presented following the discussion of each of the different stains.

Statistical comparisons by means of "t" tests were made on the differences of the stain removal ratings of all possible pairs of fabrics which had been subjected to 25 launderings, stained and laundered again.

STATISTICAL ANALYSIS OF DATA CONCERNING GRAPE JUICE STAIN

The mean scores and rank order for stain removal ratings of grape juice are presented in Summary C which follows this discussion. The 35-65 cotton-polyester including all the finishes ranked first in grape juice stain removal for all fabrics with the exception of those treated with durable press without fabric softener. It was noted that as the polyester component increased in fabric blends, higher rank orders resulted. Because of the hydrophobic nature of

polyester the staining materials were repelled.

Total scores for each fabric at different laundering intervals showed that stain removal ranked highest after the first laundering period. A gradual decrease in stain removal was evident as the number of launderings increased. This would be an indication that finish was removed following the various number of launderings to which the fabrics were subjected.

100 Per Cent Cotton without Soil Release Agent. According to the statistical comparisons of the stain removal scores between the unfinished cotton fabrics and those finished with the two different types of durable press without and in combination with fabric softeners may be summarized as follows. The untreated cotton fabrics and those with DMDHEU durable press were superior to those having wet fixation durable press with Valspex and Mykon SF fabric softeners by a highly significant difference ($P < 0.001$). The stain release ratings of fabrics treated with wet fixation durable press with Valspex, however, surpassed that of fabric finished with wet fixation-Mykon SF or without fabric softener by a difference which was significant ($P < 0.02$).

70-30 Cotton-Polyester without Soil Release Agent.

The order established according to the statistical comparisons, made with respect to the stain release ratings, of

70-30 cotton-polyester fabrics treated with DMDHEU without, and in combination with fabric softeners, surpassed the untreated fabric at a slight significant difference. The DMDHEU durable-press finish in combination with Valspex softener exceeded the same durable press finish with Mykon and without softener by a difference which was distinctly significant ($P < 0.01$). The difference by which the former fabric surpassed the one finished with wet fixation-Mykon SF as well as those fabrics without fabric softener were more highly significant ($P < 0.001$). Wet fixation durable press in combination with Valspex was surpassed by the same durable press treatment in combination with Mykon SF by a highly significant difference. The stain release of fabrics with wet fixation-Mykon SF was less than fabrics with wet fixation without fabric softeners by a significant difference ($P < 0.01$)

50-50 Cotton-Polyester without Soil Release Agent. The effect of stain release of the 50-50 cotton-polyester untreated fabrics surpassed those that were treated with wet fixation durable press in combination with fabric softeners by a significant difference ($P < 0.05$). The same fabrics also were superior to fabrics with DMDHEU-Valspex and wet fixation without softener by a less significant difference ($P < 0.01$). In addition the difference between stain release ratings of fabric treated with DMDHEU-Valspex and those with wet fixation durable press in combination with fabric softeners were

highly significant ($P < 0.001$). According to the stain release ratings the DMDHEU durable-press finish with Mykon SF and without fabric softener were superior to the fabrics treated with wet fixation alone. The fabrics finished with DMDHEU-Mykon SF and without fabric softener revealed a slightly higher significant difference to those having wet fixation alone ($P < 0.01$).

35-65 Cotton-Polyester without Soil Release Agent.

The statistical comparisons obtained by means of "t" tests on means of stain removal ratings of various pairs of fabrics showed that fabrics without durable press or softeners surpassed those with DMDHEU durable press Mykon SF and those without fabric softener by a significant difference ($P < 0.05$). These fabrics also surpassed fabrics with DMDHEU-Mykon SF by a lower significant difference. The difference by which the untreated fabric was superior to those with wet fixation durable press without softener was highly significant ($P < 0.001$).

Differences in stain removal between the following pairs of fabrics were significantly high at the one-tenth per cent level of confidence: (a) cotton-polyester fabrics finished with DMDHEU-Valspex when compared to fabric finished with DMDHEU alone, (b) cotton-polyester finished with DMDHEU-Valspex when compared to fabrics finished with wet fixation-Valspex, and (c) cotton-polyester fabrics finished with DMDHEU-Valspex when compared to fabrics finished with wet fixation

alone. The difference by which the fabric with DMDHEU-Mykon SF surpassed the fabric treated with DMDHEU without softener was distinctly significant ($P < 0.01$). Fabric finished with DMDHEU-Mykon SF were superior to those with wet fixation alone by a highly significant difference ($P < 0.001$). The fabric treated with DMDHEU alone showed a slight decrease in stain acceptance when compared to wet fixation-Valspex or Mykon SF fabric softeners. The same DMDHEU durable press treatment revealed a slightly higher difference when compared to wet fixation alone ($P < 0.01$).

100 Per Cent Cotton with Mission Valley Soil Release Agent. The 100 per cent stained and laundered cotton fabrics without durable press or fabric softeners revealed a lower difference than did fabrics treated with DMDHEU-Mykon or wet fixation durable press with Valspex which surpassed the former fabric by a highly significant difference ($P < 0.001$). Fabrics finished with DMDHEU-Valspex also exceeded the fabrics treated with DMDHEU-Mykon and wet fixation-Valspex by the same high significant difference. Fabrics with DMDHEU alone were highly superior in stain removal ratings to fabrics with wet fixation-Valspex.

Fabrics with the wet fixation treatment of durable press were not greatly different from each other in removal of grape juice stain. Fabrics treated with Valspex in addition to the durable press finishes experienced a slight superior rating.

70-30 Cotton-Polyester with Mission Valley Soil Release Agent. A statistical analysis of the data by means of the "t" test applied to pairs of fabrics with respect to removal of grape juice stain showed that the following pairs of fabrics were highly significant ($P < 0.001$): (a) cotton-polyester fabrics finished with DMDHEU-Valspex when compared to fabrics without durable press or softener, (b) cotton-polyester fabrics finished with DMDHEU-Mykon SF when compared to cotton-polyester fabrics without durable press or fabric softener, (c) cotton-polyester fabrics finished with DMDHEU alone when compared to fabrics without durable press and softener, and (d) wet fixation finished fabrics with Valspex compared to fabrics without durable press or softener. The wet fixation treatment of durable press in combination with Mykon SF and fabrics with the same durable press treatment without fabric softener were significantly lower in stain removal ratings than fabrics without durable press or fabric softeners. The 70-30 cotton-polyester fabrics with Mission Valley stain release in combination with DMDHEU-Valspex surpassed fabrics to which durable press and Mykon SF fabric softener was applied by a highly significant difference ($P < 0.001$). The same significant difference was experienced for fabrics with DMDHEU durable press and Mykon SF when compared to fabrics with wet fixation-Mykon and wet fixation durable press alone.

The fabric treated with wet fixation durable press-Valspex experienced a highly significant difference ($P < 0.001$) when compared to the same durable press treatment without fabric softener. All other differences for the 70-30 cotton-polyester blended fabrics were less significant.

50-50 Cotton-Polyester with Mission Valley Soil Release Agent. The statistical comparisons between fabrics without durable press and those with durable press treatment with Mission Valley soil release demonstrated a 0.01 significant difference in favor of the latter. The fabric with DMDHEU-Valspex was highly significant to the fabric without durable press and softener as well as fabrics treated with wet fixation alone ($P < 0.001$). This same durable press treatment experienced a slightly less significant difference when compared to fabrics with DMDHEU-Mykon SF and to fabrics with wet fixation-Mykon SF. The difference between the following pairs of fabrics were highly significant at the one-tenth per cent level of confidence: (a) cotton-polyester fabrics finished with DMDHEU-Mykon when compared to fabrics with wet fixation alone, (b) cotton-polyester fabrics finished with DMDHEU when compared to fabrics with wet fixation without fabric softener, and (c) cotton-polyester fabrics finished with wet fixation-Valspex when compared to fabrics finished with wet fixation alone. The differences by which the fabric finished with wet fixation-Mykon surpassed the fabric

to which wet fixation was applied was significant at the 5.0 per cent level.

35-65 Cotton-Polyester with Mission Valley Soil Release Agent. The effect of stain release of cotton-polyester fabrics without durable press, and those finished with DMDHEU-Valspex were significantly different ($P < 0.01$) when compared to fabrics finished with durable press in combination with Mykon SF fabric softener. The fabrics finished with DMDHEU durable press with Valspex were highly significant ($P < 0.001$) when compared to those with wet fixation-Mykon. The same significant difference was also experienced between fabrics with wet fixation and Mykon fabric softener. The following pairs of fabrics with Mission Valley soil release were significantly different ($P < 0.01$): (a) cotton-polyester fabrics with DMDHEU-Mykon finish when compared to fabrics with wet fixation-Mykon SF, (b) cotton-polyester fabrics finished with wet fixation-Valspex when compared to fabrics with wet fixation alone, (c) cotton-polyester fabrics finished with wet fixation-Valspex when compared to fabrics with wet fixation durable press-Mykon, and (d) cotton-polyester fabrics finished with wet fixation-Mykon when compared to fabrics with wet fixation alone.

100 Per Cent Cotton with Scotchgard FC-218 Soil Release Agent. Statistical comparisons of the removal of grape

juice from pairs of the experimental fabrics revealed the fact that fabrics with DMDHEU-Valspex finish were significant at the 1.0 per cent level to fabrics without durable press or fabric softener. A less significant difference ($P < 0.02$) was experienced between fabrics finished with wet fixation alone and those without durable press or fabric softener. The 100 per cent cotton with DMDHEU-Valspex and Scotchgard soil release, when compared to fabrics finished with DMDHEU-Mykon and wet fixation-Mykon showed the latter to be highly significant ($P < 0.001$). The same durable press treatment was also inferior to fabrics finished with wet fixation-Valspex by a less significant difference (0.01), and to wet fixation alone by a higher significant difference ($P < 0.05$). The fabrics with DMDHEU-Mykon and Scotchgard finish were superior to fabrics finished with DMDHEU alone in the removal of grape juice stain. The fabric with DMDHEU durable press was superior to fabrics finished with wet fixation-Mykon SF fabric softener by a difference which was distinctly different ($P < 0.05$).

70-30 Cotton-Polyester with Scotchgard FC-218 Soil Release Agent. When the 70-30 cotton-polyester fabrics without durable press or softeners, but with Scotchgard were compared to DMDHEU-Valspex a significant difference ($P < 0.01$) was experienced in favor of the former finish. Fabrics finished with DMDHEU-Mykon were surpassed in stain removal

ratings when compared to the fabrics with wet fixation treatment of durable press. The difference between the following pairs of fabrics were significant ($P < 0.05$): (a) cotton-polyester fabrics with DMDHEU alone when compared to fabrics with wet fixation-Valspex, (b) cotton-polyester with wet fixation-Valspex when compared to fabrics with wet fixation treatment of durable press-Mykon SF, and (c) cotton-polyester fabrics finished with wet fixation when compared to fabrics with wet fixation-Valspex.

50-50 Cotton-Polyester with Scotchgard FC-218 Soil Release Agent. The stain removal ratings for fabrics with wet fixation durable press Mykon SF without fabric softener were surpassed, by the other fabric finishes in stain removal, by a highly significant difference ($P < 0.001$). The difference in stain removal of fabrics with DMDHEU-Valspex finish was significantly lower ($P < 0.05$) when compared to fabrics without durable press or fabrics finished with DMDHEU-Mykon. This same significant difference was experienced for fabrics with wet fixation durable press with Valspex.

35-65 Cotton-Polyester with Scotchgard FC-218 Soil Release Agent. The statistical comparison of 35-65 cotton-polyester with Scotchgard in combination with the different finishes showed fabrics without durable press to be superior to those with DMDHEU-Valspex and fabrics with wet fixation

durable press alone by a significant difference ($P < 0.01$). Fabrics finished with the DMDHEU durable press in combination with Valspex were inferior in stain removal to fabrics finished with DMDHEU-Mykon SF or to fabrics finished with wet fixation durable press by a significant difference ($P < 0.05$).

100 Per Cent Cotton with Rhoplex SR-488 Soil Release Agent. The stain release ratings of fabrics with durable press finish in combination with Rhoplex SR-488 soil release finish were superior by a highly significant difference (0.001) to fabrics without durable press or fabric softeners. Wet fixation durable press treatment in combination with fabric softeners of Valspex and Mykon SF were superior by a highly significant difference when compared to fabrics finished with DMDHEU-Valspex and fabric softener. The DMDHEU durable press finish with Valspex revealed less significant difference in stain release than fabrics treated with wet fixation durable press alone.

70-30 Cotton-Polyester with Rhoplex SR-488 Soil Release Agent. The difference by which the fabric finished with DMDHEU-Valspex and Rhoplex stain release agent surpassed the fabric without durable press, fabric softener, or fabrics finished with wet fixation durable press-Mykon SF was significant ($P < 0.05$). Fabrics with no durable press revealed the

significant difference of 0.01 when compared to fabrics finished with DMDHEU-Mykon with the latter finish being superior. The fabric with wet fixation-Valspex was slightly significant ($P < 0.01$) when compared to fabrics without durable press or fabric softeners. The stain removal rating for fabrics finished with DMDHEU-Mykon surpassed the fabrics to which the wet fixation treatment of durable press was applied.

The cotton-polyester fabric treated with DMDHEU alone was superior to fabrics with wet fixation-Mykon SF finish at a significant difference ($P < 0.01$). The application of wet fixation-Valspex was superior in stain removal rating to that of fabric finished with wet fixation-Mykon SF by a slightly significant difference.

50-50 Cotton-Polyester with Rhoplex SR-488 Soil Release Agent. The application of DMDHEU durable press finish in combination with fabric softeners as well as those fabrics without softeners made the fabrics less susceptible to stain retention. The difference in stain release ratings of fabrics finished with DMDHEU-Valspex and those with wet fixation durable press in combination with fabric softeners was distinctly significant ($P < 0.01$). This same level of confidence also was experienced by fabrics finished with DMDHEU-Mykon softener when compared to fabrics finished

with wet fixation with Valspex and Mykon SF, respectively. The difference between the following pairs of fabrics were significant at the 1.0 per cent level of confidence: (a) cotton-polyester fabrics finished with DMDHEU alone when compared to cotton-polyester with wet fixation-Valspex, (b) cotton-polyester fabrics finished with DMDHEU when compared to fabrics finished with wet fixation-Mykon fabric softener, (c) cotton-polyester fabrics finished with wet fixation-Valspex when compared to fabrics with wet fixation durable press alone, and (d) cotton-polyester fabrics finished with wet fixation-Mykon SF when compared to wet fixation durable press alone. The application of wet fixation-Valspex was superior in stain release rating of grape juice to that of fabric finished with wet fixation-Mykon SF by a difference which was slightly significant ($P < 0.100$).

35-65 Cotton-Polyester with Rhoplex SR-488 Soil Release Agent. The difference between stain release of cotton-polyester fabrics with durable press treatment alone and fabrics to which durable press treatment in combination with fabric softeners were applied was slightly significant. All other differences between the various pairs of fabrics, however, were not significant.

100 Per Cent Cotton with Cirrasol PT Soil Release Agent. The cotton fabric without durable press or fabric softeners was surpassed by fabrics with DMDHEU-Mykon SF as well as by those fabrics with DMDHEU alone by a highly significant difference ($P < 0.001$). The untreated cotton fabric experienced greater stain release than fabrics with wet fixation in combination with Mykon SF, or wet fixation alone. The DMDHEU-Valspex treated fabric was surpassed by the following by a significant difference ($P < 0.05$): (a) cotton fabric finished with DMDHEU alone, (b) cotton fabric finished with DMDHEU-Mykon, and (c) cotton fabrics finished with wet fixation-Valspex. The stain release ratings of fabric treated with DMDHEU-Mykon SF as well as those without fabric softener in combination with Rhoplex surpassed the stain ratings of fabrics with wet fixation durable press. The differences were highly significant ($P < 0.001$). There was a slightly lower significant difference between fabrics treated with DMDHEU durable press and those with wet fixation durable press. The stain release of fabrics treated with wet fixation in combination with either of the two softeners were surpassed at a 1.0 per cent level of confidence by fabrics with wet fixation and no fabric softener.

70-30 Cotton-Polyester with Cirrasol PT Soil Release Agent. The stain release obtained from the laundered stained specimens treated with DMDHEU by a difference which

was highly significant in comparison with fabrics treated with wet fixation durable press. The untreated fabric with Cirrasol was surpassed by fabrics with the two types of durable press in combination with Mykon SF softener at a slightly lower level of significance ($P < 0.01$).

The statistical comparisons of the 70-30 cotton-polyester fabrics treated with DMDHEU-Valspex may be summarized as follows. The application of DMDHEU-Mykon softener made the fabric less susceptible to staining by a lower significant difference ($P < 0.05$). The DMDHEU durable press treatment with Valspex softener was surpassed by the same durable press finish without softeners by differences which were only slightly significant. The cotton-polyester fabrics treated with DMDHEU-Mykon SF fabric softener were less significant in stain removal ratings than was the fabric treated with DMDHEU alone. According to the statistical comparisons of fabric treated with DMDHEU-Mykon SF, it was evident that stains were more resistant to removal from fabrics with wet fixation durable press. The DMDHEU durable press treated fabrics responded better to stain removal than did fabrics treated with wet fixation durable press.

50-50 Cotton-Polyester with Cirrasol PT Soil Release Agent. The stain release of grape juice from the untreated cotton-polyester fabric with Cirrasol surpassed the stain release of the same fabric blend treated with the two types

of durable press in combination with fabric softeners, by a highly significant difference ($P < 0.001$). The stain rating of fabrics with DMDHEU-Valspex were inferior to the other fabrics with the different durable press treatments with fabric softeners. The fabric with DMDHEU durable press alone was significantly different from the DMDHEU-Valspex treated fabrics. The stain release of fabrics treated with DMDHEU alone surpassed fabrics treated by wet fixation and fabric softeners by differences which were highly significant ($P < 0.001$).

35-65 Cotton-Polyester with Cirrasol PT Soil Release Agent. A statistical analysis of the data by means of the "t" test applied to pairs of fabrics with respect to the removal of grape juice stain showed that fabrics with no durable press and without a fabric softener as well as fabrics with DMDHEU-Valspex surpassed the fabrics treated with wet fixation-Mykon SF by a highly significant difference ($P < 0.001$). Differences with slightly lower levels of confidence were found when the fabrics treated with DMDHEU-Mykon SF were compared with fabrics to which wet fixation treatments were applied. Other differences found between the durable press with Valspex and Mykon softeners were highly significant ($P < 0.001$). When either DMDHEU or wet fixation treated fabrics were compared to fabrics with wet fixation alone the stain release ratings were reduced significantly ($P < 0.01$).

Fabrics without Durable Press or Fabric Softener.

With respect to the all cotton experimental fabrics without durable press or fabric softeners, with different soil release agents, Rhoplex was surpassed by all cotton without stain release and by fabrics treated with Scotchgard by a highly significant difference ($P < 0.001$). The comparison of fabrics treated with Rhoplex exhibited a reverse trend when compared to fabrics treated with Cirrasol. The mean stain removal scores of the untreated fabric with Scotchgard was superior to Mission Valley treated fabrics by a difference which was distinctly significant ($P < 0.01$).

The 70-30 cotton-polyester stain removal scores of fabrics without a soil release agent, as well as those with the various soil release agents were not significantly different except for the following pairs of comparisons: (a) fabrics without stain release surpassed those treated with Mission Valley by differences which were significant ($P < 0.01$); (b) the fabric without soil release surpassed the fabrics treated with Cirrasol at a comparatively lower level of significance, and (c) the fabric treated with Cirrasol was superior to fabric finished with Mission Valley by the same low level. Scotchgard and Rhoplex each exhibited greater stain release ratings than did Mission Valley by significant levels of difference, $P < 0.05$ and $P < 0.02$, respectively.

The difference between the mean stain rating scores of 50-50 cotton-polyester without durable press and softeners in combination with the soil release agents revealed the finding that Mission Valley and Rhoplex were each exceeded in stain removal by the fabric without stain release by a significant level of difference ($P < 0.05$). Fabrics treated with Scotchgard and Cirrasol were superior to those treated with Rhoplex by a difference which was significant ($P < 0.02$).

The 35-65 cotton-polyester fabrics without durable press or fabric softeners in combination with the various soil release agents were not significant except for the following comparisons. The fabrics without soil release surpassed those treated with Mission Valley, Rhoplex, and Cirrasol at a comparatively low significant difference.

Statistical comparisons of the removal of grape juice from pairs of the experimental fabrics without stain release agents revealed the fact that fabrics of all cotton and those of 50-50 cotton-polyester experienced no significant difference in stain removal. The all cotton fabrics were surpassed by the 35-65 cotton-polyester by a slight significant difference. On the other hand, the 70-30 cotton-polyester fabric blend was surpassed by the all cotton at the same low significant difference. The 70-30 cotton-polyester blend was also inferior to fabric blends of 50-50 and 35-65 cotton-polyester by the significant level of difference ($P < 0.05$).

Fabrics Finished with DMDHEU Durable Press without Fabric Softener. The difference between the mean stain removal scores of the fabrics treated with DMDHEU with the different soil control agents were not significant except for one exception. When Cirrasol treated fabrics were compared to fabrics without stain release, or fabrics treated with Mission Valley, or Rhoplex a slight significant difference of 0.01 was observed. When the Cirrasol treated fabrics were compared to Scotchgard treated fabrics a reverse trend was evident by a slightly lower significant difference.

There was no significant difference between the mean stain removal scores of the 70-30 cotton-polyester fabric treated with DMDHEU durable press in combination with the different soil release agents. The blends of 70-30 and 35-65 cotton-polyester surpassed the stain removal ratings of cotton.

The stain removal ratings of 50-50 cotton-polyester fabrics treated with DMDHEU durable press in combination with the various soil control agents were not significantly different. The difference between the mean stain removal ratings of grape juice from the fabrics without soil release were surpassed by fabrics treated with Mission Valley, Scotchgard, and Rhoplex at a significant level of difference ($P < 0.05$). The fabrics with Cirrasol exhibited a slightly higher significant rating than those fabrics without soil removal finishes.

Fabrics Finished with DMDHEU Durable Press and Valspex Fabric Softener. The mean stain removal scores of the fabric treated with DMDHEU durable press-Valspex without soil release finishes surpassed those with corresponding durable press treatment with the addition of Scotchgard, Rhoplex, and Cirrasol. Fabrics to which Mission Valley soil release was applied in addition to DMDHEU-Valspex surpassed the cotton fabric with the same type durable press and softener with either of the other soil release agents by highly significant differences ($P < 0.001$).

The stained and laundered cotton fabrics treated with DMDHEU in addition to Cirrasol and Rhoplex exhibited higher stain removal ratings than did the fabrics finished with Scotchgard or Cirrasol, by differences which were significant ($P < 0.02$). The mean stain removal scores of the 70-30 cotton-polyester blend fabric treated with Mission Valley in addition to the durable press finish surpassed the fabrics treated with Scotchgard, Rhoplex, and Cirrasol. The differences were highly significant ($P < 0.001$). Fabrics with Scotchgard were superior in stain removal to those fabrics with Rhoplex and Cirrasol by differences which were significant ($P < 0.001$). There were no other significant differences between the stain ratings scores of the 70-30 cotton-polyester fabrics treated with DMDHEU in combination with Valspex and the remaining soil release agents.

The effect of stain release of 50-50 cotton-polyester blend fabrics treated with DMDHEU-Valspex without soil release agents and those with Mission Valley as well as those with Rhoplex surpassed fabrics treated with Cirrasol soil release at a highly significant difference ($P < 0.001$). The fabrics without stain release and the fabrics treated with Mission Valley were superior to fabrics with Scotchgard soil release agents at the one per cent level of confidence. Rhoplex finished fabrics surpassed the fabrics to which Scotchgard was applied by differences which were significant ($P < 0.05$).

The differences between the mean stain removal ratings of fabrics with DMDHEU durable press-Valspex and those treated with soil release agents were not significant except for the following pairs of comparisons: (a) fabrics without soil release showed superior in comparison to fabrics treated with Scotchgard by a difference at the 1.0 per cent level of confidence, (b) fabrics with Mission Valley soil control surpassed those fabrics with Scotchgard by a significant difference ($P < 0.01$), and (c) fabrics with Scotchgard were inferior to fabrics treated with Rhoplex and Cirrasol soil release agents by a significant difference ($P < 0.05$).

When fabrics treated with Scotchgard were analyzed the mean stain removal was found to exceed fabric blends of

50-50 and 35-65 cotton polyester by a slight significant level. Statistical data computed for the stain removal rating of grape juice from the experimental fabrics revealed the fact that 35-65 cotton-polyester surpassed the other experimental fabric blends by significant differences.

Fabrics Finished with DMDHEU Durable Press and Mykon SF Fabric Softener. The 100 per cent cotton fabric with DMDHEU-Mykon finish without soil release agents exhibited higher stain removal ratings than did the following comparisons: (a) fabrics finished with Mission Valley were significantly different ($P < 0.05$), (b) fabrics with Scotchgard were slightly significant, and (c) fabrics with Cirrasol were surpassed by a significant difference ($P < 0.01$). The fabrics with Mission Valley soil control were surpassed by fabrics with Rhoplex by a significant difference ($P < 0.05$). The fabrics with Rhoplex soil release agents also exhibited greater stain removal qualities than did fabrics with Scotchgard or Cirrasol. The differences were significant ($P < 0.01$).

The stain removal scores between the 70-30 cotton-polyester with DMDHEU-Mykon without soil release was not greatly significant when compared to the same durable press treatment with soil release agents. The differences between the following pairs of fabrics were significantly different ($P < 0.02$): (a) cotton-polyester fabrics without soil release finish when compared to fabrics finished with Cirrasol,

(b) cotton-polyester fabrics finished with Mission Valley when compared to fabrics finished with Cirrasol, and (c) cotton-polyester fabrics finished with Scotchgard when compared to those with Cirrasol. From these comparisons it is obvious that fabrics with DMDHEU-Mykon in combination with Cirrasol were not superior in stain removal.

The differences between the mean stain removal ratings of the fabrics treated with DMDHEU-Mykon without soil release and with the various soil release agents were not significant except for one exception. Fabrics with Mission Valley surpassed the fabrics treated with Cirrasol soil release by a significant difference ($P < 0.01$).

The 35-65 cotton-polyester blended fabrics treated with DMDHEU-Mykon without and in combination with soil release agents did not exhibit high stain removal rating for grape juice. The fabrics treated with Cirrasol exhibited an inferior rating when compared to fabrics treated with the other soil release agents used in the present study. It was noted that the different blends of the experimental fabrics ranked higher in stain removal of grape juice when compared to the all cotton fabric.

Fabrics Finished with Wet Fixation Durable Press and Valspex Fabric Softener. The statistical comparisons obtained by means of the "t" tests on means of stain removal ratings of various pairs of fabrics show significant differences.

Fabrics without soil release finishes were surpassed by a highly significant difference by fabrics treated with Mission Valley and Scotchgard. The 100 per cent cotton fabrics with wet fixation-Valspex without soil release were also surpassed by Rhoplex treated fabrics by a lower significant difference ($P < 0.01$). Fabrics with Mission Valley, Rhoplex, and Scotchgard were all superior to fabrics treated with Cirrasol. The fabrics finished with Scotchgard exhibited more stain release of grape juice than fabrics with Rhoplex by differences which were significant ($P < 0.05$).

The 70-30 cotton-polyester fabrics treated with wet fixation durable press and Valspex without soil release agents were surpassed by a highly significant difference by fabrics to which the different soil control agents were applied. Fabrics to which soil release control was applied were superior in stain removal by a highly significant differences when compared to fabrics treated with Cirrasol.

The effect of the stain release of 50-50 cotton-polyester fabrics treated with wet fixation durable press and Valspex fabric softener in combination with the various soil control agents may be summarized as follows: The untreated cotton-polyester fabric released less stain than the fabrics treated with Mission Valley and Scotchgard. The difference was significant ($P < 0.05$). The application of Mission Valley and Scotchgard to 50-50 cotton-polyester

fabrics exhibited a significant difference ($P < 0.01$) when compared to fabrics treated with Rhoplex. On the other hand, when fabrics treated with Rhoplex were compared to fabrics with Cirrasol a highly significant difference was exhibited ($P < 0.001$).

The stain release of 35-65 cotton-polyester blended fabrics with wet fixation durable press with Valspex fabric softener without and in combination with soil release agents were not significantly different. The removal of grape juice stain from the experimental fabrics displayed some statistical differences in mean ratings. All three blends of cotton-polyester exceeded the 100 per cent cotton fabrics. The 70-30 blend with DMDHEU durable press was exceeded in stain removal by the 35-65 blend.

Fabrics Finished with Wet Fixation Durable Press and Mykon SF Fabric Softener. The differences between the mean stain removal scores of the 100 per cent cotton fabric treated with wet fixation durable press with Mykon fabric softener in addition to Scotchgard and Rhoplex surpassed the fabrics without soil release treatment by a significant difference ($P < 0.001$). The durable press finished fabrics with Mission Valley exhibited a significant difference in stain removal when compared to fabrics treated with Scotchgard and Rhoplex. The differences were highly significant ($P < 0.001$).

The differences between the stain removal ratings of the fabrics treated with wet fixation durable press with Mykon fabric softener in combination with the various soil control agents exhibited significant differences. Fabrics without soil release were superior to fabrics with Mission Valley, Rhoplex and Cirrasol by significant differences ($P < 0.01$). The addition of Scotchgard to the experimental fabrics surpassed fabrics treated with Rhoplex and Cirrasol by the same significant difference. On the other hand, when Cirrasol was compared to Rhoplex a slight significant difference was exhibited in favor of the former finish.

The stain removal rating of the 50-50 cotton-polyester blended fabrics treated with wet fixation durable press and Mykon fabric softener, without and in combination with the different soil release agents were not significant except for the following pairs of comparisons: (a) fabrics treated with Mission Valley soil release surpassed the fabrics with Scotchgard by differences which were significant ($P < 0.05$), (b) fabrics treated with Mission Valley also surpassed the fabrics treated with Cirrasol at the $P < 0.05$ difference, and (c) fabrics treated with Rhoplex soil release surpassed the fabrics with Cirrasol which were only slightly significant.

The 35-65 cotton-polyester fabrics without soil release surpassed fabrics treated with Cirrasol and Mission Valley in the removal of grape juice stain. The differences

were significant at the 2.0 per cent level of confidence. Other differences in stain removal ratings between the various pairs of fabrics with soil release agents which were significant ($P < 0.01$) follow: (a) fabrics finished with Scotchgard when compared to fabrics treated with Mission Valley, (b) fabrics finished with Rhoplex when compared to fabrics with Mission Valley, and (c) fabrics finished with Scotchgard when compared to fabrics with Cirrasol. One other difference was noted, when Rhoplex finished fabrics were compared to fabrics finished with Cirrasol the difference was highly significant ($P < 0.001$).

When fabrics without soil release agents were analyzed it was found that the 70-30 and the 35-65 cotton-polyester blends exceeded cotton by a highly significant difference ($P < 0.001$). Highly significant differences ($P < 0.001$) were evident when the 50-50 cotton-polyester was compared to the 70-30 cotton-polyester fabric, the former exceeded in stain removal by all other experimental fabrics.

Fabrics Finished with Wet Fixation without Fabric Softener. The differences between the mean stain removal ratings of the fabrics treated with wet fixation durable press alone and with the various soil release agents were not significant except for the following pairs of comparisons: (a) the fabrics with soil release treatment surpassed the fabrics with Cirrasol by a significant difference ($P < 0.01$);

(b) the fabrics treated with Mission Valley surpassed the fabrics treated with Cirrasol by a difference which was significant ($P < 0.01$), and (c) fabrics with Rhoplex surpassed the fabrics treated with Cirrasol by a significant difference ($P < 0.01$).

The statistical comparisons obtained by means of "t" tests on means of stain removal ratings of various pairs of 70-30 cotton-polyester fabrics show significant differences. The differences by which fabrics treated with Scotchgard surpassed the fabrics without soil release and those with Rhoplex was distinctly significant ($P < 0.01$). The other comparisons of fabrics with Mission Valley and Cirrasol to fabrics finished with Scotchgard were highly significant ($P < 0.001$). The stain rating scores of cotton-polyester fabrics treated with Mission Valley surpassed those to which Rhoplex was applied by a significant difference ($P < 0.05$). On the other hand, Rhoplex treated fabrics surpassed in the stain removal of grape juice when compared to fabrics treated with Cirrasol by the same 0.05 significant difference.

The mean scores of the 50-50 cotton-polyester fabrics without soil release finishes were surpassed by the mean scores of all fabrics with soil release finishes by differences which were significant ($P < 0.01$). The different soil release agents were highly significant. The following comparisons between pairs of fabrics revealed differences which

were highly significant ($P < 0.001$): (a) cotton-polyester with Cirrasol when compared to fabrics finished with Mission Valley, (b) cotton-polyester with Rhoplex when compared to fabrics finished with Mission Valley, and (c) cotton-polyester fabrics with Cirrasol when compared to fabrics finished with Mission Valley.

The effect of stain release on the 35-65 cotton-polyester fabric treated with wet fixation durable press in combination with the various soil release agents may be summarized as follows: when fabrics treated with Mission Valley, Scotchgard or Rhoplex soil release agents were compared to fabrics without these finishes stain ratings were reduced significantly. When fabrics treated with either Mission Valley or Scotchgard in addition to the wet fixation durable press were compared by means of the "t" test to fabrics treated with Rhoplex and Cirrasol the differences were only slightly significant.

The removal of grape juice from the experimental fabrics revealed statistical differences in mean ratings. The 100 per cent cotton was surpassed in stain removal by the 50-50 cotton-polyester blend at a highly significant difference ($P < 0.001$). The 35-65 cotton-polyester blend was exceeded in stain removal by the other fabric blends.

RANK ORDER OF REMOVAL OF
GRAPE JUICE STAIN

Comparison of Fiber Content of Fabrics without Durable Press, Fabric Softener, or Soil Release. The mean scores of stain removal of grape juice for all laundering intervals showed that 70-30 cotton-polyester was surpassed by the all-cotton and the other fabric blends. The rank order obtained from the laundered stained fabrics of different fiber content by means of statistical comparisons are as follows:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Mission Valley Soil Release, but without Durable Press or Fabric Softener. It is noted that while 35-65 cotton-polyester ranked first in stain removal of grape juice, lower ranks were received by cotton and the other fabric blends. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Scotchgard FC-218 Soil Release, but without Durable Press or Fabric Softener. Both the 35-65 and 50-50 cotton-polyester blends exceeded in stain removal when compared to cotton and the 70-30 cotton-polyester. The statistical comparisons of the mean stain removal from fabrics are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Rhoplex SR-488 Soil Release Agent, but without Durable Press or Fabric Softener. The 35-65 cotton-polyester blend received the highest rank and the 100 per cent cotton obtained the lowest rank, with the other two blends falling into place between these two extremes. The following rank order was established by statistical comparison of the mean stain release made with respect to the fabrics of different fiber content falling within the category under discussion:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Cirra-sol PT Soil Release, but without Durable Press or Fabric Softeners. The fabrics with the highest polyester content received the higher ranks, whereas, fabrics with the highest cotton content fell heir to the lower ranks. The rank order of statistical comparisons was established from the mean stain release rating of the different fiber contents as follows:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, but without Soil Release Agent. Comparisons of the removal of grape juice from fabrics experienced no significant difference in mean stain release scores throughout, with high scores for all fabrics. The following rank order was established as a

result of statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. The stain removal ratings of the different fiber contents indicated no difference. The statistical comparisons of the mean stain removal ratings show the following rank order:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The 35-65 and 50-50 cotton-polyester blends exceeded in stain removal when compared to cotton and the 70-30 cotton-polyester blend. The statistical comparisons of fiber content according to rank orders for stained and laundered fabrics follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	4
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The 35-65 and 50-50 cotton-polyester blends were superior in grape juice stain removal when compared to the cotton and 70-30 cotton-polyester blend. The following rank order was determined by statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. The 35-65 cotton-polyester blend received the highest rank with the 50-50 blend receiving the lowest rank, cotton and the 70-30 blend each ranked second in stain release of grape juice. The following rank order was determined by statistical comparison of the mean stain release ratings of test fabrics falling within this category:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, but without a Soil Release Agent. The comparisons of the removal of grape juice from the experimental fabrics showed no variations according to fiber content. The following rank order was established according to statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Mission Valley Soil Release Agent. All of the different fabric blends exceeded cotton in stain release of fabrics. The rank order established from statistical comparisons of the mean stain release obtained from laundering the stained fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Scotchgard FC-218 Soil Release Agent. Each of the different cotton-polyester blends surpassed all cotton in the release of grape juice stain. The statistical comparisons of the mean stain removal ratings show the following rank order:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Cirrasol PT Soil Release Agent. The comparisons of the removal of grape juice from fabrics experienced no difference in the mean stain release scores. The following rank order was established as a result of statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, but without Fabric Softener or Soil Release Agent. The mean scores of stain removal of grape juice for all laundering intervals showed that 35-65 cotton-polyester was surpassed by the cotton and other fabric blends. The rank order was established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of the different fiber contents are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press with Mission Valley Soil Release Agent, but without Fabric Softener. The mean scores of stain removal of grape juice for all laundering intervals showed that all experimental fabrics received a rank of first place. The rank order was established as a result of statistical

comparisons of the mean stain release obtained from laundering the stained fabrics of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. Cotton was exceeded in stain release by each of the different fabric blends in removal of grape juice stain from the laundered specimens. The following rank order was established as a result of statistical comparison of mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Rhoplex SR-488 Soil Release, but without Fabric Softener. The different fiber contents indicated no variations in stain removal from the experimental fabrics. The statistical comparisons of the mean stain removal ratings show the following rank order:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Cirrasol PT Soil Release Agent, but without Fabric Softener. The 35-65 and 70-30 cotton-polyester blends exceeded in stain removal when compared to cotton and the 50-50 cotton-polyester blend. The statistical comparisons of fiber content according to rank orders for stained and laundered fabrics are as follows:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, but without a Soil Release Agent. The 35-65 cotton-polyester blend received the highest rank, cotton and the 70-30 blend obtained the lowest rank, with the 50-50 blend falling into place between these two extremes. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of

different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Mission Valley Stain Release Agent. The cotton fabric was exceeded by all of the cotton-polyester blends in stain release of grape juice from fabrics. The rank order established from statistical comparisons of the mean stain release obtained from laundered stained fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The 50-50 cotton-polyester blend exceeded all other experimental fabrics in the removal of grape juice. The following rank order was established according to statistical comparisons of the

mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The 35-65 cotton-polyester blend received the highest rank with cotton and the other fabric blends each receiving second place in stain release of grape juice from the experimental fabrics. The following rank order was determined by statistical comparison of the mean stain release ratings of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. The 35-65 cotton-polyester blend received the highest rank, cotton and the 70-30 blend obtained the lowest rank, with the 50-50 cotton-polyester blend falling into place between these two outer limits. The

rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are as follows:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, but without Soil Release Agent. All fabrics surpassed the cotton in removal of grape juice, the 70-30 and 35-65 cotton-polyester blends received first place and the 50-50 blend placed second. The statistical comparisons of the mean stain removal ratings show the following rank order:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Mission Valley Soil Release Agent. The mean scores of stain removal of grape juice for all laundering intervals showed no variation. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber

content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Rhoplex SR-488 Soil Release. The 35-65 cotton-polyester blend received the highest rank with cotton receiving the lowest rank, the 70-30 and 50-50 blends each ranked second in stain release of grape juice. The following rank order was determined by statistical comparison of the mean stain release ratings of experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Cirrasol PT Soil Release. The comparisons of the removal of grape juice from the experimental fabrics showed no variation according to fiber content. The following rank order was established according to statistical comparisons of the

mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, but without Fabric Softener or Soil Release Agent. The comparisons of the removal of grape juice from fabrics finished with wet fixation durable press experienced no difference in the mean stain release scores; all of the experimental fabrics received the second place rank. The following rank order was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press with Mission Valley Soil Release Agent, but without Fabric Softener. It was noted that the 35-65 cotton-polyester blend ranked first in stain removal of grape juice; second place ranks were received by cotton

and the other fabric blends. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, and Scotchgard FC-218 Soil Release, but without a Fabric Softener. The comparison of the removal of grape juice from the experimental fabrics showed that fabrics with the polyester content received the highest rank. The following rank order was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Rhoplex SR-488 Soil Release Agent, but without Fabric Softener. The 35-65 and 50-50 cotton

polyester blends exceeded in stain removal with the cotton and 70-30 blend receiving a rank of second. The following rank order was established as a result of statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Cirrasol PT Soil Release Agent, but without Fabric Softener. The 50-50 cotton-polyester blend received the highest rank and the 100 per cent cotton obtained the lowest rank, with the other two blends falling into place between these two extremes. The rank order of statistical comparisons established from the mean stain release rating of the different fiber content follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	2

S U M M A R Y C

EVALUATION OF GRAPE JUICE STAIN REMOVAL AS A RESULT OF ONE LAUNDERING AFTER THE FABRICS WITH NO DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	3.5	3.0	3.0	4.0	4.0	4.0	3.6	2
C	50-50 Cotton- Polyester	4.0	5.0	4.0	4.5	4.0	4.0	4.2	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.5	5.0	5.0	4.4	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3
B	70-30 Cotton- Polyester	3.0	2.5	2.5	2.5	3.0	3.0	2.8	3
C	50-50 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	4.0	3.7	3
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y C, ContinuedEVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS WITH NO
DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
B	70-30 Cotton-Polyester	4.0	4.0	3.0	3.0	3.0	3.0	3.3	2
C	50-50 Cotton-Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1
D	35-65 Cotton-Polyester	4.5	4.5	4.5	4.5	4.5	4.5	4.5	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	2.5	2.0	2.0	2.0	2.0	2.0	2.1	3
B	70-30 Cotton-Polyester	3.5	3.5	3.0	3.0	3.0	3.5	3.2	2
C	50-50 Cotton-Polyester	4.0	4.0	3.0	3.0	3.5	3.5	3.5	2
D	35-65 Cotton-Polyester	3.5	4.0	4.0	4.0	4.0	4.0	3.9	1

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS WITH NO
DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	3.5	3.0	3.0	3.0	3.0	3.0	3.1	2
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	16.0	14.5	14.5	14.5	14.5	14.5	88.5	4
B	70-30 Cotton- Polyester	17.5	16.0	14.5	15.5	16.0	16.5	96.0	3
C	50-50 Cotton- Polyester	20.5	20.5	18.5	19.0	19.0	19.5	117.0	2
D	35-65 Cotton- Polyester	20.0	20.5	20.5	21.0	21.5	21.5	125.0	1
	Total	74.0	71.5	68.0	70.0	71.0	72.0	426.5	

S U M M A R Y C, Continued

EVALUATION OF GRAPE JUICE STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU DURABLE
PRESS AND VALSPEX (P-167) FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton- Polyester	4.0	5.0	5.0	5.0	5.0	5.0	4.8	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

S U M M A R Y C, ContinuedEVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED WITH DMDHEU DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.5	1.5	1.0	1.0	1.0	1.0	1.5	4
B	70-30 Cotton-Polyester	3.0	3.5	2.0	1.0	1.0	1.0	1.9	4
C	50-50 Cotton-Polyester	4.0	4.0	3.5	2.0	2.0	1.5	2.8	3
D	35-65 Cotton-Polyester	3.5	4.0	3.0	3.0	1.0	1.0	2.6	3

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	3.5	3.5	4.0	4.0	3.8	2
B	70-30 Cotton-Polyester	3.0	4.0	4.0	4.0	4.0	4.0	3.8	2
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED WITH DMDHEU DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab-ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.0	3.0	3.0	2.5	2.5	3.0	2
B	70-30 Cotton-Polyester	4.0	3.0	3.0	3.0	2.5	2.5	3.0	2
C	50-50 Cotton-Polyester	3.5	2.5	2.5	2.5	2.5	2.5	2.7	3
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab-ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	21.5	18.5	17.5	17.5	17.5	17.5	110.0	4
B	70-30 Cotton-Polyester	20.5	20.5	19.0	18.0	17.5	17.5	113.0	3
C	50-50 Cotton-Polyester	21.5	20.5	20.0	18.5	18.5	18.0	117.0	2
D	35-65 Cotton-Polyester	21.5	25.0	21.0	21.0	19.0	19.0	126.5	1
	Total	85.0	84.5	77.5	75.0	72.5	72.0	466.5	

S U M M A R Y C, Continued

EVALUATION OF GRAPE JUICE STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU DURABLE
PRESS AND MYKON SF FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.5	3.0	3.0	3.0	3.0	3.0	3.2	2
B	70-30 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1
C	50-50 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
D	35-65 Cotton- Polyester	5.0	4.5	4.0	4.0	4.0	4.0	4.2	1

S U M M A R Y C, Continued

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	3.5	3.5	3.5	3.8	2
B	70-30 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton- Polyester	4.0	4.0	3.5	3.5	3.5	3.5	3.7	2
C	50-50 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2
D	35-65 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	20.5	18.5	18.5	18.0	18.0	18.0	111.5	4
B	70-30 Cotton- Polyester	20.5	20.0	19.5	19.5	19.5	19.5	118.5	2
C	50-50 Cotton- Polyester	20.5	19.5	19.5	19.5	19.5	19.5	118.0	2
D	35-65 Cotton- Polyester	21.0	20.0	19.5	19.5	19.5	19.5	119.0	1
	Total	82.5	78.0	77.0	76.5	76.5	76.5	467.0	

S U M M A R Y C, Continued

EVALUATION OF GRAPE JUICE STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU DURABLE
PRESS AND NO FABRIC SOFTENER HAD BEEN LAUNDERED THE
DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	3.5	3.5	3.5	4.0	4.0	3.8	2

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y C, ContinuedEVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED WITH DMDHEU DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton-Polyester	5.0	4.5	4.0	4.0	4.0	4.0	4.2	1
C	50-50 Cotton-Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
D	35-65 Cotton-Polyester	5.0	4.5	4.0	4.0	4.0	4.0	4.2	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton-Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.5	4.5	4.0	4.0	4.0	4.2	1

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	3.5	3.5	3.5	4.0	3.8	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	3.5	3.9	2
D	35-65 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	20.0	19.5	19.0	19.0	19.0	19.5	116.0	4
B	70-30 Cotton- Polyester	22.0	20.5	20.0	20.0	20.0	20.0	122.5	1
C	50-50 Cotton- Polyester	21.0	20.0	20.0	20.0	20.0	19.5	120.5	3
D	35-65 Cotton- Polyester	21.5	20.0	20.0	19.5	20.0	20.0	121.5	2
	Total	84.5	80.5	79.0	78.5	79.0	79.0	490.5	

S U M M A R Y C, Continued

EVALUATION OF GRAPE JUICE STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENER HAD
BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	2.0	2.0	2.0	2.0	2.0	2.2	3
B	70-30 Cotton- Polyester	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3
C	50-50 Cotton- Polyester	2.5	3.0	3.5	3.5	4.0	4.0	3.4	2
D	35-65 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.5	3.5	3.5	3.5	3.3	2
B	70-30 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y C, Continued

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND VALSPEX (P-167)
FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	3.5	2.5	3.7	2
B	70-30 Cotton-Polyester	4.0	4.0	4.0	3.5	3.5	3.0	3.7	2
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	3.5	3.0	3.0	2.5	2.0	3.0	2

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton-Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
C	50-50 Cotton-Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND VALSPEX (P-167)
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	2.5	2.0	2.0	2.0	2.0	2.2	3
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	2.5	2.9	3
C	50-50 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
D	35-65 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	16.0	14.5	14.5	14.5	14.0	13.0	86.5	4
B	70-30 Cotton- Polyester	18.5	17.0	17.0	16.5	16.5	15.5	101.0	3
C	50-50 Cotton- Polyester	17.5	17.5	18.0	18.0	18.5	18.5	108.0	2
D	35-65 Cotton- Polyester	21.0	19.5	19.0	19.0	18.5	18.0	115.0	1
	Total	73.0	68.5	68.5	68.0	67.5	65.0	410.5	

S U M M A R Y C, Continued

EVALUATION OF GRAPE JUICE STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND MYKON SF FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	2.5	3.0	2.5	3.0	3.5	3.0	2.9	3
B	70-30 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	3.5	4.0	1
C	50-50 Cotton- Polyester	2.5	3.0	3.5	3.5	4.0	4.0	3.4	2
D	35-65 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	3.0	3.0	3.5	3.5	3.5	3.5	3.3	2
C	50-50 Cotton- Polyester	3.0	3.0	4.0	4.5	4.0	4.0	3.8	2
D	35-65 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	4.0	3.6	2

S U M M A R Y C, ContinuedEVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND MYKON SF FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	3.5	3.5	3.8	2
B	70-30 Cotton- Polyester	5.0	4.5	4.5	4.0	4.0	4.0	4.3	1
C	50-50 Cotton- Polyester	3.0	3.0	3.0	3.5	3.0	3.0	3.1	2
D	35-65 Cotton- Polyester	5.0	4.5	4.0	4.0	4.0	4.0	4.2	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	2.0	2.0	2.0	2.5	2.5	2.5	2.2	3
B	70-30 Cotton- Polyester	4.0	3.0	3.0	3.0	3.0	2.5	3.1	2
C	50-50 Cotton- Polyester	4.0	3.0	3.0	3.5	3.0	3.5	3.3	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	3.5	3.5	3.2	2
B	70-30 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2
C	50-50 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
D	35-65 Cotton- Polyester	3.0	3.5	3.5	3.5	3.5	3.5	3.4	2

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	14.5	15.0	14.5	15.5	16.0	15.5	91.0	4
B	70-30 Cotton- Polyester	20.0	18.0	18.5	18.0	18.0	17.0	109.5	2
C	50-50 Cotton- Polyester	15.5	15.0	16.5	18.0	17.0	17.5	99.5	3
D	35-65 Cotton- Polyester	20.5	19.5	19.0	19.0	19.0	19.5	116.5	1
	Total	70.5	67.5	68.5	70.5	70.0	69.5	416.5	

S U M M A R Y C, Continued

EVALUATION OF GRAPE JUICE STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton-Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2
C	50-50 Cotton-Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
D	35-65 Cotton-Polyester	3.0	3.5	3.0	3.0	3.0	3.0	3.1	2

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton-Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton-Polyester	3.0	3.0	3.0	3.0	3.0	3.5	3.1	2
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y C, ContinuedEVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	2.5	2.0	2.0	3.1	2
B	70-30 Cotton-Polyester	5.0	4.5	4.5	4.0	4.0	4.0	4.3	1
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.0	3.0	3.5	3.5	3.2	2
B	70-30 Cotton-Polyester	3.0	3.0	4.0	3.5	3.5	3.5	3.4	2
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.5	4.5	4.5	4.2	1

EVALUATION OF GRAPE JUICE STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	2.5	2.5	2.5	2.5	2.5	2.6	3
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	3.5	3.5	3.5	4.0	4.0	4.0	3.8	2

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	16.0	15.5	15.5	14.0	14.0	14.0	89.0	4
B	70-30 Cotton- Polyester	17.5	17.0	18.0	17.0	17.0	17.0	103.5	3
C	50-50 Cotton- Polyester	19.0	18.5	18.5	18.5	18.5	19.0	112.0	2
D	35-65 Cotton- Polyester	19.5	19.0	18.5	19.5	19.5	19.5	115.5	1
	Total	72.0	70.0	70.5	69.0	69.0	69.5	420.0	

STATISTICAL ANALYSIS OF DATA
CONCERNING MUSTARD STAIN

The general pattern of stain removal for mustard followed the tendency demonstrated by that of grape juice. Mustard stain is difficult to remove from fabric because of the color additive from dye. The nature of the two fibers under consideration in this study account for much of the stain removal results, since cotton is absorbent and polyester is hydrophobic.

When all the fabric totals were added for each laundering interval the initial laundering period ranked first followed by a progressive decline in stain ratings with the least stain removal experienced after the twenty-fifth laundering. Laundering intervals between the fifth and twenty-fifth showed a gradual decrease in stain ratings.

Summary D which follows this discussion reveals ratings of mustard stain removal from the experimental fabrics. The total scores for each fabric after the different laundering periods are presented.

Fabrics without Durable Press or Fabric Softener.

The 100 per cent cotton fabric without durable press, fabric softener, or soil release agents exhibited higher stain removal scores than did the untreated fabrics with the addition of Mission Valley or Cirrasol by differences which were significant ($P < 0.02$). The Mission Valley treated fabrics

rated a higher significant difference in stain removal than did the fabrics with Scotchgard or Rhoplex. On the other hand, fabric with Scotchgard was superior to fabrics finished with Rhoplex and Cirrasol by significant levels of differences, $P < 0.001$ and $P < 0.02$, respectively.

The effect of soil release from the 70-30 cotton-polyester fabric without soil release agents surpassed those of the same fabric blend with Rhoplex and Cirrasol. The differences between the following pairs of fabrics with different soil release agents were significant ($P < 0.01$): (a) cotton-polyester fabrics finished with Scotchgard when compared to those finished with Mission Valley, (b) cotton-polyester fabrics finished with Mission Valley when compared to fabrics finished with Cirrasol, (c) cotton-polyester fabrics finished with Scotchgard when compared to Cirrasol and (d) cotton-polyester fabrics finished with Cirrasol when compared to Rhoplex. When Rhoplex was applied to the 70-30 cotton-polyester fabrics alone stain resistance was not reduced significantly; whereas, the application of the remaining soil release agents increased soil removal of the experimental fabrics.

The statistical comparisons of 50-50 cotton-polyester fabrics without durable press or fabric softeners, but with the application of various soil control agents exhibited differences in stain removal. The untreated cotton-polyester

fabrics were superior to fabrics finished with Rhoplex by a difference which was highly significant ($P < 0.001$). The fabrics treated with Mission Valley soil release surpassed those fabrics to which either Scotchgard or Rhoplex were applied by a less significant difference.

The difference between the mean stain removal ratings of mustard from the 35-65 cotton-polyester without durable press, softeners or soil release agents was greater than the ratings of fabrics treated with Mission Valley or Rhoplex soil release. Fabrics treated with Mission Valley were surpassed by fabrics with the other stain control agents when applied to the experimental fabrics by a highly significant difference ($P < 0.001$). The fabrics to which Rhoplex was applied were surpassed by the fabrics finished with Scotchgard and Cirrasol by significant differences ($P < 0.01$).

Statistical comparisons of the removal of mustard stain from pairs of the experimental fabrics without durable press, softeners, or stain release revealed that cotton fabrics retained more stain. The untreated cotton fabric was surpassed by the blends at a difference which was distinctly significant ($P < 0.01$).

When fabrics with Scotchgard stain removal were analyzed it was found that 50-50 and 35-65 cotton-polyester blends exceeded the cotton and the 70-30 cotton-polyester blend by a significant difference. Superior stain removal

ability was demonstrated by the 35-65 cotton-polyester when comparisons were made with the other experimental fabrics. The 50-50 blend fabric with Rhoplex surpassed the cotton and the 70-30 cotton-polyester at significant differences, $P < 0.001$ and $P < 0.01$, respectively.

Fabrics Finished with DMDHEU Durable Press without Fabric Softener. The difference between the mean stain removal scores of the 100 per cent cotton fabrics treated with DMDHEU Valspex with the different soil release agents were not significant.

The stain removal ratings of the 70-30 cotton-polyester fabrics treated with DMDHEU durable press and Valspex were significantly different from fabrics finished with DMDHEU in combination with different soil release agents. Fabrics to which Scotchgard soil release was applied surpassed all other combinations of finishes to which statistical comparisons were made. Fabrics finished with either Scotchgard or Cirrasol exceeded fabrics finished with Rhoplex by differences which were highly significant ($P < 0.001$).

The differences in stain removal of the 50-50 cotton-polyester fabric with DMDHEU Valspex without and in combination with the different soil release agents were not significant with one exception. Fabrics to which Scotchgard finish was applied were significantly different from the fabrics with other soil release finishes ($P < 0.001$).

Statistical comparisons by means of "t" tests were made on the difference in stain removal ratings of all possible pairs of fabrics revealed that fabrics with Scotchgard surpassed the fabrics to which other soil release agents were applied, by a difference which was distinctly significant ($P < 0.01$).

There were indications that the cotton fabric was exceeded by the cotton-polyester blends in the removal of stain from fabrics without soil release or those treated with Mission Valley, Cirrasol, or Rhoplex. The difference between the mean stain removal rating of mustard from the fabric blends treated with Scotchgard were slightly significant when compared to that of cotton with the same finish.

Fabrics Finished with DMDHEU Durable Press and Mykon Fabric Softener. The statistical comparisons obtained by means of the "t" test on means of stain removal ratings of various pairs of fabrics show significant differences. Fabric with Rhoplex soil release finish was surpassed by the fabrics without soil release as well as those treated with Mission Valley, Scotchgard and Cirrasol by a highly significant difference ($P < 0.001$).

The cotton fabrics without soil release were superior to fabrics with Scotchgard in stain removal. The effect of stain removal from the 70-30 cotton-polyester blends treated with DMDHEU Mykon without and in combination with the various

soil release agents show that fabrics with Rhoplex retained more stain. The addition of each of the other soil release agents to DMDHEU durable press finished fabrics decreased the staining tendency of the fabrics. The differences between fabrics without soil release and those treated with Mission Valley, Scotchgard, and Cirrasol when compared to fabrics treated with Rhoplex were highly significant ($P < 0.001$).

The differences between the mean stain removal scores of the fabrics treated with DMDHEU Mykon with different soil release agents were not significant with one exception. When fabrics treated with Cirrasol soil release were compared to fabrics without soil release or those to which Mission Valley or Rhoplex were added, slight significant differences were observed.

There was no significant difference between the mean stain removal scores of the 35-65 cotton-polyester fabrics treated with DMDHEU durable press with Mykon SF fabric softener in combination with the various soil release agents. Neither was there a difference in stain release from pairs of fabric without stain release agents. When fabrics treated with Mission Valley, Scotchgard or Cirrasol soil release were analyzed all fabric blends demonstrated superior ratings in stain removal to the cotton fabric.

The mean stain removal ratings for fabrics treated with Rhoplex demonstrated statistical differences. The 50-50 and 35-65 cotton-polyester blends exceeded in stain

release ratings when compared to cotton and the 70-30 cotton-polyester blend with Rhoplex by highly significant differences ($P < 0.001$).

Fabrics Finished with DMDHEU Durable Press and Val-spex Fabric Softener. The 100 per cent cotton fabric with DMDHEU-Valspex without soil release agents exhibited higher stain removal ratings than did fabrics treated with the same durable press with the addition of Rhoplex soil control. The Scotchgard and Cirrasol treated fabrics were superior in stain removal, by differences which were significant ($P < 0.05$) to fabrics treated with Mission Valley soil release. Two other significant stain removal differences were noted: fabrics finished with Scotchgard and those finished with Rhoplex surpassed fabrics treated with Cirrasol ($P < 0.01$).

The differences between the mean stain removal scores of the 70-30 cotton-polyester fabrics treated with DMDHEU in combination with the various soil release agents were not significant for one exception. When fabrics treated with Mission Valley were compared to fabrics finished with Rhoplex or Cirrasol soil release, slight significant differences were observed in stain removal ratings.

The mean stain removal scores of the 50-50 cotton-polyester blend fabric treated with DMDHEU and soil release agents of Scotchgard and Cirrasol exhibited higher ratings than fabrics treated with Mission Valley by differences which

were significant ($P < 0.01$). The fabrics finished with durable press and Rhoplex were superior in stain removal to fabrics treated with Mission Valley by a difference which was significant ($P < 0.05$).

The differences between the mean stain removal scores of the 35-65 cotton-polyester fabric treated with DMDHEU in combination with the different soil release agents were not significant. However, the 35-65 blend finished with durable press and Mission Valley exceeded in stain removal of mustard when compared to other fabric finishes by differences which were distinctly significant ($P < 0.01$).

The removal of stain from the experimental fabrics displayed statistical differences. All three of the cotton-polyester blends exceeded cotton at highly significant differences ($P < 0.001$). The 70-30 and 50-50 cotton-polyester blends were surpassed in stain removal by the 35-65 blend.

Fabrics Finished with Wet Fixation Durable Press and Valspex Fabric Softener. The cotton fabric with wet fixation-Valspex finish were surpassed in stain removal ratings by fabrics finished with the same durable press with the addition of soil release agents. Fabrics treated with Mission Valley, Scotchgard, and Cirrasol surpassed the untreated fabrics by highly significant differences ($P < 0.001$). The untreated fabrics were inferior to fabrics treated with Rhoplex in regard to stain removal by a difference which was significant

($P < 0.05$). When fabrics finished with Scotchgard and those finished with Mission Valley were analyzed the mean stain removal for each were found to exceed those of fabrics treated with Rhoplex or Cirrasol by highly significant differences ($P < 0.001$).

The statistical comparisons obtained by means of the "t" test on mean stain removal ratings of various pairs of fabrics were not significant except for two comparisons. The difference between fabrics treated with wet fixation Valspex in combination with Scotchgard and those treated with Rhoplex were significant ($P < 0.01$). The 70-30 cotton-polyester fabric treated with Mission Valley in addition to the durable press finished surpassed fabrics to which Rhoplex was applied in the wet fixation Valspex durable press finish.

The effect of the stain release from 50-50 cotton-polyester fabrics treated with wet fixation durable press in combination with the various soil release agents was significant. The application of Mission Valley and Rhoplex to the experimental fabrics exhibited superior ratings when compared to fabrics without soil release agents by highly significant differences ($P < 0.001$). The wet fixation Valspex treated fabrics with the addition of Scotchgard and Cirrasol surpassed fabrics with the same type durable press with Mission Valley by significant difference ($P < 0.01$). When fabrics treated with Scotchgard were compared to fabrics

treated with Rhoplex only slight significant difference was exhibited in favor of the former finish. There was an indication that Cirrasol treated fabrics were superior to the fabrics finished with Rhoplex in addition to the durable press treatment.

The 35-65 cotton-polyester fabrics with wet fixation durable press and Valspex fabric softener were surpassed in stain removal by fabrics with the same finish with the addition of Scotchgard and Rhoplex soil release. The differences were distinctly significant ($P < 0.01$). Other stain removal ratings between various pairs of fabrics with soil release by differences which were significant at the 1.0 per cent level follow: (a) cotton-polyester fabrics finished with Scotchgard when compared to fabrics treated with Mission Valley, (b) cotton-polyester fabrics finished with Scotchgard when compared to fabrics finished with Cirrasol and (c) cotton-polyester finished fabrics finished with Rhoplex when compared to fabrics finished with Cirrasol.

When cotton fabrics without soil release were analyzed, the mean stain removal was surpassed by the cotton-polyester blends by a distinctly significant difference ($P < 0.01$). Statistical data computed for the stain removal of mustard from the experimental fabrics revealed the fact that 35-65 cotton-polyester blend fabric surpassed the other experimental fabrics by significant differences. No differences

of any significance were evident when comparing paired fabrics finished with Mission Valley or Scotchgard soil control agents.

Fabrics Finished with Wet Fixation Durable Press and Mykon SF Fabric Softener. The mean stain removal scores of the fabric treated with wet fixation durable press Mykon without stain release finish were surpassed by fabrics treated with the same type durable press in combination with Scotchgard by a highly significant difference ($P < 0.001$). Other differences in stain removal ratings between the fabrics with durable press without soil control revealed that fabrics with Rhoplex and those with Cirrasol were superior in rating at the 0.01 level of confidence. Fabrics finished with Scotchgard were superior in stain removal to those fabrics with Mission Valley and Cirrasol in addition to durable press finish by a highly significant difference ($P < 0.001$). On the other hand, when Rhoplex finished fabric was compared to fabrics treated with Mission Valley a significant difference of 0.01 was exhibited in favor of the latter.

The differences between the mean stain removal scores of the 70-30 cotton-polyester fabric treated with wet fixation durable press was surpassed by fabrics with wet fixation durable press with the addition of Rhoplex or Cirrasol soil release. The differences were highly significant. Other differences in stain removal ratings between various pairs of

fabrics with soil release agents which were highly significant ($P < 0.001$) follow: (a) cotton-polyester fabrics finished with Mission Valley when compared to fabrics finished with Rhoplex, (b) cotton-polyester fabrics finished with Scotchgard when compared to fabrics finished with Rhoplex, and (c) cotton-polyester fabrics finished with Cirrasol when compared to Rhoplex.

The 50-50 cotton-polyester fabrics finished with wet fixation durable press with Mykon fabric softener were surpassed by fabrics with the same type treatment with the addition of soil release agents at the 0.01 level of confidence. The mean stain removal scores of the 50-50 cotton-polyester blend fabric treated with Cirrasol in addition to the durable press finish was surpassed by the fabrics finished with Mission Valley, Rhoplex and Scotchgard. The differences were significant ($P < 0.02$).

The difference between the mean stain removal ratings of fabrics with wet fixation durable press with the addition of soil release agents was not significant except for the following pair of comparisons: (a) cotton-polyester fabrics without soil release were superior in stain release to fabrics treated with Rhoplex by a significant difference ($P < 0.02$), and (b) fabrics without soil release were superior in comparison to fabrics treated with Cirrasol. The Cirrasol treated fabrics exhibited inferior ratings when compared to fabrics treated with other soil release agents by differences which

were significant ($P < 0.02$)

The cotton fabric without soil release was surpassed in the removal of mustard stain by all fabric blends at the same high statistical difference ($P < 0.001$). The 35-65 blend finished with wet fixation Mykon without soil release exceeded the stain removal ratings of the other two blends by highly significant differences.

When the mean stain removal ratings of fabrics treated with Mission Valley were analyzed, it was found that all blends exceeded cotton. The wet fixation treated blends showed that 50-50 and 70-30 cotton-polyester blends were surpassed by the 35-65 cotton-polyester blend. All of these differences were highly significant ($P < 0.001$).

The 50-50 and 35-65 blends surpassed the cotton by highly significant differences when treated with Rhoplex or Scotchgard in addition to the durable press finish. Also exhibiting a high significant difference in stain removal was the 70-30 blend which was exceeded by all other fabric blends.

Fabrics Finished with Wet Fixation without Fabric Softener. The statistical comparisons obtained by means of the "t" tests on means of stain removal ratings of various pairs of fabrics show significant differences. Fabrics with Mission Valley and those with Cirrasol in addition, the the durable press finish were surpassed by the fabrics with

Rhoplex treatment by differences which were significant ($P < 0.01$).

The cotton with durable press, but without soil release was surpassed in stain removal by the fabric blends. The 35-65 blend fabric with Mission Valley surpassed the 70-30 blend fabric in stain removal, while on the other hand, the 50-50 cotton-polyester blend exceeded fabrics of 35-65 cotton-polyester blend by a significant difference ($P < 0.01$).

The differences in stain removal of fabrics treated with Cirrasol in addition to durable press were not significant when compared statistically. With respect to the fabrics finished with durable press, Scotchgard, all fabrics surpassed the cotton in removal of mustard by differences which were slightly significant. Not one pair of fabrics treated with Mission Valley soil release demonstrated any significant difference when compared to other fabrics for the removal of stain. The 35-65 and the 50-50 cotton-polyester blends exceeded in stain removal ratings of the other two fabrics when given similar treatments by highly significant differences ($P < 0.001$).

100 Per Cent Cotton without Soil Release. Statistical comparisons by means of "t" tests were made on the differences in stain removal ratings of all possible pairs of fabrics which had been subjected to 25 launderings. The effect on stain release of all cotton fabrics without durable

press, fabric softener, or soil release may be summarized as follows. According to the stain release measurements, the DMDHEU durable-press finish with Mykon and Valspex softeners decreased staining tendencies of the 100 per cent. cotton fabric. When wet fixation durable press with Mykon SF was applied to the all cotton fabric the acceptance of stain was reduced significantly.

The difference in stain acceptance between cotton with DMDHEU-Valspex and DMDHEU-Mykon finishes were significant ($P < 0.02$). All other differences of fabric treated with DMDHEU-Valspex were highly significant ($P < 0.001$). The stain release measurement of fabric treated with DMDHEU-Mykon surpassed that of fabric finished with DMDHEU alone by a difference which was significant ($P < 0.01$). The remaining comparisons between fabrics treated with DMDHEU alone when compared to different pairs of fabrics in the group were highly significant ($P < 0.001$). The difference by which the fabric with wet fixation durable press with Valspex was surpassed by the same durable press finish without softener was distinctly significant ($P < 0.01$).

70-30 Cotton-Polyester without Soil Release. The statistical comparisons obtained by means of "t" tests for mustard stain removal ratings of various pairs of fabrics show that fabrics without durable press or fabric softeners surpassed those having DMDHEU durable press alone and also

fabric with wet fixation treatment without fabric softener by a significant difference ($P < 0.01$). The fabric finished with DMDHEU-Mykon surpassed the same durable press finish without softener by a significant difference ($P < 0.01$). The fabrics finished with wet fixation durable press were exceeded in stain removal by a highly significant difference by the fabrics to which DMDHEU durable press with Mykon. The cotton-polyester blends with DMDHEU decreased the staining tendency by a highly significant difference when compared to fabrics with wet fixation durable press in combination with Valspex. On the other hand, stain removal from fabric with wet fixation-Mykon was superior to the same durable press treatment without fabric softener by a highly significant difference ($P < 0.001$).

50-50 Cotton-Polyester without Soil Release. Stain release of untreated 50-50 cotton-polyester fabric surpassed the other experimental fabrics with wet fixation-Mykon and those with wet fixation alone by a highly significant difference ($P < 0.001$) in the removal of mustard stain. The differences by which the untreated fabric surpassed the one finished with DMDHEU durable press was distinctly significant ($P < 0.01$). The other differences in stain removal ratings of mustard were not significant.

The 50-50 cotton-polyester fabric treated with DMDHEU durable press Valspex surpassed the fabric to which the same

durable press without fabric softener was applied. The application of Valspex and Mykon with DMDHEU surpassed fabrics with wet fixation durable press without fabric softener by a highly significant difference ($P < 0.001$).

The differences between the mean stain removal ratings of the fabrics treated with DMDHEU alone were not significant except for the following pairs of comparisons:

(a) the fabric treated with wet fixation Valspex was surpassed by the fabric treated with DMDHEU by a highly significant difference ($P < 0.001$), and (b) the fabric treated with wet fixation-Mykon was surpassed by fabrics treated with DMDHEU by a comparatively lower significant difference ($P < 0.01$). On the other hand, fabrics finished with wet fixation durable press without fabric softener exceeded the same durable press treatment with softeners by significant differences.

35-65 Cotton-Polyester without Soil Release Agent.

The stain removal scores of the untreated 35-65 cotton-polyester fabrics surpassed the stain rating scores of the fabrics treated with wet fixation durable press in combination with Valspex and Mykon fabric softeners. The differences were distinctly significant ($P < 0.01$). The other significant differences between the stain ratings of the 35-65 cotton-polyester fabrics may be summarized as follows: (a) the fabric finished with DMDHEU Valspex softener were superior to fabrics finished with wet fixation Valspex by a significant

difference ($P < 0.01$), (b) fabrics finished with DMDHEU without a softener and with Mykon exceeded fabrics with wet fixation durable press and Valspex fabric softener by a significant difference ($P < 0.01$).

The mean stain removal scores of fabrics finished with wet fixation in combination with Valspex and Mykon surpassed the mean scores of the fabrics treated with wet fixation durable press alone. The differences were highly significant ($P < 0.001$).

100 Per Cent Cotton with Mission Valley Soil Release Agent. The mean stain removal scores of the 100 per cent cotton fabric with Mission Valley without durable press and softeners was surpassed by the mean scores of the fabrics treated with DMDHEU in combination with softeners and by the fabric finished with wet fixation-Valspex. The differences were all highly significant ($P < 0.001$).

The stain removal scores of the cotton fabrics treated with DMDHEU-Valspex were surpassed by fabrics treated with wet fixation durable press without softener and the same durable press treatment with Valspex. The differences were significant, $P < 0.01$ and $P < 0.02$, respectively. There were no other significant differences except for the following pairs of highly significant comparisons: (a) fabrics finished with DMDHEU-Valspex surpassed the fabrics with wet fixation and Mykon softener, (b) the fabrics with DMDHEU-

Valspex also exceeded fabrics with wet fixation durable press alone.

The difference by which fabrics finished with DMDHEU-Mykon surpassed the fabrics to which wet fixation without softener or Mykon was applied, were significant ($P < 0.01$). In addition, stain release measurements of fabrics treated with wet fixation in combination with fabric softeners surpassed that of fabrics finished with wet fixation alone.

70-30 Cotton-Polyester with Mission Valley Soil Release Agent. The differences between the mean stain removal scores of the 70-30 cotton-polyester fabrics were not significant except for the following pairs of comparisons which were highly significant: (a) the untreated 70-30 cotton-polyester fabric was surpassed by fabrics treated with DMDHEU, (b) the 70-30 cotton-polyester fabric treated with DMDHEU-Valspex surpassed the same durable press treatment without fabric softener, (c) the 70-30 cotton-polyester fabrics treated with DMDHEU-Mykon exceeded those with DMDHEU alone. The mean stain removal ratings of fabric with DMDHEU was superior to fabrics with wet fixation durable press alone and in combination with Mykon by significant differences ($P < 0.01$).

50-50 Cotton-Polyester with Mission Valley Soil Release Agent. According to the statistical comparisons of stain removal scores of the cotton-polyester fabric treated

with DMDHEU in combination with Valspex and Mission Valley, significant differences were observed ($P < 0.01$) for fabrics finished with wet fixation with fabric softeners. The stain rating scores of the cotton-polyester fabric treated with DMDHEU-Mykon were significantly different for the following fabrics ($P < 0.01$): (a) fabrics finished with DMDHEU alone, (b) fabrics treated with wet fixation durable press-Valspex, and (c) fabrics treated with wet fixation-Mykon.

The mean scores for stain removal of the fabrics finished with wet fixation in combination with fabric softeners surpassed the stain removal ratings of fabrics treated with wet fixation alone. The differences were highly significant ($P < 0.001$).

35-65 Cotton-Polyester with Mission Valley Soil Release Agent. The effect of stain release of untreated cotton-polyester fabrics with Mission Valley and those with durable press were highly significant ($P < 0.001$), with the exception of fabrics finished with wet fixation alone and in combination with Mykon which exceeded the untreated fabrics with Mission Valley soil release by a less significant level. The fabrics finished with DMDHEU alone and in combination with Valspex and Mykon exceeded the fabrics with wet fixation by a lower significant level ($P < 0.01$).

100 Per Cent Cotton with Scotchgard FC-218 Soil Release Agent. The stain removal scores for the Scotchgard

treated fabrics without durable press were surpassed by the stain rating scores of fabrics finished with DMDHEU and wet fixation durable press. The significant levels of differences were, $P < 0.1$ and $P < 0.05$, respectively. There were no significant differences between the stain rating scores of the fabrics with DMDHEU in combination with Valspex. Fabrics finished with wet fixation Valspex surpassed the following fabrics by significant differences ($P < 0.01$): (a) DMDHEU-Mykon, (b) DMDHEU alone, and (c) wet fixation alone. On the other hand, when fabrics with wet fixation alone were compared to durable press fabrics with Mykon a slightly lower significant difference was observed.

70-30 Cotton-Polyester with Scotchgard FC-218 Soil Release Agent. The effect of stain release of cotton-polyester fabrics without durable press compared to fabrics treated with the two different types of durable press with Scotchgard may be summarized as follows. According to stain release measurements, the DMDHEU durable press finish and fabrics with wet fixation durable press with Valspex decreased the staining tendencies of fabric.

The stain release scores of the DMDHEU durable press fabrics in combination with Valspex decreased staining tendencies of the 70-30 cotton-polyester blends with the addition of Scotchgard soil release. When the fabrics treated with DMDHEU-Valspex were compared to fabrics with wet fixation-

Mykon finish the acceptance of stain was reduced significantly. The difference in stain release of all cotton fabrics with DMDHEU-Mykon and Scotchgard and that of the fabrics treated with wet fixation with Scotchgard was not significant. On the other hand, the DMDHEU-Mykon fabrics exceeded in stain removal of fabrics with the same durable press alone by a significant difference ($P < 0.01$). The stain release measurements for fabric treated with wet fixation durable press with Mykon were surpassed by fabric treated with DMDHEU durable press.

50-50 Cotton-Polyester with Scotchgard FC-218 Soil Release Agent. The statistical comparison of 50-50 cotton-polyester with Scotchgard in combination with the different finishes revealed that fabric without durable press and fabric softeners was not significantly different from fabric with durable press treatments in combination with softeners for one exception. The cotton-polyester blend with DMDHEU-Valspex surpassed the untreated blend by a highly significant difference ($P < 0.001$).

The stain release measurements of the fabric treated with DMDHEU-Valspex exceeded all other treatments of durable press with Scotchgard by differences which were highly significant ($P < 0.001$). The differences between various pairs of fabrics compared to wet fixation durable press were significant.

35-65 Cotton-Polyester with Scotchgard FC-218 Soil Release Agent. Stain release of fabrics treated with Scotchgard without durable press and fabric softeners surpassed the fabric treated with wet fixation-Mykon by a difference which was significant ($P < 0.02$). The untreated cotton-polyester fabric with Scotchgard surpassed the fabrics with DMDHEU durable press and Valspex by the same significant difference. The difference by which fabrics finished with DMDHEU-Valspex surpassed the fabrics treated with wet fixation durable press in combination with fabric softeners was significant ($P < 0.01$). Differences in stain removal between the following pairs of fabrics were highly significant: (a) cotton-polyester fabric finished with DMDHEU-Mykon when compared to fabrics with wet fixation, (b) cotton-polyester fabric finished with DMDHEU when compared to fabrics with wet fixation-Mykon, (c) cotton-polyester finished fabrics finished with wet fixation alone when compared to fabrics with wet fixation-Mykon.

100 Per Cent Cotton with Rhoplex SR-488 Soil Release Agent. Statistical comparisons by means of "t" tests were made to determine the stain removal ratings of various pairs of experimental fabrics with Rhoplex soil release. All the differences between fabrics without durable press and fabric softeners were significant. The differences by which fabrics finished with DMDHEU-Valspex and DMDHEU alone were highly significant ($P < 0.001$). The other differences were less

highly significant ($P < 0.02$). The difference in stain acceptance between DMDHEU-Valspex and the other finishes were highly significant.

The application of DMDHEU durable press finish alone to the cotton fabric made the fabric less susceptible to staining. When wet fixation durable press with Valspex was applied in addition to the Rhoplex to the experimental fabrics the stain acceptance of the fabrics was increased significantly; whereas, the application of wet fixation-Mykon SF revealed an increase in stain retention.

70-30 Cotton-Polyester with Rhoplex SR-488 Soil Release Agent. The stain release rating of fabrics treated with Rhoplex was surpassed by the cotton-polyester fabric treated with DMDHEU-Valspex by differences which were highly significant ($P < 0.001$). According to the scores of the stained fabrics, the fabric finished with DMDHEU-Valspex was significantly more resistant to stains than were the cotton-polyester fabrics with the other durable press treatments. The cotton-polyester fabric treated with DMDHEU surpassed that of fabrics with wet fixation in combination with Mykon by differences highly significant ($P < 0.001$). The application of wet fixation durable press finish with Valspex reduced the stain acceptance to an extent significantly different from fabrics treated with wet fixation without softeners or with Mykon by significant levels of difference,

$P < 0.01$ and $P < 0.05$, respectively.

50-50 Cotton-Polyester with Rhoplex SR-488 Soil Release Agent. The statistical comparisons of the 50-50 cotton-polyester fabrics with Rhoplex in addition to DMDHEU durable press with Mykon were not significantly different in stain removal except for the following two comparisons: the untreated fabrics surpassed fabrics finished with wet fixation-Valspex by a slightly significant difference, and the fabrics finished with DMDHEU exceeded the fabrics finished with wet fixation durable press by a slightly higher significant difference ($P < 0.01$).

The mean stain removal rating of fabric without durable press and softeners was surpassed by fabrics treated with the durable press finishes in combination with fabric softeners. The fabrics with DMDHEU alone were exceeded by fabrics with the same type durable press in combination with softeners by differences which were highly significant. The addition of Valspex fabric softener to the DMDHEU durable press finished fabric decreased the stain removal tendencies when comparisons were made to fabrics with wet fixation without softener and in combination with Mykon at a highly significant difference ($P < 0.001$).

35-65 Cotton-Polyester with Rhoplex SR-488 Soil Release Agent. The statistical comparisons obtained by means of "t" tests on means of stain removal ratings of the various

pairs of fabrics with Rhoplex showed that fabrics without durable press and fabric softeners were exceeded in stain removal by all other fabric finishes. Stain removal scores of the fabric treated with DMDHEU durable press finish plus Valspex surpassed the mean scores of the fabrics treated with wet fixation without fabric softeners or in combination with Mykon SF. The differences were highly significant ($P < 0.001$).

100 Per Cent Cotton with Cirrasol PT Soil Release Agent. The mean stain removal ratings of cotton fabric with Cirrasol, but without durable press finish was surpassed by fabric with DMDHEU durable press finish by a highly significant difference. The difference between the cotton fabric to which DMDHEU and fabric softeners was applied with Cirrasol and those treated with wet fixation in combination with the corresponding softeners and Cirrasol was highly significant ($P < 0.001$). On the other hand, the cotton fabric treated with wet fixation-Mykon exceeded fabrics without fabric softeners by a difference which was significant ($P < 0.01$).

70-30 Cotton-Polyester with Cirrasol PT Soil Release Agent. The stain removal ratings of the 70-30 cotton-polyester fabric with Cirrasol, but without durable press and softeners was surpassed by the stain ratings of the fabrics to which durable press finishes had been applied with different fabric softeners. The addition of soil release agents,

fabric softeners, and durable press finishes resulted in higher stain removal ratings.

The effect of DMDHEU-Valspex with Cirrasol on the removal of stain from the cotton-polyester fabrics may be summarized as follows: the mean stain removal ratings for fabrics with wet fixation was surpassed by fabrics finished with DMDHEU durable press. The durable press treatments with Mykon and Cirrasol exhibited a highly significant difference ($P < 0.001$) when compared to fabrics without softeners.

50-50 Cotton-Polyester with Cirrasol PT Soil Release Agent. The statistical comparisons of the stain removal ratings achieved as a result of one laundering after staining fabrics with Cirrasol, but without durable press resulted in significantly higher ratings than did fabrics treated with durable press Mykon finish. The highly significant differences ($P < 0.001$) of the other pairs of fabrics were as follows: (a) cotton-polyester fabrics finished with DMDHEU when compared to fabrics finished with wet fixation-Mykon, (b) cotton-polyester fabrics finished with wet fixation-Valspex when compared to fabrics finished with wet fixation-Mykon, and (c) cotton-polyester fabrics finished with wet fixation when compared to fabrics with wet fixation-Mykon.

35-65 Cotton-Polyester with Cirrasol PT Soil Release Agent. The fabrics finished with wet fixation Valspex with

Cirrasol and fabrics finished with wet fixation-Mykon surpassed the 35-65 cotton-polyester blend without durable press by significant levels of differences, $P < 0.01$ and $P < 0.02$, respectively. When Cirrasol was added to fabrics treated with DMDHEU-Valspex the stain removal score surpassed that of the fabrics to which wet fixation durable press with softeners and Cirrasol were applied. The differences were distinctly significant ($P < 0.01$). The stain removal ratings of the fabric with DMDHEU durable press alone and with Mykon surpassed the stain removal scores of the fabrics finished with wet fixation with the corresponding treatments. On the other hand, fabrics with wet fixation with softeners were superior in stain removal when compared to fabrics with wet fixation durable press alone by a significant difference ($P < 0.02$).

RANK ORDER OF REMOVAL
OF MUSTARD STAIN

Comparison of Fiber Content of Fabrics without Durable Press, Fabric Softener, or Soil Release. The different fabric blends exceeded cotton in stain release of mustard for all laundering intervals. The rank order established from statistical comparisons of the mean stain release of fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Mission Valley Soil Release, but without Durable Press or Fabric Softener. The fabrics with the highest polyester content received the first place rank, whereas, fabrics with the highest cotton content received the second place rank. The following rank order was established as a result of statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics with Scotchgard FC-218 Soil Release Agent, but without Durable Press or Fabric Softener. The 35-65 cotton-polyester surpassed the cotton and other blends in stain removal of mustard for all laundering intervals. The statistical comparisons of fiber content according to rank order for the stained and laundered fabrics are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Rhoplex SR-488 Soil Release Agent, but without Durable Press or Fabric Softener. The 35-65 and 50-50 cotton-polyester blends exceeded in stain removal when compared to cotton and the 70-30 cotton-polyester blend. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of different fiber content falling within the category under discussion follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics with Cirrasol PT Soil Release, but without Durable Press or Fabric Softeners. The 100 per cent cotton and 70-30 cotton-polyester blend fabrics were exceeded in stain removal by significant differences when compared to the other two fabric blends. The rank order

of statistical comparisons established from the mean stain release rating of the different fiber contents follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, but without Soil Release Agent. The all cotton was surpassed in stain release by each of the different fabric blends in the removal of mustard stain from the stained and laundered specimens. The following rank order was established as a result of statistical comparison of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. All of the cotton-polyester fabric blends exceeded the 100 per cent cotton in the release

of mustard stain from the laundered fabrics. The following rank order was determined by statistical comparisons of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. All of the different fabric blends surpassed cotton in stain release of mustard from the experimental fabrics. The rank order established from statistical comparisons of the mean stain release obtained from the stained and laundered fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The 35-65 and 50-50 cotton-polyester blends were superior in stain removal of mustard when compared to the cotton and 70-30 cotton-polyester blend. The

following rank order was determined by statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. All cotton was exceeded by each of the different fiber blends by a small significant difference. The following rank order was established according to statistical comparisons of the mean stain release scores of the test fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, but without a Soil Release Agent. Comparisons of the removal of mustard from fabrics experienced no significant difference in mean stain release scores throughout, with high scores for all fabrics. The following rank order was established as a

result of statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Mission Valley Soil Release Agent. Each of the different fabric blends exceeded cotton in stain release from the stained and laundered experimental fabrics. The statistical comparisons of the mean stain removal ratings show the following rank order:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Scotchgard FC-218 Soil Release Agent. Cotton was surpassed in stain release ratings of mustard stain by each of the different cotton-polyester fabric blends. The following rank order was established according to the statistical comparison of

mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Rhoplex SR-488 Soil Release Agent. Both of the 35-65 and 50-50 cotton-polyester blends exceeded in stain removal when compared to cotton and the 70-30 cotton-polyester blend. The statistical comparisons of the mean stain removal from the experimental fabrics are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Cirrasol PT Soil Release Agent. The 100 per cent cotton and the 50-50 cotton-polyester were surpassed in stain removal rating of mustard by the 70-30 and 35-65 cotton-polyester blends. The rank order obtained from the laundered stained fabrics of different fiber content by means of statistical comparisons are as follows:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, but without Fabric Softener or Soil Release Agent. The 35-65 cotton-polyester blend received the highest rank with cotton and the other fabric blends receiving the second place rank. The rank order was established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of the different fiber contents are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, with Mission Valley Soil Release Agent, but without a Fabric Softener. The 35-65 cotton-polyester blend received the highest rank and the all cotton obtained the lowest rank, with the other two blends falling into place between these two extremes. The following rank order was

established by statistical comparison of the mean stain release made with respect to the fabrics of different fiber content falling within the category under discussion:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. The 100 per cent cotton and 70-30 cotton-polyester blend were surpassed in stain release of mustard by the other two fabric blends. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Rhoplex SR-488 Soil Release, but without Fabric Softener. The 35-65 cotton-polyester blend

received the highest rank with cotton and the other fabric blends receiving the second place rank. The following rank order was established as a result of statistical comparison of mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Cirrasol PT Soil Release Agent, but without a Fabric Softener. The all cotton and 70-30 cotton-polyester blend were each surpassed in stain removal of mustard by each of the other fabric blends by a small significant difference. The rank order obtained from the laundered stained fabrics of different fiber content by means of statistical comparisons are as follows:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, but without Soil Release Agent. Each of the different cotton-

polyester blends surpassed all cotton in stain release of mustard from the experimental fabrics. The rank order established from statistical comparisons of the mean stain release obtained from laundering the stained fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. The mean scores of stain removal of mustard for all laundering intervals revealed no significant difference. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester.	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The comparisons of

removal of mustard from the experimental fabrics experienced no significant difference in mean stain release scores throughout, with high scores for all fabrics. The following rank order was established as a result of statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The 35-65 cotton-polyester blend received the highest rank and the 100 per cent cotton obtained the lowest rank; each of the other two blends fell into place between these two extremes. The rank order established from statistical comparisons of the mean stain release of fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. The 50-50 cotton-polyester blend received the highest rank, the all cotton and 70-30 blend obtained the lowest ranks, with the 35-65 cotton-polyester blend falling heir to second place. The rank order of statistical comparisons established from the mean stain release rating of the different fiber content follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, but without Soil Release Agent. The 70-30 cotton-polyester blend received the highest rank and the 100 per cent cotton received the lowest rank, with the other two blends falling into place between these two extremes. The rank order of mean stain release of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Mission Valley Soil Release Agent. Each of the different fabric blends exceeded cotton in stain release of mustard from the experimental fabrics. The rank order established from statistical comparisons of the mean stain release obtained from laundering the stained fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The comparisons of the removal of mustard from the fabrics experienced no significant difference in mean stain release scores. The rank order established as a result of statistical comparisons of the mean stain release obtained from the laundered fabrics of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Rhoplex SR-488 Soil Release Agent. Both the 35-65 and 50-50 cotton-polyester blends exceeded in stain removal when compared to cotton and the 70-30 cotton-polyester blend. The statistical comparisons of the mean stain removal of mustard from the experimental fabrics are shown in the following summarization of rank order:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Cirrasol PT Soil Release Agent. The comparisons of the removal of mustard stain from fabrics experienced no significant difference in mean stain release scores throughout, with comparatively high scores for all fabrics. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, but without Fabric Softener or Soil Release Agent. The mean scores of stain removal of mustard from the experimental fabrics revealed no significant difference. The following rank order was established as a result of statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mission Valley Soil Release Agent, but without Fabric Softener. No significant difference was evident in stain removal of mustard from the experimental fabrics. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. Each of the different fabric blends surpassed all cotton in stain release of mustard from the experimental fabrics. The rank order established from statistical comparisons of the mean stain release obtained from laundering the stained fabrics are presented in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Rhoplex SR-488 Soil Release Agent, but without a Fabric Softener. Fabrics with the highest polyester content received the first place rank, whereas, fabrics with the highest cotton content received the second place rank. The rank order established from statistical

comparisons of the mean stain release obtained from laundering the stained fabrics are presented in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Cirrasol PT Soil Release Agent, but without Fabric Softener. The highest rank was received by the 50-50 cotton-polyester blend, all cotton and the 70-30 cotton-polyester blend obtaining the lowest ranks, the 35-65 cotton-polyester blend received the second place rank. The rank order of statistical comparisons established from the mean stain release rating of the different fiber content follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	2

S U M M A R Y D

EVALUATION OF MUSTARD STAIN REMOVAL AS A RESULT OF ONE LAUNDERING AFTER THE FABRICS WITH NO DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	2.5	2.5	2.5	2.5	2.5	2.6	3
B	70-30 Cotton- Polyester	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3
C	50-50 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2
D	35-65 Cotton- Polyester	3.5	3.0	3.0	3.0	3.0	3.0	3.1	2

S U M M A R Y D, ContinuedEVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH NO DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
B	70-30 Cotton- Polyester	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	3.5	3.5	3.8	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	2.5	2.5	2.0	2.0	2.0	2.0	2.2	3
B	70-30 Cotton- Polyester	3.0	3.0	2.5	2.5	3.0	3.0	2.8	3
C	50-50 Cotton- Polyester	3.5	3.5	3.0	3.0	3.0	3.0	3.2	2
D	35-65 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH NO DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	2.5	2.5	2.5	2.5	2.5	2.6	3
B	70-30 Cotton- Polyester	3.0	2.5	2.0	2.0	2.0	2.0	2.2	3
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	16.5	13.5	13.0	13.0	13.0	13.0	82.0	4
B	70-30 Cotton- Polyester	16.5	15.0	14.0	14.0	14.5	14.5	88.5	3
C	50-50 Cotton- Polyester	19.0	19.0	18.5	18.5	18.0	18.0	111.0	2
D	35-65 Cotton- Polyester	19.5	18.5	18.5	18.5	18.5	18.5	112.0	1
	Total	71.5	66.0	64.0	64.0	64.0	64.0	393.5	

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU
DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENER HAD
BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.5	3.5	3.5	3.5	4.0	4.0	3.7	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	3.5	3.5	4.0	4.0	4.0	3.8	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND VALSPEX (P-167)
FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	4.0	3.5	3.0	3.0	3.9	2
B	70-30 Cotton-Polyester	5.0	5.0	4.5	4.0	4.0	4.0	4.4	1
C	50-50 Cotton-Polyester	5.0	5.0	5.0	5.0	4.5	4.5	4.8	1
D	35-65 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	4.0	4.8	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	3.5	4.0	3.5	3.5	3.5	3.7	2
B	70-30 Cotton-Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND VALSPEX (P-167)
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	20.5	19.0	18.5	18.0	18.0	18.0	112.0	4
B	70-30 Cotton- Polyester	20.0	20.0	19.5	19.0	19.0	19.0	116.5	3
C	50-50 Cotton- Polyester	21.0	21.0	21.0	21.0	20.5	20.5	125.0	1
D	35-65 Cotton- Polyester	21.0	21.0	21.0	21.0	21.0	20.0	125.0	1
	Total	82.5	81.0	80.0	79.0	78.5	77.5	478.5	

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU
DURABLE PRESS AND MYKON SF FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.0	3.5	3.0	3.0	3.3	2
B	70-30 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.0	2.5	2.5	2.5	2.5	2.5	2.6	3
B	70-30 Cotton-Polyester	3.5	3.5	3.0	2.5	2.5	2.5	2.9	3
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	3.5	3.5	3.5	4.0	4.0	3.8	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	18.5	17.0	16.5	17.0	16.5	16.5	102.0	4
B	70-30 Cotton- Polyester	19.5	19.5	19.0	18.5	18.5	18.5	113.5	3
C	50-50 Cotton- Polyester	20.0	19.5	19.5	19.5	20.0	20.0	118.5	2
D	35-65 Cotton- Polyester	20.0	20.0	20.0	20.0	20.0	20.0	120.0	1
	Total	78.0	76.0	75.0	75.0	75.0	75.0	454.0	

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU
DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
C	50-50 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.5	3.0	2.5	2.5	2.5	2.5	2.8	3
B	70-30 Cotton- Polyester	4.0	3.0	3.5	3.5	3.5	3.5	3.5	2
C	50-50 Cotton- Polyester	4.0	3.5	3.0	3.0	3.5	3.0	3.3	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y D, ContinuedEVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton-Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.5	3.0	3.0	3.0	3.0	3.0	3.1	2
B	70-30 Cotton-Polyester	4.0	3.5	3.5	4.0	3.5	4.0	3.8	2
C	50-50 Cotton-Polyester	4.0	4.0	3.5	3.5	4.0	4.0	3.8	2
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	3.5	3.5	3.5	3.8	2
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	19.0	16.5	16.0	16.0	16.0	16.0	99.5	4
B	70-30 Cotton- Polyester	20.0	17.5	18.0	18.0	17.5	18.0	109.0	3
C	50-50 Cotton- Polyester	20.0	19.0	18.0	18.0	19.0	18.5	112.5	2
D	35-65 Cotton- Polyester	20.0	20.0	20.0	20.0	20.0	20.0	120.0	1
	Total	79.0	73.0	72.0	72.0	72.5	72.5	441.0	

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENER HAD
BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	2.0	2.0	2.0	2.0	2.0	2.2	3
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
D	35-65 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2
B	70-30 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2
C	50-50 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
D	35-65 Cotton- Polyester	3.5	3.5	4.0	3.5	3.5	3.5	3.6	2

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND VALSPEX (P-167)
FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	2.5	2.5	2.5	2.5	2.7	3
B	70-30 Cotton-Polyester	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
C	50-50 Cotton-Polyester	4.0	4.0	4.0	3.5	3.5	3.5	3.8	2
D	35-65 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND VALSPEX (P-167)
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	2.5	2.5	2.5	2.5	2.5	2.6	3
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	16.5	15.0	14.5	14.5	14.5	14.5	89.5	4
B	70-30 Cotton- Polyester	17.5	16.5	16.5	16.5	16.5	16.5	100.0	3
C	50-50 Cotton- Polyester	19.0	18.5	18.5	18.0	18.0	18.0	110.0	2
D	35-65 Cotton- Polyester	19.5	18.5	19.0	18.5	18.5	18.5	112.5	1
	Total	72.5	68.5	68.5	67.5	67.5	67.5	412.0	

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND MYKON SF FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	2.5	2.5	2.5	2.5	2.5	2.6	3
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	3.5	3.0	3.0	3.0	3.0	3.0	3.1	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	3.5	3.5	3.8	2

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	2.5	2.5	2.5	2.5	2.5	2.6	3
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
D	35-65 Cotton- Polyester	3.5	3.5	4.0	3.5	3.5	3.5	3.6	2

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND MYKON SF
FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
D	35-65 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	2.5	2.0	2.0	2.0	2.0	2.0	2.1	3
B	70-30 Cotton- Polyester	2.5	2.5	2.5	2.5	2.0	2.0	2.3	3
C	50-50 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2
D	35-65 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.0	3.4	2

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND MYKON SF
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	3.5	3.0	3.0	3.0	3.0	3.0	3.1	2
C	50-50 Cotton- Polyester	3.5	3.5	3.0	3.0	3.0	3.0	3.2	2
D	35-65 Cotton- Polyester	3.5	3.5	3.0	3.0	3.0	3.0	3.2	2

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	15.5	13.5	13.5	13.5	13.5	13.5	83.0	4
B	70-30 Cotton- Polyester	16.0	15.5	15.5	15.5	15.0	15.0	92.5	3
C	50-50 Cotton- Polyester	18.5	17.0	16.5	16.5	16.5	16.5	101.5	2
D	35-65 Cotton- Polyester	18.5	18.0	18.0	17.5	17.5	16.5	106.0	1
	Total	68.5	64.0	63.5	63.0	62.5	61.5	383.0	

S U M M A R Y D, Continued

EVALUATION OF MUSTARD STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	3.5	3.0	3.0	3.0	3.0	3.0	3.1	2
C	50-50 Cotton- Polyester	3.5	3.5	3.5	3.5	3.0	3.5	3.4	2
D	35-65 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
D	35-65 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2

S U M M A R Y D, ContinuedEVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	3.5	3.5	3.5	3.8	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.0	2.5	2.5	2.5	2.5	2.5	2.6	3
B	70-30 Cotton- Polyester	3.0	2.5	2.5	2.5	3.0	2.5	2.7	3
C	50-50 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
D	35-65 Cotton- Polyester	3.5	3.0	3.0	3.0	3.0	3.0	3.1	2

EVALUATION OF MUSTARD STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.5	2.5	2.5	2.5	2.5	2.5	2.7	3
B	70-30 Cotton- Polyester	3.0	2.5	2.0	2.0	2.0	2.0	2.2	3
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	16.5	15.0	15.0	14.5	14.5	14.5	90.0	2
B	70-30 Cotton- Polyester	16.5	15.0	14.5	14.5	15.0	14.5	90.0	2
C	50-50 Cotton- Polyester	18.5	18.0	18.0	18.0	17.5	18.0	90.0	2
D	35-65 Cotton- Polyester	17.5	17.0	17.0	17.0	17.0	17.0	102.5	1
	Total	69.0	65.0	64.5	64.0	64.0	64.0	372.5	

STATISTICAL ANALYSIS OF DATA
CONCERNING CATSUP STAIN

The removal of catsup stain from the test fabrics presented a different trend as will be observed in Summary E which follows. All fabrics experienced diversification in rank order.

Score totals for all fabrics in the different laundering series demonstrated contrasting ranks. The initial scores for all fabrics ranked first with the score for the tenth laundering receiving second place. As the number of launderings increased before staining, a gradual decrease in stain rating was noticed, indicating that some of the finish was lost due to the laundering series.

Fabrics without Durable Press or Fabric Softener.

The rank order established according to statistical comparisons made with respect to the stain release of cotton fabrics without durable press or fabric softener, but with soil release agents revealed differences. The comparison of stain removal scores from the untreated cotton fabric without soil release was surpassed by fabrics treated with soil release agents alone by differences which were significant ($P < 0.01$).

The difference between the mean stain removal ratings of the 70-30 cotton-polyester with Scotchgard soil release, but without durable press or fabric softeners

surpassed fabrics without soil release or those to which Mission Valley or Rhoplex were applied by highly significant differences ($P < 0.001$). On the other hand, when the fabrics treated with Cirrasol were compared to fabrics treated with Scotchgard slight significant differences were observed in favor of fabrics with Cirrasol finish.

The 50-50 cotton-polyester stain removal scores of fabrics without soil release and those with the various soil release agents were not significant except for the following comparisons: (a) fabrics finished with Cirrasol surpassed those without soil release agents by a significant difference ($P < 0.02$), (b) fabrics finished with Scotchgard surpassed those with Rhoplex by differences which were highly significant ($P < 0.001$), and (c) fabrics finished with Cirrasol surpassed those with Scotchgard by differences which were significant ($P < 0.01$).

The 35-65 cotton-polyester fabrics without durable press, fabric softener, or soil release agents were surpassed in stain removal by fabrics treated with the various soil release agents by significant differences. The fabrics treated with Scotchgard rated higher when compared to fabrics with Mission Valley, Rhoplex or Cirrasol soil release at significant differences of, $P < 0.01$ and $P < 0.001$, respectively.

The statistical comparisons of the removal of cat-sup stain from pairs of the experimental fabrics without

durable press, fabric softener, or soil release revealed that cotton retained more stain than did the 70-30 or the 50-50 cotton-polyester blends by significant differences ($P < 0.02$). The 50-50 cotton-polyester blend surpassed the 70-30 blend by the same significant level.

When fabrics finished with Scotchgard, but without durable press or fabric softeners were analyzed it was found that the blends surpassed the cotton with corresponding treatment by differences which were distinctly significant ($P < 0.01$).

Fabrics Finished with DMDHEU Durable Press and Valspex Fabric Softener. The cotton fabric with DMDHEU durable press and Valspex fabric softener were not significant in stain removal ratings when compared to fabrics finished with the same durable press finish with the addition of soil release agents with one exception. The untreated fabric surpassed that of fabric finished with Scotchgard by a slightly significant difference. The differences in stain removal ratings between the following pairs of fabrics finished with soil release in addition to the durable press and fabric softener were significant ($P < 0.05$): (a) cotton fabric finished with Mission Valley when compared to fabric finished with Scotchgard, (b) cotton fabric finished with Rhoplex when compared to fabrics finished with Scotchgard, and (c) cotton fabric finished with Cirrasol when compared to fabric

finished with Scotchgard. From the above comparisons it is evident that Scotchgard soil release was inferior to other soil release agents in the removal of stains from the experimental fabrics. All blends exceeded in stain removal when compared to cotton by differences which were distinctly significant ($P < 0.05$).

Fabrics Finished with DMDHEU Durable Press and Mykon SF Fabric Softener. The mean stain removal scores of cotton fabric treated with DMDHEU-Mykon without soil release agents demonstrated superior ratings when compared to fabrics with Scotchgard, Rhoplex or Cirrasol. The cotton fabrics treated with Mission Valley soil release were found to exceed in stain removal when compared to fabrics treated with Scotchgard and Rhoplex by significant levels of differences, $P < 0.01$ and $P < 0.001$, respectively.

The 70-30 cotton-polyester fabric treated with DMDHEU-Mykon in addition to Rhoplex soil release were surpassed in stain removal to the fabric without soil release and the fabrics to which Mission Valley and Scotchgard were applied by a slight significant difference. On the other hand, fabrics treated with Rhoplex exhibited higher stain removal ratings than did the fabrics treated with Cirrasol by differences which were significant ($P < 0.05$).

The differences between the mean stain removal scores of the 50-50 cotton-polyester agents surpassed fabrics finished

with Scotchgard and Cirrasol by differences which were distinctly significant ($P < 0.01$). The untreated fabrics also surpassed fabrics treated with Rhoplex by a difference which was significant ($P < 0.05$). When fabrics finished with Mission Valley were compared to fabrics with the other three soil release agents, slight significant differences were evident in stain removal. Fabric finished with Scotchgard exhibited slightly superior stain removal ratings when compared to Cirrasol treated fabrics.

Statistical data computed for the stain removal rating of catsup from the experimental fabrics revealed the fact that 35-65 cotton-polyester fabrics without soil release were surpassed by fabrics finished with Scotchgard and Rhoplex by significant levels of differences, $P < 0.01$ and $P < 0.001$, respectively. On the other hand, fabrics treated with Mission Valley exceeded the fabrics treated with Rhoplex and Scotchgard by significant levels. Two other stain removal differences were noted, fabrics finished with Cirrasol surpassed fabrics finished with Scotchgard and Rhoplex by significant levels of differences, $P < 0.01$ and $P < 0.001$, respectively.

The removal of stain from the experimental fabrics displayed statistical differences. The 70-30 cotton-polyester blend treated with DMDHEU-Mykon and Scotchgard were superior in stain removal ratings to the all cotton fabric with the corresponding treatment. The 70-30 blends with Scotchgard

also exceeded in stain removal when compared to the other two fabric blends by a significant difference ($P < 0.01$). The fabric blends finished with Rhoplex in addition to the DMDHEU-Mykon treatment demonstrated superior stain release ratings when compared to the cotton fabric. The stain removal was significantly different ($P < 0.05$). Other stain removal ratings between the various pairs of fabrics with Cirrasol that were significantly different ($P < 0.01$) follow: (a) cotton-polyester fabric compared to the cotton, (b) the cotton-polyester blend when compared to the 70-30 blend, and (c) the 35-65 cotton-polyester fabric when compared to the 50-50 blend.

Fabrics Finished with DMDHEU without Fabric Softener.

The stain removal from various pairs of fabrics when compared statistically revealed the fact that cotton treated with DMDHEU without softener or soil release agents surpassed the fabrics treated with Mission Valley soil release at significant differences ($P < 0.01$). The mean stain removal rating for fabrics treated with the other three soil release agents was significant at the ($P < 0.01$) level.

The stain removal of the 70-30 cotton-polyester fabrics finished with DMDHEU durable press without soil release agents were surpassed by fabrics treated with Mission Valley, Scotchgard, Rhoplex and Cirrasol by significant differences ($P < 0.01$).

The stain removal rating of the 50-50 cotton-polyester blend treated with DMDHEU-Mykon without soil release surpassed the same fabric blend finished with Mission Valley by a highly significant difference ($P < 0.001$). Fabrics to which Mission Valley soil release finish was applied were superior to fabrics with the other soil release finishes by differences which were significant ($P < 0.001$).

The fabric blends finished with Mission Valley were superior to the cotton fabrics with the same treatment by differences which were distinctly significant ($P < 0.01$). The 35-65 cotton-polyester blends finished with Mission Valley in addition to the DMDHEU durable press surpassed the other two blends in stain removal by differences which were significant ($P < 0.01$).

Fabrics Finished with Wet Fixation Durable Press and Valspex Fabric Softener. The statistical comparisons obtained by means of the "t" test on means of stain removal ratings of the various pairs of fabrics show little significant differences. The differences between the mean stain removal scores of the fabrics treated with wet fixation durable press with Rhoplex fabric softener with different soil release agents were not significant. Two slight differences were indicated when the 50-50 cotton-polyester fabrics treated with durable press in addition to Scotchgard were compared to the cotton and the 70-30 blend with corresponding finishes.

Fabrics Finished with Wet Fixation Durable Press and Mykon Fabric Softener. The 100 per cent cotton fabric finished with wet fixation-Mykon exhibited lower stain removal ratings than did fabrics treated with Scotchgard in addition to the durable press finish. The difference was significant ($P < 0.02$). The fabrics treated with Scotchgard also surpassed the fabric treated with the other three soil release agents in stain release by the same significant difference.

The mean stain removal ratings for fabrics treated with wet fixation-Mykon demonstrated statistical differences. The 65-35 cotton-polyester blends without soil release agents exceeded in stain release ratings when compared to the same blend with soil release agents by highly significant differences ($P < 0.001$). When fabrics treated with Scotchgard were compared to the fabrics treated with Rhoplex and Cirrasol the difference was highly significant ($P < 0.001$).

The differences between the mean stain removal ratings of the 50-50 cotton-polyester blend treated with wet fixation-Mykon without soil release and with the various soil release agents were not significant except for slight indications. Fabrics finished with Scotchgard surpassed the fabrics treated with Rhoplex and Cirrasol by slightly significant differences.

The mean stain removal rating of cotton fabrics treated with wet fixation-Mykon without soil release was surpassed by the 70-30 cotton-polyester blend by a highly

significant difference ($P < 0.001$). The differences between the mean stain removal scores of the cotton and 70-30 cotton-polyester blend was significantly higher than that of the other blends when treated with Scotchgard.

Fabrics Finished with Wet Fixation without Fabric Softener. The cotton fabrics treated with wet fixation durable press finish were surpassed in stain removal ratings by fabrics finished with the corresponding durable press with the addition of Scotchgard and Rhoplex. The significant levels of differences were $P < 0.001$ and $P < 0.01$, respectively. Fabrics treated with Mission Valley were also surpassed in stain removal ratings by the fabrics finished with Scotchgard and Rhoplex. The fabrics finished with wet fixation in combination with Scotchgard also surpassed fabrics treated with Rhoplex and Cirrasol by significant differences. On the other hand, when fabrics treated with Rhoplex were analyzed they were found to be superior in stain release to fabrics treated with Cirrasol.

The 70-30 cotton-polyester fabrics finished with wet fixation durable press and Scotchgard were found to exceed in stain removal ratings all other experimental fabrics with the corresponding durable press finish by highly significant differences. When the 50-50 cotton-polyester blend with wet fixation was analyzed it was found that fabrics treated with Scotchgard exceeded fabrics without soil release and those

with Mission Valley at highly significant differences ($P < 0.001$). The fabrics treated with Scotchgard were also superior in stain removal ratings to fabrics finished with Rhoplex and Cirrasol by significant levels of differences, $P < 0.02$ and $P < 0.01$, respectively. On the other hand, the Cirrasol treated fabrics were superior to fabrics treated with Rhoplex.

Statistical comparisons of the removal of catsup stain from pairs of the experimental fabrics with wet fixation without soil release were surpassed by fabrics with the corresponding durable press treatment with the addition of Mission Valley and Scotchgard by highly significant differences ($P < 0.001$). On the other hand, there were indications that fabrics treated with Scotchgard were surpassed by fabrics treated with Rhoplex and Cirrasol.

The mean stain removal ratings for fabrics treated with Mission Valley demonstrated statistical differences. The 35-65 cotton-polyester blends exceeded in stain release ratings when compared to the cotton and other blends. The cotton fabric treated with wet fixation durable press and Rhoplex surpassed the 70-30 cotton-polyester with corresponding finish. The 35-65 cotton-polyester blend with wet fixation durable press and Rhoplex soil release surpassed the cotton and the 50-50 blend in stain removal.

100 Per Cent Cotton without Soil Release Agent. The statistical comparisons of the stain removal scores between

the cotton fabric treated with the two different types of durable press without and in combination with fabric softeners showed variation in stain ratings. The untreated cotton fabric was surpassed by fabric treated with DMDHEU without and in addition to fabric softeners by a highly significant difference ($P < 0.001$). The stain release ratings of fabric finished with wet fixation exceeded that of the unfinished fabric by a difference which was distinctly significant ($P < 0.01$). Fabrics finished with DMDHEU durable press were superior to those having wet fixation durable press by the same significant difference.

70-30 Cotton-Polyester without Soil Release Agent.

A statistical analysis of the data by means of the "t" test applied to pairs of fabrics with respect to the removal of catsup stain showed significant differences. The fabrics with DMDHEU exceeded the other fabrics in stain removal by highly significant differences with one exception. Fabrics treated with wet fixation durable press with Mykon SF fabric softener experienced slight superior differences when compared to fabrics treated with the wet fixation-Valspex or wet fixation without fabric softener. The fabrics with DMDHEU durable press with Valspex and Mykon surpassed fabrics without durable press or softeners by significant levels of differences, $P < 0.01$ and $P < 0.02$, respectively. The 70-30 cotton-polyester fabrics with wet fixation-Valspex surpassed

the fabrics with wet fixation durable press treatment with Mykon by a highly significant difference ($P < 0.001$). This same high significant difference was experienced for fabrics with wet fixation durable press without fabric softener.

50-50 Cotton-Polyester without Soil Release Agent.

The effect of soil release of the 50-50 blend without durable press, and the fabric finished with DMDHEU was significant at the 0.02 level of confidence. All other comparisons of pairs of fabrics when statistically analyzed were not significant.

35-65 Cotton-Polyester without Soil Release Agent.

The 35-65 cotton-polyester fabric treated with DMDHEU durable press without and in combination with fabric softeners exhibited higher stain release scores than did fabrics without durable press finish. The difference was highly significant ($P < 0.001$).

100 Per Cent Cotton Finished with Mission Valley Soil Release Agent. The application of DMDHEU durable press finish to cotton fabrics with Mission Valley made the fabric more susceptible to staining. The cotton fabric treated with DMDHEU durable press with Valspex and Mykon fabric softeners surpassed the fabrics finished with DMDHEU alone by a difference which was significant ($P < 0.01$). There were significant differences between the cotton fabric treated

with durable press finishes alone or in combination with the fabric softeners.

70-30 Cotton-Polyester with Mission Valley Soil Release Agent. A statistical analysis of the data by means of the "t" test applied to various pairs of fabrics with respect to the removal of catsup stain showed slightly significant differences. The fabrics treated with Mission Valley in addition to DMDHEU without and in combination with Valspex and Mykon fabric softeners experienced slightly superior ratings.

50-50 Cotton-Polyester Finished with Mission Valley Soil Release Agent. No statistical differences were observed when comparisons between fabrics without durable press treatment with Mission Valley soil release, with one exception. The fabric without durable press or fabric softener surpassed the fabric treated with wet fixation-Mykon by a difference which was distinctly significant ($P < 0.01$). The DMDHEU-Valspex and DMDHEU-Mykon finished fabrics were superior in stain removal ratings to fabrics with wet fixation durable press treatment in addition to Mykon fabric softener by a highly significant difference ($P < 0.001$). On the other hand, fabrics with DMDHEU alone surpassed the following fabrics by different levels of significance: (a) fabrics with wet fixation-Valspex by differences which were significant ($P < 0.01$),

(b) fabrics with wet fixation-Mykon by differences which were distinctly significant ($P < 0.05$), and (c) fabrics with wet fixation alone by differences which were significant ($P < 0.01$).

35-65 Cotton-Polyester Finished with Mission Valley Soil Release Agent. The effect of stain release between pairs of cotton-polyester blends with Mission Valley soil release exhibited some differences. The fabrics finished with wet fixation durable press surpassed fabrics without durable press and fabric softener by a difference which was distinctly significant ($P < 0.02$). Fabrics treated with wet fixation-Valspex and with Mykon fabric softeners were surpassed in stain removal ratings by fabrics with DMDHEU durable press by differences which were highly significant ($P < 0.001$). Further comparisons revealed the fact that fabrics treated with wet fixation durable press surpassed fabrics with the same durable press with the addition of fabric softeners.

100 Per Cent Cotton Finished with Scotchgard FC-218 Soil Release Agent. The mean stain removal ratings of the fabric treated with wet fixation durable press and Scotchgard surpassed that of fabrics without durable press treatment. The cotton fabric to which wet fixation-Mykon and those without fabric softener were significant by different levels, $P < 0.05$ and $P < 0.01$, respectively. The fabrics

treated with DMDHEU durable press surpassed fabrics with the same durable press without softener and in combination with Valspex by a highly significant difference ($P < 0.001$). The fabrics to which wet fixation durable press with fabric softeners were applied surpassed in stain removal ratings when compared to fabrics with DMDHEU finish without fabric softener by significant differences ($P < 0.05$). On the other hand, there was an indication that the cotton fabric treated with wet fixation-Mykon finish surpassed fabrics with wet fixation without fabric softeners.

70-30 Cotton-Polyester Finished with Scotchgard FC-218 Soil Release Agent. The stain removal ratings for 70-30 cotton-polyester fabrics with Scotchgard, but without durable press or fabric softeners was surpassed by fabrics treated with DMDHEU by a slight significant difference. A reverse trend was evident when fabrics without durable press or fabric softeners were compared to fabrics finished with wet fixation-Valspex with a significant difference at the 5.0 per cent level of confidence. The Scotchgard treated fabrics with the addition of DMDHEU durable press with Valspex were superior in stain removal to fabrics treated with wet fixation-Valspex by a significant difference ($P < 0.01$): (a) cotton-polyester fabrics finished with DMDHEU-Mykon when compared to fabrics with DMDHEU alone, (b) cotton-polyester fabrics finished with

DMDHEU without softener when compared to fabrics with wet fixation-Valspex, and (c) cotton-polyester finished with wet fixation-Mykon when compared to fabrics with wet fixation-Valspex.

50-50 Cotton-Polyester Finished with Scotchgard FC-218 Soil Release Agent. The statistical comparisons of the 50-50 cotton-polyester with Scotchgard in combination with the durable press and softeners showed fabrics with DMDHEU durable press to be superior to those fabrics without durable press treatment. The fabrics finished with DMDHEU-Valspex surpassed the following by significant differences ($P < 0.01$): (a) cotton-polyester finished with DMDHEU-Mykon, (b) cotton-polyester finished with wet fixation-Mykon, and (c) cotton-polyester finished with wet fixation without fabric softener.

There were indications that fabrics treated with DMDHEU durable press and Mykon fabric softener were inferior to the other durable press treatments in combination with the fabric softeners. Fabrics finished with DMDHEU durable press alone surpassed those fabrics with wet fixation-Mykon by differences which were distinctly significant ($P < 0.01$).

35-65 Cotton-Polyester Finished with Scotchgard FC-218 Soil Release Agent. The stain release ratings of fabrics with durable press finish in combination with

Scotchgard soil release finish were superior by significant levels of confidence to fabrics without durable press or fabric softeners. The following comparisons of fabrics were significantly different ($P < 0.01$): (a) cotton-polyester fabrics finished with DMDHEU-Valspex when compared to fabrics with DMDHEU-Mykon, (b) cotton-polyester fabrics finished with DMDHEU alone when compared to fabrics with wet fixation-Valspex, and (c) cotton-polyester fabrics finished with DMDHEU-Mykon when compared to fabrics with DMDHEU without softener. The fabrics with wet fixation durable press finish without fabric softener surpassed fabrics treated with DMDHEU-Mykon and fabrics treated with wet fixation-Valspex at differences significant at the 5.0 per cent level of confidence.

100 Per Cent Cotton Finished with Rhoplex SR-488 Soil Release Agent. According to the statistical comparisons of stain removal scores the cotton fabric treated with Rhoplex and DMDHEU without fabric softener, or with the combination with Valspex surpassed the untreated cotton fabric by a highly significant difference ($P < 0.001$). The cotton fabric finished with DMDHEU-Valspex exceeded in stain removal when compared to fabric with DMDHEU-Mykon by the same high level of significance.

70-30 Cotton-Polyester Finished with Rhoplex SR-488 Soil Release Agent. The effect of stain release from cotton-

polyester fabrics with Rhoplex, but without durable press were surpassed by the fabrics finished with DMDHEU durable press. The differences were highly significant ($P < 0.001$). According to stain release scores, the fabrics with DMDHEU durable press with fabric softeners decreased in staining tendencies of the experimental fabrics. The stain release measurement of fabric treated with DMDHEU-Mykon surpassed fabrics finished with wet fixation alone or with Mykon fabric softener by differences which were significant ($P < 0.05$).

50-50 Cotton-Polyester Finished with Rhoplex SR-488 Soil Release Agent. The statistical comparisons obtained by means of the "t" test for stain removal of catsup from various pairs of fabrics show that fabric with softeners were surpassed by fabric treated with DMDHEU at a highly significant difference ($P < 0.001$). The fabrics finished with DMDHEU-Mykon rated by a higher significant difference in stain release to fabrics treated with wet fixation durable press. The stain removal ratings for fabrics treated with DMDHEU without fabric softener surpassed the fabrics to which the wet fixation treatment of durable press was applied.

35-65 Cotton-Polyester Finished with Rhoplex SR-488 Soil Release Agent. The application of DMDHEU durable press finish without or in combination with fabric softeners made fabrics less susceptible to stain retention. The stain

release ratings of fabrics finished with DMDHEU surpassed fabrics without durable press treatment at a highly significant difference ($P < 0.001$). The difference in stain release of fabrics finished with DMDHEU-Mykon and those finished with wet fixation durable press without fabric softener or the addition of Mykon was highly significant ($P < 0.001$). Other superior differences exhibited by fabrics treated with DMDHEU-Mykon at a lower significant level were revealed when compared to fabrics finished with wet fixation with Valspex and wet fixation with Mykon fabric softener. On the other hand, fabrics finished with wet fixation alone surpassed fabrics treated with wet fixation-Valspex by a highly significant difference ($P < 0.001$).

100 Per Cent Cotton Finished with Cirrasol PT Soil Release Agent. The cotton fabric with Cirrasol, but without durable press or fabric softener was surpassed by fabrics finished with DMDHEU Mykon and fabrics finished with wet fixation durable press by highly significant differences ($P < 0.001$). The stain release ratings of fabric treated with DMDHEU-Valspex surpassed fabrics finished with wet fixation durable press by a highly significant difference.

70-30 Cotton-Polyester Finished with Cirrasol PT Soil Release Agent. The differences in stain removal of the 70-30 cotton-polyester fabric with Cirrasol soil

release were not significant, but for one exception. The fabrics without durable press or fabric softener surpassed fabrics with wet fixation durable press by a highly significant difference ($P < 0.001$).

50-50 Cotton-Polyester Finished with Cirrasol PT Soil Release Agent. The statistical comparison of the 50-50 cotton-polyester fabrics treated with Cirrasol may be summarized as follows. The cotton-polyester fabrics without durable press or fabric softener surpassed fabrics finished with DMDHEU Mykon by differences which were distinctly significant ($P < 0.01$). The stain release evaluation of fabrics finished with wet fixation durable press with softeners revealed that they were exceeded in stain removal by fabrics finished with wet fixation with softeners by a highly significant difference ($P < 0.001$). The fabrics finished with DMDHEU durable press with Valspex surpassed fabrics with the same durable press with Mykon softener by a significant difference ($P < 0.01$). According to comparisons made of fabrics treated with DMDHEU-Mykon it was evident that higher significant differences existed between fabrics treated with wet fixation with the addition of fabric softeners. Less significant differences were exhibited when fabrics with DMDHEU-Mykon were compared to fabrics with durable press but without fabric softeners.

35-65 Cotton-Polyester Finished with Cirrasol PT Soil Release Agent. The difference between the mean stain removal ratings of fabrics treated with Cirrasol was not significant except for two comparisons. The cotton-polyester fabrics finished with wet fixation-Valspex and those finished with wet fixation-Mykon were surpassed by fabrics without durable press or fabric softeners by a highly significant difference ($P < 0.001$).

RANK ORDER OF REMOVAL
OF CATSUP STAIN

Comparison of Fiber Content of Fabrics without Durable Press, Fabric Softener, or Soil Release. The all cotton was surpassed in stain release by each of the different fabric blends in removal of catsup stain from the stained and laundered specimens. The following rank order was established as a result of statistical comparison of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Mission Valley Soil Release, but without Durable Press or Fabric Softener. The comparisons of the removal of catsup from

fabrics experienced no significant difference in mean stain release scores throughout, with high scores for all fabrics. The following rank order was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Scotchgard FC-218 Soil Release Agent, but without Durable Press or Fabric Softener. The mean scores of stain removal of catsup for all laundering intervals revealed no significant difference. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Rhoplex SR-488 Soil Release Agent, but without Durable Press or Fabric Softener. The comparisons of the removal of catsup

stain from fabrics experienced no significant difference in mean stain release scores, with comparatively high scores for all fabrics. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Cirrasol PT Soil Release, but without Durable Press or Fabric Softeners. No significant difference was evident in stain removal of catsup from the experimental fabrics. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, but without Soil Release Agent. Comparisons of the removal of catsup from the experimental fabrics revealed no significant difference in mean stain release scores. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. Each of the different experimental fabrics received the highest rank in the release of catsup stain from the laundered fabrics. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. No significant differences were evident in stain removal of catsup from the experimental fabrics. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The highest rank was awarded to each of the different experimental fabrics in stain release of catsup from the laundered experimental fabrics. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. Each of the different experimental fabrics in this category rated superior in stain removal of catsup. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, but without a Soil Release Agent. The comparisons of the mean stain release scores revealed no significant difference in stain release, high scores for all experimental fabrics were obtained. The following was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Mission Valley Soil Release Agent. Comparisons of the removal of mustard from fabrics experienced no significant difference in the mean stain release, all fabrics received the highest rank. The following rank order was established according to statistical comparisons of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The mean scores of stain removal of catsup for all laundering intervals showed no significant difference. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The comparisons of the mean stain release of catsup from fabrics revealed no significant difference with all fabrics receiving high ranks. The statistical comparisons of the mean stain removal from the experimental fabrics are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Cirrasol PT Soil Release Agent. The mean scores of stain removal of catsup for all laundering intervals revealed no significant differences. The rank order obtained from the statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, but without Fabric Softener or Soil Release Agent. No significant difference in the mean stain release scores of the different fabrics was evident, the highest scores were received by each fabric. The following rank order was established as a result of statistical comparison of mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparisons of Fiber Content of Fabrics Finished with DMDHEU Durable Press, with Mission Valley Soil Release Agent, but without a Fabric Softener. Each of the different experimental fabrics received the highest rank in stain removal of catsup. The rank order was established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of the different fiber contents are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. The mean scores of stain removal of catsup for all laundering intervals revealed no significant difference. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Rhoplex SR-488 Soil Release, but without Fabric Softener. The highest rank was awarded to all experimental fabrics in the removal of catsup stain. The following rank order was established as a result of statistical comparisons of mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Cirrasol PT Soil Release Agent, but without a Fabric Softener. The 100 per cent cotton as well

as each of the cotton-polyester fabric blends received high ranks in the removal of catsup stain. The rank order obtained from the laundered stained fabrics of different fiber content by means of statistical comparisons are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, but without Soil Release Agent. Each of the different fabrics were rated as superior in stain removal of catsup. The following rank order was established as a result of statistical comparison of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. The comparisons of removal of catsup from the experimental fabrics experienced

no significant difference in mean stain release scores. The following rank order was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The comparisons of removal of catsup from the experimental fabrics experienced no significant difference in mean stain release scores throughout, with high scores obtained by all fabrics. The following rank order was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The mean scores of stain removal of catsup for all laundering intervals revealed no

significant difference, with high scores received by all fabrics. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. Each of the different fabric blends surpassed the 100 per cent cotton in stain release of catsup from the stained and laundered experimental fabrics. The rank order established from statistical comparisons of the mean stain release obtained from the test fabrics are presented in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, but without Soil Release Agent. Comparisons of the removal of

catsup from fabrics experienced no significant differences in mean stain release scores, with high scores for all of the different fabrics. The rank order of statistical comparisons established from the mean stain release rating of the different fiber content follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparisons of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Mission Valley Soil Release Agent. The different experimental fabrics each received a high rank in release of catsup stain. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The comparisons of

the mean stain removal scores of catsup from the experimental fabrics revealed no significant difference. The following rank order was established as a result of statistical comparisons of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Rhoplex SR-488 Soil Release Agent. Each of the different fabrics received a superior rank in the release of catsup from the laundered experimental specimens. The following rank order was determined by statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Cirrasol PT Soil Release Agent. No significant difference

was evident in stain removal of catsup from the experimental fabrics. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, but without Fabric Softener or Soil Release Agent. The mean scores of the stain removal of catsup for all laundering intervals showed no significant difference. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, with Mission Valley Soil Release Agent, but without Fabric Softener. The comparisons of

removal of catsup from the experimental fabrics experienced no significant difference in mean stain release scores. The following rank order was established as a result of statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. The comparisons of the removal of catsup from fabrics experienced no significant difference in mean stain release scores throughout, with high scores for all fabrics. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Rhoplex SR-488 Soil Release Agent, but without a Fabric Softener. No significant differ-

was evident in stain removal of catsup from the experimental fabrics, all received high scores. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Cirrasol PT Soil Release Agent, but without Fabric Softener. Comparisons of the removal of catsup from the experimental fabrics revealed no significant difference in mean stain release scores. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different fiber content falling within the category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

S U M M A R Y E

EVALUATION OF CATSUP STAIN REMOVAL AS A RESULT OF ONE LAUNDER-
ING AFTER THE FABRICS WITH NO DURABLE PRESS AND NO FABRIC
SOFTENER HAD BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.0	3.0	3.5	3.5	3.4	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	5.0	4.0	5.0	4.0	4.0	4.3	1
D	35-65 Cotton- Polyester	4.0	4.0	5.0	4.0	4.0	4.0	4.2	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.5	4.5	4.5	4.5	4.5	4.5	4.5	1
D	35-65 Cotton- Polyester	4.5	4.5	4.5	4.5	4.5	4.5	4.5	1

S U M M A R Y E, ContinuedEVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS WITH NO
DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1
B	70-30 Cotton- Polyester	5.0	5.0	4.5	4.5	4.5	5.0	4.8	1
C	50-50 Cotton- Polyester	4.5	5.0	4.5	4.5	4.5	4.5	4.6	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	4.5	4.5	4.5	4.6	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS WITH NO
DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	20.5	19.5	19.0	19.0	19.5	19.5	117.0	4
B	70-30 Cotton- Polyester	22.0	22.0	21.5	21.5	21.5	21.5	130.0	3
C	50-50 Cotton- Polyester	22.0	23.5	22.0	23.0	22.0	22.0	134.5	1
D	35-65 Cotton- Polyester	22.5	22.5	23.5	22.0	22.0	22.0	134.5	1
	Total	87.0	87.5	86.0	85.5	85.0	85.0	515.0	

S U M M A R Y E, Continued

EVALUATION OF CATSUP STAIN REMOVAL AS A RESULT OF ONE LAUNDER-
ING AFTER THE FABRICS FINISHED WITH DMDHEU DURABLE PRESS AND
VALSPEX (P-167) FABRIC SOFTENER HAD BEEN LAUNDERED THE
DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	4.0	5.0	5.0	4.8	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

S U M M A R Y E, ContinuedEVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
DMDHEU DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	4.0	4.0	3.0	3.0	4.0	1
B	70-30 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

EVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
DMDHEU DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	25.0	25.0	24.0	23.0	23.0	23.0	143.0	4
B	70-30 Cotton- Polyester	25.0	25.0	25.0	25.0	25.0	25.0	150.0	1
C	50-50 Cotton- Polyester	25.0	25.0	25.0	25.0	25.0	25.0	150.0	1
D	35-65 Cotton- Polyester	25.0	25.0	25.0	25.0	25.0	25.0	150.0	1
	Total	100.0	100.0	99.0	98.0	98.0	98.0	593.0	

S U M M A R Y E, Continued

EVALUATION OF CATSUP STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU
DURABLE PRESS AND MYKON SF FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

S U M M A R Y E, Continued

EVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
DMDHEU DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
B	70-30 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton-Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
D	35-65 Cotton-Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1
B	70-30 Cotton-Polyester	4.0	4.0	4.5	5.0	5.0	5.0	4.6	1
C	50-50 Cotton-Polyester	5.0	5.0	4.5	4.0	4.5	4.5	4.6	1
D	35-65 Cotton-Polyester	4.5	4.0	4.5	4.5	4.5	4.5	4.4	1

EVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
DMDHEU DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	5.0	4.5	4.5	4.5	4.5	4.5	4.6	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	23.5	22.0	22.0	22.0	22.0	22.0	133.5	4
B	70-30 Cotton- Polyester	23.0	23.0	23.5	24.0	24.0	24.0	141.5	1
C	50-50 Cotton- Polyester	25.0	23.5	23.0	22.5	23.0	23.0	140.0	3
D	35-65 Cotton- Polyester	24.5	23.0	23.0	23.5	23.5	23.5	141.5	1
	Total	96.0	91.5	92.0	92.0	92.5	92.5	556.5	

S U M M A R Y E, Continued

EVALUATION OF CATSUP STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU
DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN LAUN-
DERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
B	70-30 Cotton- Polyester	4.5	4.5	4.5	4.5	4.5	4.5	4.5	1
C	50-50 Cotton- Polyester	4.5	4.0	4.5	4.5	4.5	4.5	4.4	1
D	35-65 Cotton- Polyester	4.5	5.0	5.0	5.0	5.0	5.0	4.9	1

S U M M A R Y E, ContinuedEVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
DMDHEU DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

EVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
DMDHEU DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	25.0	24.0	24.0	24.0	24.0	24.0	145.0	3
B	70-30 Cotton- Polyester	24.5	23.5	23.5	23.5	23.5	23.5	142.0	4
C	50-50 Cotton- Polyester	24.5	24.0	24.5	24.5	24.5	24.5	146.5	2
D	35-65 Cotton- Polyester	24.5	25.0	25.0	25.0	25.0	25.0	149.5	1
	Total	98.5	96.5	97.0	97.0	97.0	97.0	583.0	

S U M M A R Y E, Continued

EVALUATION OF CATSUP STAIN REMOVAL AS A RESULT OF ONE LAUNDER-
ING AFTER THE FABRICS FINISHED WITH WET FIXATION DURABLE PRESS
AND VALSPEX (P-167) FABRIC SOFTENER HAD BEEN LAUNDERED THE
DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated. Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y E, ContinuedEVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
WET FIXATION DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
B	70-30 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
C	50-50 Cotton- Polyester	4.5	4.5	4.5	4.5	4.5	4.5	4.5	1
D	35-65 Cotton- Polyester	5.0	4.5	4.0	4.0	4.0	4.0	4.2	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1

PART V: CIRRASOL PT STAIN REMOVAL AGENT

[illegible][illegible]

S U M M A R Y E, Continued

EVALUATION OF CATSUP STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXA-
TION DURABLE PRESS AND MYKON SF FABRIC SOFTENER HAD
BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	5.0	4.5	5.0	4.5	4.5	4.5	4.7	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y E, ContinuedEVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
WET FIXATION DURABLE PRESS AND MYKON SF FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	5.0	4.0	4.0	4.7	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	4.5	4.9	1
C	50-50 Cotton- Polyester	5.0	4.5	4.5	4.0	4.0	4.0	4.3	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
WET FIXATION DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	21.0	21.0	21.0	21.0	20.0	20.0	124.0	2
B	70-30 Cotton- Polyester	22.0	21.5	22.0	21.5	21.5	21.0	129.5	1
C	50-50 Cotton- Polyester	21.5	20.5	20.5	20.0	20.0	20.0	122.5	3
D	35-65 Cotton- Polyester	20.0	20.0	20.0	20.0	20.0	20.0	120.0	4
	Total	84.5	83.0	83.5	82.5	81.5	81.0	496.0	

S U M M A R Y E, Continued

EVALUATION OF CATSUP STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET
FIXATION DURABLE PRESS AND NO FABRIC SOFTENER HAD
BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.5	4.5	5.0	5.0	5.0	5.0	4.8	1

S U M M A R Y E, ContinuedEVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
WET FIXATION DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	5.0	5.0	4.5	4.5	4.5	4.8	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	4.5	4.5	4.8	1
C	50-50 Cotton- Polyester	5.0	4.5	4.5	4.5	4.5	4.5	4.6	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	4.5	4.5	4.5	4.8	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.5	4.0	4.0	4.0	4.5	5.0	4.3	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.5	4.5	4.2	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

EVALUATION OF CATSUP STAIN REMOVAL FROM FABRICS FINISHED WITH
WET FIXATION DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	21.5	21.5	21.5	20.5	21.0	21.5	127.5	3
B	70-30 Cotton- Polyester	21.0	21.0	21.0	21.0	20.5	20.5	125.0	4
C	50-50 Cotton- Polyester	22.0	21.5	21.5	21.5	22.0	22.0	130.5	2
D	35-65 Cotton- Polyester	23.5	23.5	24.0	23.5	23.5	23.5	141.5	1
	Total	88.0	87.5	88.0	86.5	87.0	87.5	524.5	

STATISTICAL ANALYSIS OF DATA CONCERNING COFFEE WITH CREAM STAIN

The total score values of all fabrics for the stain removal of coffee with cream were very close as is evident in Summary F which follows. Many similarities were noted between the removal of this stain and the other water-borne stains, however, not as wide variations were displayed as was the case with the other stains.

It was noted that little rating difference existed between the initial and the twenty-fifth launderings. The lowest stain rating score was awarded to the fifth laundering interval. Ranking of the stain ratings was similar to that of the other stains already discussed in that as the number of launderings increased the finish tended to be less effective.

Fabrics without Durable Press or Fabric Softener.

The statistical comparisons of the stain removal measurements of the cotton fabric without durable press, fabric softener, or soil release agents exhibited differences. The untreated cotton fabric surpassed fabrics treated with the different soil release agents at the 0.01 level of confidence. Fabrics finished with Cirrasol revealed slightly subordinate stain removal ratings when compared to fabrics with Scotchgard and Rhoplex soil release. When Mission Valley soil release was applied to the cotton fabric stain resistance

was slightly reduced as compared to fabrics treated with Rhoplex.

The difference between the stain removal ratings of coffee with cream from the 70-30 cotton-polyester blend without durable press, softeners or soil release agents was highly significant to fabrics treated with soil release only. The differences were all highly significant ($P < 0.001$).

The mean stain removal scores of the 50-50 cotton-polyester fabric without durable press, softeners, or soil release surpassed fabrics with the corresponding treatment with the addition of Scotchgard and Rhoplex. The difference was highly significant ($P < 0.001$).

The 35-65 cotton-polyester fabrics without durable press, fabric softeners, or soil release finishes were highly significant ($P < 0.001$) to fabrics without durable press, fabric softeners, but with the addition of different soil release agents. The untreated fabrics were less susceptible to stains than fabrics with different durable press, softeners or soil release finishes.

There were slight indications that the untreated 50-50 and the 35-65 cotton-polyester blends retained less stain than did the cotton or 70-30 blend. The all cotton fabric with Scotchgard was surpassed by the blends in stain release by a slight significant difference. With respect to the fabrics treated with Rhoplex, there were indications

that the 70-30 and 35-65 cotton-polyester blends released more stain than did the cotton fabrics.

Fabrics Finished with DMDHEU and Valspex Fabric Softener. The mean stain removal scores of cotton fabric finished with DMDHEU-Valspex without soil release agents was surpassed by fabrics with the corresponding finish with the addition of Mission Valley and Scotchgard. The differences were significant, $P < 0.01$ and $P < 0.02$, respectively. The Mission Valley treated fabrics were superior in stain release of coffee with cream by differences which were highly significant ($P < 0.001$) when compared to fabrics treated with Scotchgard, Rhoplex or Cirrasol soil release agents. Two other stain release differences were noted, fabrics finished with Scotchgard surpassed those finished with Rhoplex and Cirrasol by significant differences, $P < 0.05$ and $P < 0.02$, respectively.

The differences between the mean stain removal scores of the 70-30 cotton-polyester fabrics treated with DMDHEU-Valspex in combination with the various soil release agents were not significant, with two exceptions. Fabrics without soil release and those treated with Mission Valley surpassed fabrics finished with Scotchgard by a highly significant difference ($P < 0.001$).

The mean stain removal scores of the 50-50 cotton-polyester treated with DMDHEU-Valspex without soil release

agents demonstrated highly superior ratings when compared to fabrics with Scotchgard, Rhoplex or Cirrasol. The differences were highly significant ($P < 0.001$). The cotton-polyester fabric treated with Mission Valley soil release was found to exceed in stain removal when compared to fabrics with the three other soil release agents by differences which were highly significant ($P < 0.001$). One other difference was indicated, the fabric finished with Rhoplex was slightly significant when comparison was made to fabrics treated with Cirrasol.

The effect of stain release from the 35-65 cotton-polyester blend fabrics finished with DMDHEU-Valspex without soil release agents surpassed fabrics with Scotchgard treatment by a difference which was significant ($P < 0.05$). Other superior stain release ratings were evident when the fabric without soil release was compared to fabrics with Rhoplex and Cirrasol. The differences were highly significant ($P < 0.001$). The fabrics having been treated with Mission Valley soil release were superior in stain release when compared to fabrics with Scotchgard and Rhoplex. The difference was significant, $P < 0.05$ and $P < 0.001$, respectively. When fabrics treated with Scotchgard were compared to fabrics finished with Rhoplex and Cirrasol soil release, slight significant differences were observed in stain removal ratings.

When fabrics without soil release treatment were analyzed, the mean stain removal was surpassed by each of the

different fabric blends by a difference which was significant ($P < 0.01$). Statistical data computed for the removal of coffee with cream stain from the experimental fabrics with Scotchgard treatment revealed the fact that 35-65 cotton-polyester surpassed the cotton and the 50-50 cotton-polyester blend by a significant difference ($P < 0.01$). The Scotchgard treated 50-50 blend exceeded the cotton in stain removal by a significant difference ($P < 0.02$). There were indications that the 50-50 blend with Rhoplex released more stain than did the cotton or the 70-30 cotton-polyester.

Fabrics Finished with DMDHEU Durable Press and Mykon Fabric Softener. The statistical comparisons obtained by means of the "t" test on stain removal ratings of the various pairs of fabrics show significant differences. The 100 per cent cotton fabric with DMDHEU-Mykon without soil release agents exhibited lower stain removal rating than did fabrics treated with Mission Valley. The difference was highly significant ($P < 0.001$). The fabrics treated with Mission Valley also surpassed fabrics treated with Scotchgard, Rhoplex and Cirrasol by the same high significant difference.

The effect of stain removal from the 70-30 cotton-polyester blend treated with DMDHEU-Mykon without soil release surpassed fabric treated with Scotchgard, Rhoplex and Cirrasol by differences highly significant ($P < 0.001$). The

difference between fabrics treated with Mission Valley soil release and fabrics with Scotchgard, Rhoplex and Cirrasol were also highly significant ($P < 0.001$).

The difference in stain removal scores of the fabrics treated with DMDHEU-Mykon without soil release agents surpassed fabrics with corresponding treatment with the addition of Scotchgard and Rhoplex soil release by differences highly significant ($P < 0.001$). Fabrics treated with Mission Valley also surpassed the fabrics treated with Scotchgard and Rhoplex at highly significant levels of confidence. One other significant comparison was observed when Cirrasol treated fabrics were compared to fabrics finished with Rhoplex; the difference was distinctly significant ($P < 0.01$).

The 35-65 cotton-polyester blend fabric with Cirrasol soil release in addition to DMDHEU-Mykon surpassed the cotton and other two blends in stain release. The difference was significant ($P < 0.01$).

The mean stain removal ratings for fabrics treated with Rhoplex demonstrated statistical differences. The 35-65 cotton-polyester blend exceeded in stain release when compared to the 50-50 cotton-polyester blend by a lower significant difference ($P < 0.01$).

When fabrics treated with DMDHEU-Mykon with Cirrasol were analyzed, the mean stain release rating of the 50-50 cotton-polyester blend was found to exceed the cotton and

the 70-30 blend by a highly significant difference ($P < 0.001$). One other comparison of 50-50 cotton-polyester blend was found to surpass the 35-65 blend by a slightly lower significant difference ($P < 0.01$).

Fabrics Finished with DMDHEU Durable Press without Fabric Softener. A statistical analysis of the data by means of the "t" test applied to various pairs of fabrics with respect to the removal of coffee with cream stain showed significant differences. The 50-50 cotton-polyester fabric treated with DMDHEU with Scotchgard was only slightly significant when comparison was made with other fabrics and finishes. The 35-65 cotton-polyester fabric finished with Rhoplex in addition to durable press indicated better soil release than fabrics treated without soil release or fabrics with Cirrasol treatment. Fabrics treated with Mission Valley soil release were superior in soil release when compared to fabrics with Rhoplex by a significant difference ($P < 0.05$).

The difference between the mean stain removal scores of fabrics treated with DMDHEU durable press and Rhoplex soil release indicated that the 35-65 cotton-polyester blend exceeded the cotton and other fabric blends. The difference was only slightly significant.

Fabrics Finished with Wet Fixation Durable Press and Mykon SF Fabric Softener. The 100 per cent cotton fabric with wet fixation-Mykon without soil release agents exhibited

a higher stain removal rating than did fabric with the corresponding finish with the addition of Mission Valley soil release. The difference was significant ($P < 0.01$). The fabrics with Scotchgard were superior in stain removal to fabrics with Rhoplex and Cirrasol treatment by a significant difference ($P < 0.01$).

The differences between the mean stain removal scores of the 70-30 cotton-polyester fabric treated with wet fixation-Mykon without soil release agents surpassed fabrics with the same type finish with the addition of Scotchgard and Rhoplex by significant levels of difference, $P < 0.01$ and $P < 0.001$, respectively. The fabrics finished with the durable press treatment and Cirrasol were superior in stain removal when compared to fabrics treated with Rhoplex by a highly significant difference ($P < 0.001$).

Statistical data for the stain removal rating of coffee with cream from the experimental fabrics revealed the fact that fabrics finished with wet fixation-Mykon with Rhoplex were surpassed by comparisons of fabrics without soil release and those with Mission Valley, Scotchgard and Cirrasol. The differences were highly significant ($P < 0.001$).

The fabric blends finished with Scotchgard were superior to the cotton fabric with the corresponding finish by differences which were significant ($P < 0.05$). The stain removal ratings between the fabrics with durable press and Rhoplex revealed the fact that cotton was superior to the

50-50 blend by the highly significant difference of $P < 0.001$. Other differences in stain release ratings between various pairs of fabrics with Rhoplex soil release are as follow:

(a) the 50-50 cotton-polyester blend when compared to 70-30 blend was significantly different ($P < 0.01$), (b) the 35-65 cotton-polyester blend when compared to the 70-30 blend was significantly different ($P < 0.01$), and (c) the 35-65 cotton-polyester blend when compared to the 50-50 blend was highly significant ($P < 0.001$).

Fabrics Finished with Wet Fixation Durable Press without Fabric Softener. The statistical comparisons obtained by means of the "t" test on means of stain removal ratings of various pairs of fabrics showed little significant differences. The differences between the mean stain removal scores of the 35-65 cotton-polyester fabrics treated with wet fixation durable press with Mission Valley soil release agent surpassed fabrics with the corresponding durable press finish without soil release at a difference significant at the 0.02 level of confidence. The Mission Valley treated fabrics also exceeded in stain removal when compared to fabrics with Scotchgard and Rhoplex by the same significant difference.

The 35-65 cotton-polyester blend with wet fixation durable press with the addition of Mission Valley soil release surpassed the cotton as well as the 70-30 and the

50-50 cotton-polyester blends by a difference which was significant ($P < 0.02$). Other statistical comparisons of the stain release measurements of the experimental fabrics exhibited differences which were not significant.

100 Per Cent Cotton without Soil Release. The statistical comparisons obtained by means of "t" tests on the means of stain removal ratings of various pairs of fabrics showed that fabric without durable press, softeners, or soil release surpassed those fabrics with the different finishes by a difference which was distinctly significant ($P < 0.01$). The rank order established according to the statistical comparisons made with respect to the stain release ratings of the 70-30 cotton-polyester fabrics with wet fixation durable press was surpassed by the untreated blend at a highly significant difference ($P < 0.001$). The stain release ratings of fabrics treated with wet fixation-Mykon were exceeded by fabrics treated with DMDHEU-Valspex and those with DMDHEU-Mykon by a highly significant difference ($P < 0.001$).

50-50 Cotton-Polyester without Soil Release. The effect of stain release of cotton-polyester fabrics without durable press, fabric softener, or soil release agents was highly significant when compared to the fabrics finished with wet fixation durable press without and in combination with fabric softeners. The difference was highly significant

($P < 0.001$). The fabrics treated with DMDHEU-Valspex and DMDHEU-Mykon were highly superior to fabrics with the corresponding durable press finish as well as fabrics treated with wet fixation durable press ($P < 0.001$).

35-65 Cotton-Polyester without Soil Release. Statistical comparisons of the removal of coffee with cream stain from pairs of the experimental fabrics revealed the finding that fabrics without durable press, softeners, and soil release surpassed fabrics to which DMDHEU alone and wet fixation durable press with each of the two different softeners by highly significant differences ($P < 0.001$). The same high significant difference was experienced between fabrics finished with DMDHEU-Valspex and DMDHEU-Mykon when comparisons were made with fabrics treated with wet fixation durable press.

100 Per Cent Cotton Finished with Mission Valley Soil Release. The stain removal ratings for fabrics with DMDHEU durable press in combination with Mission Valley and fabric softeners surpassed fabrics with durable press, softener, or soil control agent by a difference which was highly significant ($P < 0.001$). The difference in stain removal of fabrics treated with DMDHEU with softeners was significantly higher than the fabrics with DMDHEU alone or fabrics treated with wet fixation durable press finish.

50-50 Cotton-Polyester Finished with Mission Valley Soil Release. The statistical comparisons of the 50-50 cotton-polyester with Mission Valley in combination with durable press and fabric softeners showed different significant differences. The differences in stain removal between fabrics with Mission Valley, but without durable press and softeners was surpassed by fabrics finished with DMDHEU durable press with Valspex and Mykon was highly significant ($P < 0.001$). The stain removal ratings of fabrics with wet fixation durable press were surpassed by a highly significant difference ($P < 0.001$). The fabrics treated with DMDHEU with Mission Valley soil control but without fabric softener was surpassed by the corresponding durable press treatment with Valspex or Mykon fabric softener by differences which were highly significant ($P < 0.001$).

35-65 Cotton-Polyester Finished with Mission Valley Soil Release. The application of DMDHEU durable press finish in combination with Mission Valley and fabric softeners made the experimental fabrics less susceptible to stain retention when compared to fabrics without durable press or softeners. The differences were highly significant ($P < 0.001$). This same high significant level of confidence was experienced when fabrics finished with DMDHEU-Valspex and DMDHEU-Mykon were compared to fabrics finished with wet fixation durable press. The difference in stain release ratings of

fabrics finished with wet fixation durable press with Mission Valley without fabric softener surpassed fabrics with the corresponding finish with softeners and fabrics without durable press or fabric softeners by differences which were significant ($P < 0.02$).

100 Per Cent Cotton Finished with Scotchgard. The stain release rating obtained from stain specimens treated with DMDHEU-Valspex were significant to fabrics with wet fixation durable press by differences which were distinctly significant ($P < 0.02$). The cotton fabrics with DMDHEU-Mykon and DMDHEU without softener surpassed fabrics in stain removal to which wet fixation-Mykon were applied by differences which were significant ($P < 0.01$). The stain ratings for fabrics finished with wet fixation without fabric softeners surpassed fabrics treated with wet fixation-Mykon and fabrics finished with wet fixation-Valspex by significant differences ($P < 0.02$).

70-30 Cotton-Polyester Finished with Scotchgard. Statistical comparisons of the removal of coffee with cream stain from pairs of the experimental fabrics made evident the fact that few differences existed. There were indications that fabrics treated with each durable press finish with Scotchgard but without fabric softener were superior in stain release to fabrics finished with DMDHEU-Valspex.

50-50 Cotton-Polyester Finished with Scotchgard Soil Release Agent. The differences between the mean stain removal scores of the fabrics treated with DMDHEU durable press with Scotchgard without fabric softener exceeded fabrics with the corresponding finish with the addition of Mykon by a slightly significant difference. One other slight indication was evident when the fabric with DMDHEU durable press with Scotchgard was analyzed; it was found to surpass fabrics treated with wet fixation with the addition of Valspex or Mykon fabric softeners.

35-65 Cotton-Polyester Finished with Scotchgard Soil Release Agent. The stain release ratings of fabrics with DMDHEU durable press finish in combination with Scotchgard and fabric softeners indicated slightly greater stain release than fabrics without durable press or softener. Slight variations were evident when comparing fabrics treated with Scotchgard, DMDHEU and fabric softeners to fabrics treated with wet fixation durable press with corresponding soil release and fabric softeners.

100 Per Cent Cotton Finished with Rhoplex SR-488 Soil Release Agent. Statistical comparisons of the mean stain release measurement of cotton fabric finished with Rhoplex treated with durable press in combination with and without the various soil release agents and fabric softeners

showed only slight indications. The application of durable press finishes indicated that the fabrics were more susceptible to stains. No other significant differences were exhibited between pairs of fabrics treated with Rhoplex in addition to the durable press finish with fabric softeners or those without fabric softeners.

70-30 Cotton-Polyester Finished with Rhoplex SR-488 Soil Release Agent. A statistical analysis of the data by means of the "t" test applied to pairs of fabrics with respect to the removal of coffee with cream stain showed that fabrics given the wet fixation durable press finish with Mykon and the addition of Rhoplex surpassed the fabrics with other finish combinations used in the present study.

50-50 Cotton-Polyester Finished with Rhoplex SR-488 Soil Release Agent. The statistical comparisons of the mean stain release measurements of coffee with cream showed that fabrics treated with DMDHEU-Valspex were slightly greater when compared to fabrics without durable press or fabric softener. It was noted that fabrics finished with wet fixation-Mykon with the addition of Rhoplex were more susceptible to staining. Fabrics treated with Rhoplex but without durable press or fabric softener surpassed the fabrics with wet fixation-Mykon and Rhoplex by differences which were significant ($P < 0.01$). The effect of stain release of fabrics

treated with DMDHEU without and in combination with fabric softeners when compared to fabric with wet fixation durable press may be summarized as follows. The stain rating achieved by fabrics finished with DMDHEU with Rhoplex and Valspex fabric softener was higher than the stain rating obtained by fabrics to which wet fixation with the addition of Rhoplex. The differences in the stain removal ratings between various pairs of fabrics with Rhoplex soil release which were highly significant ($P < 0.001$) follow: (a) cotton-polyester finished with DMDHEU-Mykon when compared to fabrics with wet fixation-Mykon, (b) cotton-polyester finished with DMDHEU alone when compared to fabrics with wet fixation-Mykon, and (c) cotton-polyester finished with wet fixation durable press when compared to fabrics with wet fixation-Mykon. One other highly significant difference ($P < 0.001$) was observed when fabrics treated with wet fixation without fabric softener was compared to fabric treated with wet fixation-Mykon. A difference was exhibited in favor of the former fabric.

35-65 Cotton-Polyester Finished with Rhoplex SR-488
Soil Release. When the mean stain removal ratings of fabrics treated with Rhoplex were analyzed it was found that fabric finished with DMDHEU-Mykon and fabric finished with DMDHEU without fabric softener exceeded the cotton-polyester blend with different finishes in stain removal. The fabric finished with DMDHEU-Mykon surpassed the same fabric blend

without durable press or softener by a highly significant difference ($P < 0.001$). The fabrics finished with DMDHEU-Valspex experienced lower stain removal ratings than did the fabric treated with DMDHEU-Mykon by a difference which was significant ($P < 0.01$). The comparisons of fabric finished with DMDHEU-Mykon to fabric treated with DMDHEU without fabric softener revealed that the latter was surpassed by a significant difference ($P < 0.05$). The stain rating scores of the cotton fabric finished with DMDHEU-Mykon with Rhoplex were slightly significant ($P < 0.001$) when compared to the following fabrics: (a) fabrics finished with wet fixation-Valspex, (b) fabrics finished with wet fixation-Mykon, and (c) fabrics finished with wet fixation alone.

RANK ORDER OF REMOVAL OF COF-
FEE WITH CREAM STAIN

Comparison of Fiber Content of Fabrics without Durable Press, Fabric Softener, or Soil Release Agent. The comparison of the removal of coffee with cream from fabrics experienced no significant difference in mean stain release scores throughout, with high scores for all fabrics. The following rank order was established as a result of statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Mission Valley Soil Release, but without Durable Press or Fabric Softener. The mean scores of stain removal of coffee with cream for all laundering intervals revealed no significant difference. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Scotchgard FC-218 Soil Release Agent, but without Durable Press or Fabric Softener. The different fabric blends exceeded cotton in stain release of coffee with cream for all laundering intervals. The rank order established from statistical comparisons of the mean stain release of fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Rhoplex SR-488 Soil Release Agent, but without Durable Press or Fabric Softener. The 100 per cent cotton and the 50-50 cotton-polyester were surpassed in stain removal rating of coffee with cream by the 70-30 and the 35-65 cotton-polyester blends. The statistical comparisons of fiber content according to rank order for the stained and laundered fabrics are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics with Cirrasol PT Soil Release, but without Durable Press or Fabric Softeners. The comparisons of the removal of coffee with cream from the experimental fabrics revealed no significant difference in mean stain release scores. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different

fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, but without Soil Release Agent. Each of the different fabrics were rated as superior in stain removal of coffee with cream. The following rank order was established as a result of statistical comparison of the mean stain release scores of the experimental fabrics.

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. The different experimental fabrics each received a high rank in the release of coffee with cream stain. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The 100 per cent cotton and 70-30 cotton-polyester blend fabrics were exceeded in stain removal by significant differences when compared to the other two fabrics. The rank order of statistical comparisons established from the mean stain release rating of the different fiber contents follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The comparisons of the mean stain removal scores of coffee with cream from the experimental fabrics revealed no significant differences. The following rank order was established as a result of statistical comparison of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. No significant difference was evident in stain removal of coffee with cream from the experimental fabrics. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, but without a Soil Release Agent. The mean scores of stain removal of coffee with cream for all laundering intervals revealed no significant difference. The rank order obtained from

statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Mission Valley Soil Release Agent. Comparisons of the removal of coffee with cream from the experimental fabrics revealed no significant difference in mean stain release scores. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent. Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon SF Fabric Softener, and Scotchgard FC-218 Soil Release Agent. No significant difference was revealed in stain removal of coffee with cream from the

experimental fabrics. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Rhoplex SR-488 Soil Release Agent. Each of the different experimental fabrics received the highest rank order; no significant difference was noted between the different fiber contents. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Cirrasol PT Soil Release Agent. The 35-65 and 50-50 cotton-polyester

blends were superior in stain removal of coffee with cream when compared to the cotton and 70-30 cotton-polyester blend. The rank order established from statistical comparisons of the mean stain release of fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, but without Fabric Softener or Soil Release Agent. Each of the different experimental fabrics received the highest rank in the release of coffee with cream stain from the laundered fabrics. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, with Mission Valley Soil Release Agent, but without a Fabric Softener. The comparisons of removal

of coffee with cream from the experimental fabrics experienced no significant difference in mean stain release scores. The following rank order was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. The mean scores of the stain removal of coffee with cream for all laundering intervals showed no significant difference. The rank order obtained from statistical comparisons of the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Rhoplex SR-488 Soil Release, but without Fabric Softener. The comparisons of the mean stain

removal scores of coffee with cream from the experimental fabrics revealed no significant difference. The following rank order was established as a result of statistical comparison of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Cirrasol PT Soil Release Agent, but without a Fabric Softener. No significant difference was evident in stain removal of coffee with cream from the experimental fabrics; all received high scores. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens are as follows:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, but without Soil Release Agent. The comparisons of the removal

of coffee with cream from the experimental fabrics revealed no significant difference in mean stain release scores. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. The mean scores of stain removal of coffee with cream for all laundering intervals revealed no significant difference. The rank order obtained from statistical comparisons of the mean stain release from laundering stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fabric Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The comparisons of the removal of coffee with cream from the experimental fabrics experienced no significant difference in mean stain release scores throughout, with high scores for all fabrics. The following rank order was established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of different fiber content:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. No significant difference was evident in stain removal of coffee with cream from the laundered experimental fabrics; all fabrics received first place rank. The rank order established from statistical comparisons of the mean stain release from laundered stained fabrics of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. The mean scores of stain removal of coffee with cream for all laundering intervals revealed no significant difference. The rank order obtained from statistical comparisons of the laundered stain fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, but without Soil Release Agent. The comparisons of the removal of coffee with cream from fabrics revealed no significant difference in mean stain release scores. The rank order established as a result of statistical comparisons of the mean stain release from laundering the stained fabrics of

different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Mission Valley Soil Release Agent. The different fabric blends exceeded cotton in stain release of coffee with cream for all laundering intervals. The rank order established from statistical comparisons of the mean stain release of fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Scotchgard FC-218 Soil Release Agent. The 35-65 cotton-polyester blend surpassed the all cotton and other blends in stain removal of coffee with cream for all laundering

intervals. The statistical comparisons of fiber content according to rank order for the stained and laundered fabrics are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The 100 per cent cotton surpassed the different fabric blends in the stain release of coffee with cream from the laundered test specimens. The following rank order was established as a result of statistical comparisons of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Cirrasol PT Soil Release Agent. The comparisons of the removal of coffee with cream from the experimental fabrics

experienced no significant difference in mean stain release scores, all scores were extremely high. The following rank order was determined by statistical comparisons of the mean stain release scores of the different fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, but without Fabric Softener or Soil Release Agent. No significant difference was evident in stain removal of coffee with cream from the test fabrics. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press with Mission Valley Soil Release Agent, but without Fabric Softener. The comparisons of the

mean stain release scores revealed no significant difference in stain release; high scores for all fabrics were experienced. The following rank order was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. Each of the different experimental fabrics in this category rated superior in stain removal of coffee with cream. The following rank order was determined by statistical comparisons of the mean stain release scores of the fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Rhoplex SR-488 Soil Release Agent, but without a Fabric Softener. The mean scores of

stain removal of coffee with cream for all laundering intervals revealed no significant difference. The rank order obtained from the statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	1
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Cirrasol PT Soil Release Agent, but without Fabric Softener. Each of the different fabric blends surpassed all cotton in stain release of coffee with cream in this category. The rank order established from statistical comparisons of the mean stain release obtained from laundering the stained fabrics are presented in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	1
50-50 Cotton-Polyester	1
35-65 Cotton-Polyester	1

S U M M A R Y F

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL AS A RESULT OF
ONE LAUNDERING AFTER THE FABRICS WITH NO DURABLE PRESS AND
NO FABRIC SOFTENER HAD BEEN LAUNDERED THE DESIGNATED NUMBER
OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	4.0	4.5	5.0	5.0	5.0	4.8	1
B	70-30 Cotton- Polyester	4.5	5.0	5.0	5.0	5.0	5.0	4.9	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y F, ContinuedEVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
WITH NO DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.5	4.0	3.5	3.5	3.5	3.0	3.7	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.2	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.5	3.5	3.5	4.0	4.0	4.0	3.4	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	3.5	4.0	4.0	4.0	4.0	4.0	3.9	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
WITH NO DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	21.0	19.5	19.5	20.5	20.5	20.0	121.0	4
B	70-30 Cotton- Polyester	20.5	21.0	21.0	21.0	21.0	21.0	125.5	3
C	50-50 Cotton- Polyester	21.0	21.0	21.0	21.0	21.0	21.0	126.0	1
D	35-65 Cotton- Polyester	21.0	21.0	21.0	21.0	21.0	21.0	126.0	1
	Total	83.5	82.5	82.5	83.5	83.5	83.0	498.5	

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL AS A RESULT OF
ONE LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU
DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	4.0	4.0	4.5	4.0	4.0	4.2	1
B	70-30 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.5	5.0	5.0	5.0	5.0	5.0	4.9	1
B	70-30 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton-Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

S U M M A R Y F, ContinuedEVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICSFINISHED WITH DMDHEU DURABLE PRESS AND VALSPEX (P-167)FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.0	2.5	3.5	3.5	3.5	3.3	2
B	70-30 Cotton-Polyester	4.5	3.0	3.0	3.5	4.0	4.0	3.7	2
C	50-50 Cotton-Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.2	1
D	35-65 Cotton-Polyester	5.0	5.0	4.0	4.5	4.0	4.0	4.5	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton-Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton-Polyester	4.5	4.5	4.5	4.0	4.0	4.0	4.2	1
D	35-65 Cotton-Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.2	1

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH DMDHEU DURABLE PRESS AND VALSPEX (P-167)
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	21.5	20.0	19.5	21.0	21.0	21.0	124.0	4
B	70-30 Cotton- Polyester	22.5	21.0	21.0	21.5	21.5	21.5	129.0	3
C	50-50 Cotton- Polyester	23.0	22.5	22.5	22.0	22.0	22.0	134.0	2
D	35-65 Cotton- Polyester	23.5	23.0	22.0	22.5	22.0	22.0	135.0	1
	Total	90.5	86.5	85.0	87.0	86.5	86.5	522.0	

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL AS A RESULT OF
ONE LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU
DURABLE PRESS AND MYKON SF FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.5	5.0	5.0	5.0	5.0	5.0	4.9	1
B	70-30 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
C	50-50 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1
D	35-65 Cotton- Polyester	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1

S U M M A R Y F, ContinuedEVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICSFINISHED WITH DMDHEU DURABLE PRESS AND MYKON SFFABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.5	4.5	4.5	4.2	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	5.0	5.0	4.5	4.5	4.5	4.5	4.7	1

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH DMDHEU DURABLE PRESS AND MYKON SF
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	3.5	3.9	2
C	50-50 Cotton- Polyester	4.5	4.5	4.5	4.5	4.5	4.5	4.5	1
D	35-65 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.1	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	20.5	21.0	21.0	21.0	21.0	21.0	125.0	4
B	70-30 Cotton- Polyester	22.0	22.0	22.0	22.0	22.0	21.5	131.5	3
C	50-50 Cotton- Polyester	23.0	22.5	22.5	22.5	22.5	22.5	135.5	2
D	35-65 Cotton- Polyester	23.5	23.5	22.5	23.0	23.0	23.0	138.5	1
	Total	89.0	89.0	88.0	88.5	88.5	88.0	530.5	

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL AS A RESULT OF
ONE LAUNDERING AFTER THE FABRICS FINISHED WITH DMDHEU
DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN LAUNDERED THE
DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y F, ContinuedEVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH DMDHEU DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.5	4.0	4.0	4.0	4.0	4.0	4.2	1
B	70-30 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
C	50-50 Cotton- Polyester	4.5	4.5	4.5	4.0	4.0	4.0	4.2	1
D	35-65 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.5	4.5	4.5	4.2	1

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH DMDHEU DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	20.5	20.0	20.0	20.0	20.0	20.0	120.5	4
B	70-30 Cotton- Polyester	21.0	20.0	20.0	20.0	20.0	20.0	121.0	3
C	50-50 Cotton- Polyester	20.5	20.5	20.5	20.0	20.0	20.0	121.5	3
D	35-65 Cotton- Polyester	21.0	20.0	20.0	20.5	20.5	20.5	122.5	1
	Total	83.0	80.5	80.5	80.5	80.5	80.5	485.5	

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL AS A RESULT OF
ONE LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH WET FIXATION DURABLE PRESS AND VALSPEX
(P-167) FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART V: CIRRASOL PT STAIN REMOVAL AGENT

[illegible][illegible]

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL AS A RESULT OF
ONE LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND MYKON SF FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.5	4.0	4.0	4.0	4.0	4.0	4.2	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	4.0	4.0	4.0	4.0	4.0	3.8	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y · F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH WET FIXATION DURABLE PRESS AND MYKON
SF FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	3.5	3.9	2
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	3.5	4.0	3.9	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton- Polyester	3.0	3.5	3.5	3.5	3.5	3.5	3.4	2
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	3.7	2

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH WET FIXATION DURABLE PRESS AND MYKON
SF FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	19.0	19.5	19.5	19.5	19.5	19.5	116.5	3
B	70-30 Cotton- Polyester	19.5	19.0	19.0	19.0	19.0	19.0	114.5	4
C	50-50 Cotton- Polyester	19.0	19.5	19.5	19.5	19.0	19.5	116.0	3
D	35-65 Cotton- Polyester	20.0	20.0	20.0	20.0	20.0	20.0	120.0	1
	Total	77.5	78.0	78.0	78.0	77.5	78.0	467.0	

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL AS A RESULT OF
ONE LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN
LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.5	4.5	4.5	4.5	4.3	1

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH WET FIXATION DURABLE PRESS AND NO
FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
B	70-30 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
C	50-50 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1
D	35-65 Cotton- Polyester	5.0	4.0	4.0	4.0	4.0	4.0	4.2	1

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

S U M M A R Y F, Continued

EVALUATION OF COFFEE WITH CREAM STAIN REMOVAL FROM FABRICS
FINISHED WITH WET FIXATION DURABLE PRESS AND NO
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.5	4.0	4.0	4.0	4.0	4.0	3.9	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1
D	35-65 Cotton- Polyester	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	20.5	20.0	20.0	20.0	20.0	20.0	120.5	4
B	70-30 Cotton- Polyester	21.0	20.0	20.0	20.0	20.0	20.0	121.0	3
C	50-50 Cotton- Polyester	21.0	20.0	20.0	20.0	20.0	20.0	121.0	3
D	35-65 Cotton- Polyester	21.0	20.0	20.5	20.5	20.5	20.5	123.0	1
	Total	83.5	80.0	80.5	80.5	80.5	80.5	485.5	

STATISTICAL ANALYSIS OF DATA
CONCERNING LIPSTICK STAIN

Summary G presents the total scores the rank orders of lipstick stain removal ratings. Noticeable differences were exhibited between this stain and the water-borne stains already discussed. The first ratings fluctuated with the fiber content and fabric finish. The greatest stain removal was evident after the initial laundering periods. As the number of launderings increased before staining, the rank orders of stain removal declined, indicating loss of finish due to the launderings. Lipstick stains are difficult to remove and the ratings were not as high as those of the water-borne stains.

Fabrics without Durable Press or Fabric Softener.

The difference between the mean stain removal scores of the cotton fabric without durable press and fabric softener in combination with the various soil release agents were significant. The untreated cotton fabric without soil release exhibited higher stain removal scores than did the untreated fabric with the addition of any one soil release agent. The difference between the following pairs of fabrics with various soil release agents were highly significant: (a) cotton-polyester fabrics without durable press when compared to fabrics finished with Cirrasol, (b) cotton-polyester fabrics finished with Scotchgard when compared to fabrics

finished with Cirrasol, and (c) cotton-polyester fabrics finished with Cirrasol when compared to fabrics finished with Rhoplex. The application of Mission Valley soil release to the untreated cotton fabrics surpassed fabrics treated with Cirrasol by a significant difference ($P < 0.01$).

The stain removal scores of the 70-30 cotton-polyester fabric without durable press, fabric softeners, without soil release as well as fabrics with the various soil release agents were not significant. There were slight indications that fabric treated with Cirrasol surpassed fabrics treated with Scotchgard and Rhoplex.

The 50-50 cotton-polyester fabrics without durable press or fabric softeners in combination with the various soil release agents were not significant, except for the following comparisons. The fabrics treated with Cirrasol surpassed those fabrics finished with Rhoplex by a significant difference ($P < 0.05$). Slight significant differences were observed when the following pairs of comparisons were made: (a) cotton-polyester fabrics without soil release when compared to fabrics finished with Rhoplex, (b) cotton-polyester fabrics finished with Cirrasol when compared to fabrics treated with Mission Valley.

The 35-65 cotton-polyester fabrics without durable press, fabric softener, or soil release agents were surpassed in stain release by fabrics finished with the various soil release agents at significant differences. The fabrics treated

with Scotchgard and Cirrasol rated higher when compared to the untreated fabrics by differences which were highly significant ($P < 0.001$). The Mission Valley and Rhoplex treated fabrics surpassed the untreated fabrics at significant differences, $P < 0.01$ and $P < 0.02$, respectively. There were slight indications that fabrics treated with Cirrasol exceeded fabrics finished with Rhoplex and Mission Valley in stain release.

Statistical comparisons of the removal of lipstick stain from pairs of the experimental fabrics without durable press, softeners or stain release revealed the fact that cotton fabric retained more stain. The untreated cotton fabric was surpassed by the blends by differences which were highly significant ($P < 0.001$).

When fabrics with Rhoplex soil release were analyzed it was found that the cotton fabric exceeded the 50-50 cotton-polyester blend by a difference which was highly significant ($P < 0.001$). The 70-30 cotton-polyester blend surpassed the 50-50 blend in stain release at a significant difference ($P < 0.05$). Slight indications were made evident by the fact that the 35-65 cotton-polyester blend was surpassed by the cotton and the 50-50 blend.

Differences between the mean stain removal ratings of the various pairs of fabrics treated with Cirrasol soil release were highly significant. The fabric blends treated

with Cirrasol each surpassed cotton with the corresponding finish at differences which were highly significant ($P < 0.001$).

Fabrics Finished with DMDHEU Durable Press and Valspex Fabric Softener. The statistical comparisons obtained by means of the "t" test on means of stain removal ratings of the various pairs of fabrics showed little significant differences. Three slight differences were indicated when the cotton fabric finished with DMDHEU-Valspex with the addition of Cirrasol was compared to the corresponding durable press finish without soil release and the same durable press with Mission Valley or Rhoplex.

The statistical comparisons of the 70-30 cotton-polyester fabrics with DMDHEU-Valspex with the application of the various soil release agents exhibited slight differences in stain release. The durable press fabric with the addition of Mission Valley soil release surpassed the durable press fabric without soil release agent and fabric with DMDHEU-Valspex with Scotchgard by significant differences ($P < 0.05$).

The effect of stain release of 50-50 cotton-polyester blend fabrics finished with DMDHEU-Valspex and Mission Valley soil release surpassed the fabrics without soil release and those with Cirrasol by a highly significant difference ($P < 0.001$). The same durable press treatment with Mission Valley exceeded fabrics with Scotchgard and Rhoplex in stain release by a difference which was distinctly significant

($P < 0.01$). Scotchgard treated fabrics surpassed the fabrics to which Cirrasol was applied by a significant difference ($P < 0.05$).

The difference between the mean stain removal scores of the 35-65 cotton-polyester without soil release agents was surpassed by fabrics treated with Mission Valley, Scotchgard and Cirrasol by differences which were significant ($P < 0.01$). The Mission Valley treated fabrics surpassed fabrics treated with Scotchgard by a difference which was distinctly significant ($P < 0.05$). Fabrics finished with Rhoplex exhibited superior stain removal ratings when compared to fabrics treated with Cirrasol and Scotchgard. The differences were significant ($P < 0.01$).

Statistical data computed for the removal of lipstick from the experimental fabrics finished with DMDHEU-Valspex but without soil release indicated that cotton and the 70-30 cotton-polyester blend surpassed the other two blends. On the other hand, the 50-50 cotton-polyester fabrics with the corresponding durable press treatment with the addition of Mission Valley exceeded in stain removal when compared to the 70-30 blend by differences which were significant ($P < 0.05$). The Rhoplex treated 35-65 cotton-polyester blend exceeded the 70-30 and 50-50 blends in stain removal by significant differences, $P < 0.05$ and $P < 0.01$, respectively.

The differences between the mean stain removal ratings of fabrics with DMDHEU-Valspex with Cirrasol were not significant except for the following pairs of comparisons: (a) cotton when compared to the 50-50 cotton-polyester was significantly different ($P < 0.02$), (b) the 70-30 cotton-polyester when compared to the 50-50 blend was highly significant ($P < 0.001$), and (c) the 35-65 cotton-polyester when compared to the 50-50 blend was significantly different ($P < 0.01$).

Fabrics Finished with DMDHEU Durable Press and Mykon Fabric Softener. The statistical analysis of the data by means of the "t" test applied to pairs of cotton fabrics with respect to the removal of lipstick showed only slight significant differences. There were slight indications that the DMDHEU-Mykon cotton fabric without soil release agent exceeded fabric treated with Mission Valley soil release. Two other indications were noted, that fabrics treated with Cirrasol in addition to the durable press surpassed fabrics with corresponding durable press with Mission Valley and Scotchgard soil release agents.

The 70-30 cotton-polyester fabric treated with DMDHEU-Mykon without soil release agents was surpassed by fabrics with the corresponding durable press with the addition of soil release at significant differences. Fabric to which Mission Valley was applied exceeded the Cirrasol treated

blend by a difference which was significant ($P < 0.01$). Two other comparisons gave indications that Cirrasol fabrics were also exceeded by fabrics treated with Scotchgard and Rhoplex.

The 50-50 cotton-polyester blend treated with DMDHEU-Mykon with the addition of Mission Valley soil release indicated greater stain release than fabrics with the corresponding durable press treatment without soil release or with the application of Scotchgard.

The differences in stain removal scores of the 35-65 cotton-polyester fabrics treated with DMDHEU-Mykon without soil release agents were exceeded by fabrics with the same type durable press treatment with the addition of soil release agents. The fabrics treated with Mission Valley and Rhoplex surpassed the fabrics without soil release at highly significant differences ($P < 0.001$). The fabrics treated with Mission Valley soil release exhibited greater stain removal qualities than did fabrics with Cirrasol treatment. The difference was distinctly significant ($P < 0.02$). Further investigation revealed the fact that fabrics treated with Rhoplex rated slightly higher in stain release qualities than did fabrics treated with Rhoplex or Cirrasol.

The removal of stain from the experimental fabrics displayed statistical differences. The cotton fabric treated with DMDHEU-Mykon without soil release was superior in stain removal ratings when compared to the fabric blends with the

corresponding finishes. The 50-50 cotton-polyester without soil release exceeded the 70-30 and the 35-65 blends by significant differences, $P < 0.05$ and $P < 0.02$, respectively. The cotton fabric finished with Cirrasol in addition to the DMDHEU-Mykon treatment demonstrated superior stain release ratings when compared to the 50-50 and the 35-65 blends. Another highly significant difference was noted when the 50-50 blend was compared to the 35-65 cotton-polyester. The difference was highly significant ($P < 0.001$).

Fabrics Finished with DMDHEU Durable Press without Fabric Softener. The 100 per cent cotton fabric with DMDHEU durable press without soil release exhibited lower stain removal ratings than fabric treated with the same type durable press with the addition of soil release agents. The fabrics treated with Scotchgard and Cirrasol were superior in stain removal by significant levels of differences, $P < 0.01$ and $P < 0.05$, respectively. When the durable press fabrics treated with Scotchgard and Cirrasol were compared to fabrics finished with Rhoplex, only slight significant differences were observed.

The differences between stain removal scores of the 70-30 cotton-polyester fabric finished with DMDHEU and Scotchgard exhibited higher ratings than fabrics treated with Cirrasol or those without soil release finishes. The fabrics finished with durable press and Scotchgard were superior in

stain release by a highly significant difference ($P < 0.001$). The difference between fabrics treated with DMDHEU in combination with Scotchgard and those with the corresponding durable press with Mission Valley was significant ($P < 0.05$).

The statistical analysis of data by means of the "t" test applied to pairs of the 50-50 cotton-polyester finished with DMDHEU showed slight significant differences. There were indications that the 50-50 blend treated with Cirrasol in addition to durable press surpassed fabrics with the same type durable press finish with the application of Mission Valley or Scotchgard soil release. The Cirrasol treated fabrics were superior to fabrics with DMDHEU without soil release by a difference which was significant ($P < 0.02$).

The removal of stain from the 35-65 cotton-polyester fabrics finished with DMDHEU but without soil release displayed few statistical differences. Fabrics treated with each of the soil release finishes surpassed fabrics without soil release by significant differences. Fabrics finished with Cirrasol surpassed the untreated fabrics by a highly significant difference ($P < 0.001$). The fabrics treated with Rhoplex and Scotchgard each surpassed the durable press treated fabric without soil release by differences which were significant ($P < 0.02$).

Statistical comparisons of the removal of lipstick from pairs of the experimental fabrics without stain release agents revealed the fact that fabrics of all cotton were

surpassed by the 50-50 and 35-65 cotton-polyester blends in stain release. The 35-65 cotton-polyester surpassed the 70-30 and 50-50 blends by differences which were highly significant ($P < 0.001$). The all cotton fabrics with Mission Valley were superior in stain removal when compared to the different fabric blends. The cotton and the 70-30 cotton-polyester treated with Scotchgard in addition to the DMDHEU durable press surpassed the other two blends at differences significant at the 0.05 level. The stain release of the 35-65 cotton-polyester with durable press and Cirrasol soil release surpassed the cotton and the 50-50 blend by a significant difference ($P < 0.01$) and the 70-30 blend at a higher significant difference ($P < 0.05$).

Fabrics Finished with Wet Fixation Durable Press and Valspex Fabric Softener. The mean stain removal scores of the fabric treated with wet fixation-Valspex without stain release were surpassed by fabrics treated with the corresponding durable press finish in combination with the different soil release agents. Fabrics finished with Mission Valley and Scotchgard surpassed the fabrics without soil release by a highly significant difference ($P < 0.001$).

Differences in stain removal ratings of the cotton fabrics with wet fixation-Mykon revealed that fabrics treated with Mission Valley were superior to fabrics finished with Cirrasol in addition to the durable press. The difference

was highly significant ($P < 0.001$). Other significant differences in stain removal ratings between the various pairs of fabrics with soil release agents follow: (a) cotton fabric treated with wet fixation-Valspex with Mission Valley surpassed fabrics with the corresponding durable press with Cirrasol by a highly significant difference ($P < 0.001$), (b) cotton fabric treated with wet fixation-Valspex with Scotchgard exceeded fabrics with the corresponding durable press with Cirrasol by a significant difference ($P < 0.01$), and (c) cotton fabric treated with wet fixation-Valspex with Rhoplex surpassed fabrics with the corresponding durable press with Cirrasol by a higher significant difference ($P < 0.05$).

The differences between the mean stain removal scores of lipstick from the 70-30 cotton-polyester fabric treated with wet fixation-Valspex was surpassed by fabrics with the same type finish with the addition of soil release agents. The durable press treated fabrics with Mission Valley released more stain than did the fabrics with the other soil release treatments. The difference was highly significant ($P < 0.001$). Other differences in stain removal ratings between the fabrics with durable press with soil release revealed the fact that fabrics with Mission Valley surpassed fabrics treated with Scotchgard and Cirrasol by significant differences, $P < 0.02$ and $P < 0.01$, respectively.

The 50-50 cotton-polyester fabrics finished with wet fixation-Valspex were surpassed by fabrics with the same durable press treatment with the addition of Mission Valley and Rhoplex by highly significant differences ($P < 0.001$). The mean stain removal scores of the 50-50 blend treated with Mission Valley exceeded fabrics with the corresponding durable press with Scotchgard and Cirrasol by significant differences, $P < 0.05$ and $P < 0.01$, respectively. The Rhoplex treated fabrics were superior in stain release when compared to fabrics with Scotchgard and Cirrasol by differences which were significant ($P < 0.02$).

The effect of stain release of the 35-65 cotton-polyester fabrics treated with wet fixation-Valspex in combination with the various soil release agents surpassed fabrics with the corresponding durable press treatment without soil release. The fabrics treated with Rhoplex and Cirrasol surpassed the durable press treated fabrics by highly significant differences ($P < 0.001$). The Mission Valley and Scotchgard finished fabrics exceeded the fabric without soil release at significant differences, $P < 0.01$ and $P < 0.05$, respectively. When the durable press fabrics with the addition of Rhoplex were compared to fabrics with durable press and Scotchgard or Cirrasol, significant differences were observed. The differences were significant, $P < 0.05$ and $P < 0.01$, respectively.

The mean stain ratings of cotton and 70-30 cotton-polyester fabrics treated with wet fixation-Valspex and Cirrasol were surpassed by the 50-50 and the 35-65 blends at significant differences ($P < 0.001$). The differences between the mean stain removal scores of the 70-30 cotton-polyester was exceeded by the 35-65 blend with similar finishes.

Fabrics Finished with Wet Fixation Durable Press and Mykon SF Fabric Softener. The rank order established according to statistical comparisons made with respect to stain release of cotton fabric with wet fixation-Mykon revealed the fact that fabric without soil release agents ranked lower than did fabrics treated with the various soil release finishes. The comparison of stain release scores of the cotton fabric without soil release was surpassed by fabrics treated with Scotchgard and Mission Valley by significant differences, $P < 0.001$ and $P < 0.05$, respectively. The Cirrasol treated fabrics were surpassed in stain release of lipstick by fabrics treated with Scotchgard and Rhoplex at significant differences ($P < 0.01$).

The 70-30 cotton-polyester stain removal scores of fabrics with wet fixation-Mykon without soil release and those with the various soil release agents were not significant except for the comparison of fabrics treated with Cirrasol. The Cirrasol treated fabric was surpassed by fabrics

treated with Rhoplex and fabrics without soil release agents by significant differences ($P < 0.05$).

The differences between the mean stain removal ratings of the 50-50 cotton-polyester finished with wet fixation-Mykon without soil release were surpassed by fabrics with the corresponding finish with the addition of Mission Valley, Scotchgard, and Rhoplex by significant differences ($P < 0.01$). When the fabrics treated with Cirrasol were compared to fabrics treated with Mission Valley and Rhoplex, slight significant differences were observed in favor of fabrics with the Cirrasol finish.

The 35-65 cotton-polyester fabrics with wet fixation-Mykon without soil release were surpassed in stain removal by fabrics treated with the various soil release by significant differences. The fabrics treated with Scotchgard, Rhoplex and Cirrasol surpassed the fabric without soil release by highly significant differences ($P < 0.001$). Other comparisons of the 35-65 cotton-polyester showed that Cirrasol treated fabrics were surpassed by fabrics finished with Scotchgard and Rhoplex by differences which were distinctly significant ($P < 0.01$).

The statistical comparisons of the removal of lipstick stain from pairs of the experimental fabrics without soil release showed that the 70-30 blend released more stain than did the cotton or the other fabric blends. When fabrics

finished with wet fixation-Mykon with Cirrasol were analyzed it was found that the blends surpassed the cotton with the corresponding treatment. The differences were highly significant ($P < 0.001$).

Fabrics Finished with Wet Fixation Durable Press without Fabric Softener. Statistical data computed for the stain removal ratings of lipstick from the experimental fabrics revealed the fact that fabrics without soil release were surpassed by fabrics finished with Mission Valley, Scotchgard, and Rhoplex. The differences were highly significant. The fabrics finished with Cirrasol experienced inferior stain release when compared to fabrics treated with the other soil release agents. Fabrics with Scotchgard and Rhoplex each surpassed the fabric treated with Cirrasol by highly significant differences.

The 70-30 cotton-polyester fabrics finished with wet fixation durable press with the various soil release agents exceeded fabrics with the same type durable press finish without soil release. Fabrics finished with Mission Valley, Scotchgard and Cirrasol surpassed the fabrics without soil release by highly significant differences ($P < 0.001$). There were slight indications that the durable press finished fabric with Cirrasol was surpassed in stain release by fabrics treated with the other soil release agents.

When the 50-50 cotton-polyester blend with wet fixation durable press was analyzed it was found that the fabrics without soil release were surpassed by each of the various soil release agents by significant differences. Highly significant differences were experienced by fabrics finished with Rhoplex, Cirrasol and Scotchgard. The fabrics finished with Cirrasol were exceeded in stain release by fabrics treated with Mission Valley and Rhoplex by significant differences ($P < 0.02$).

The differences between the stain removal ratings of the 35-65 cotton-polyester fabrics treated with wet fixation durable press and Mykon fabric softener in combination with soil release exhibited significant differences. Fabrics without soil release were surpassed by fabrics with each of the various soil release agents. Fabrics treated with Scotchgard and Cirrasol surpassed fabrics without soil release by differences which were highly significant ($P < 0.001$). Statistical comparisons of the removal of lipstick stain from pairs of the experimental fabric with wet fixation and Cirrasol soil release exceeded fabrics with the corresponding durable press finish with the addition of a soil release finish of Scotchgard, Rhoplex or Mission Valley.

The mean stain removal ratings of fabrics treated with Cirrasol demonstrated statistical differences. The cotton-polyester blends exceeded in stain release when

compared to cotton by differences which were highly significant. The 35-65 blend surpassed the 70-30 blend with the corresponding finishes by highly significant differences ($P < 0.001$).

100 Per Cent Cotton without Soil Release Agent. A statistical analysis of the data by means of the "t" test applied to pairs of fabrics with respect to the removal of lipstick stain showed that fabrics without durable press or fabric softeners surpassed fabrics given the DMDHEU durable press finish by differences which were distinctly significant ($P < 0.02$). The untreated cotton fabric surpassed the fabric treated with wet fixation by a highly significant difference ($P < 0.001$). The stain release ratings of fabric finished with DMDHEU exceeded that of the other fabrics and finishes by a difference which was highly significant ($P < 0.001$).

70-30 Cotton-Polyester without Soil Release Agent. When the mean stain removal values of the experimental fabrics were compared statistically, it was evident that the untreated 70-30 cotton-polyester was superior in stain removal to fabrics finished with DMDHEU-Valspex and fabrics finished with wet fixation-Valspex. The differences were significant, $P < 0.05$ and $P < 0.001$, respectively. The fabrics finished with wet fixation alone were exceeded in

stain removal by a highly significant difference the untreated fabrics.

The difference by which fabrics finished with DMDHEU-Valspex surpassed fabrics finished with DMDHEU-Mykon was significant ($P < 0.05$). Moreover, the fabrics finished with DMDHEU-Valspex displayed further superior ratings when compared to fabrics finished with wet fixation durable press alone or in combination with Valspex fabric softener. The differences were significant, $P < 0.01$ and $P < 0.001$, respectively.

The cotton fabric finished with DMDHEU-Mykon was superior in stain removal to fabric finished with DMDHEU alone, while fabric with the same type finish surpassed fabric finished with wet fixation-Mykon with a significant difference ($P < 0.05$). Fabric finished with DMDHEU without a fabric softener gave slight indications of being superior in stain release when compared to fabrics finished with wet fixation durable press. The differences between stain ratings of fabric finished with wet fixation-Mykon surpassed fabrics treated with wet fixation alone; the difference was highly significant ($P < 0.001$).

50-50 Cotton-Polyester without Soil Release Agent.

The mean stain removal ratings for untreated 50-50 cotton-polyester surpassed those of fabric treated with DMDHEU-Valspex by a difference which was significant ($P < 0.01$).

Other superior differences displayed by the untreated blend were evident when compared with fabrics treated with wet fixation alone as well as wet fixation with fabric softeners. The differences were highly significant ($P < 0.001$). There were slight indications that fabrics finished with DMDHEU-Valspex surpassed the other fabric finishes in the removal of lipstick stain.

With respect to the 50-50 blend, the DMDHEU and DMDHEU-Mykon finished fabrics displayed superior stain removal ability when compared to fabrics with wet fixation durable press without and in addition to Mykon and Valspex. The differences were highly significant.

35-65 Cotton-Polyester without Soil Release Agent.

Statistical data computed for the ease of removal of lipstick from the experimental fabrics made evident the fact that the untreated 35-65 cotton-polyester blend displayed only slightly significant differences. Fabrics finished with DMDHEU-Valspex and DMDHEU-Mykon indicated slightly superior ratings when compared to the other fabrics and finishes used in the present study.

100 Per Cent Cotton Finished with Mission Valley Soil Release Agent. The Mission Valley treated cotton fabric without durable press or fabric softeners revealed lower stain release ratings than did fabrics treated with DMDHEU

durable press. Other significant differences between the stain ratings of the cotton fabric may be summarized as follows: (a) the fabric finished with DMDHEU-Valspex surpassed fabrics treated with wet fixation-Valspex by a significant difference ($P < 0.05$), (b) fabrics finished with DMDHEU-Mykon surpassed fabrics treated with wet fixation-Valspex by a significant difference ($P < 0.05$), and (c) fabrics finished with DMDHEU only surpassed fabrics treated with wet fixation-Valspex by a significant difference ($P < 0.02$). There were slight indications that fabrics finished with DMDHEU were less susceptible to stains than were fabrics with the various other finishes.

70-30 Cotton-Polyester Finished with Mission Valley Soil Release Agent. Statistical comparisons of the removal of lipstick from pairs of the experimental fabrics revealed the fact that fabrics given the DMDHEU-Valspex finish were superior to fabrics without durable press as well as those with wet fixation durable press. The following comparison of fabrics with regards to stain release were significantly different ($P < 0.05$): (a) cotton-polyester fabrics finished with DMDHEU-Valspex when compared to fabrics with wet fixation-Valspex finish, (b) cotton-polyester fabrics finished with DMDHEU-Valspex when compared to fabrics with wet fixation durable press finish, and (c) cotton-polyester fabrics finished with DMDHEU when compared to fabrics with wet

fixation-Mykon finish. Fabrics with DMDHEU durable press revealed slightly superior indications when compared to fabrics with wet fixation durable press.

50-50 Cotton-Polyester Finished with Mission Valley Soil Release Agent. The mean stain removal scores of the 70-30 cotton-polyester fabrics without durable press and softeners were exceeded by those fabrics treated with DMDHEU-Valspex and DMDHEU-Mykon. In addition, the cotton-polyester blend with DMDHEU-Valspex surpassed fabrics treated with DMDHEU-Mykon, fabrics treated with wet fixation-Valspex and fabrics finished with wet fixation without a fabric softener. The differences between fabrics in these comparisons were highly significant ($P < 0.001$). Lower statistical differences were observed when comparisons were made of fabrics finished with DMDHEU-Valspex and wet fixation-Mykon or DMDHEU without fabric softeners. The fabric treated with DMDHEU-Mykon surpassed fabric treated with wet fixation-Valspex by a difference which was significant ($P < 0.05$).

35-65 Cotton-Polyester Finished with Mission Valley Soil Release Agent. The statistical comparisons of the removal of lipstick from pairs of the experimental fabrics made evident the fact that slight differences existed. The application of DMDHEU-Valspex made the fabrics less susceptible to stain retention when comparison was made with fabrics

with other finishes used in the present study. Two other differences were noted in stain release when fabrics finished with Mission Valley were analyzed. Fabrics finished with DMDHEU-Valspex in addition to Mission Valley were found to surpass fabrics treated with wet fixation durable press by a difference which was significant ($P < 0.02$). The DMDHEU-Mykon finished fabric surpassed fabrics with wet fixation-Mykon by a significant difference ($P < 0.05$).

100 Per Cent Cotton Finished with Scotchgard FC-218 Soil Release Agent. Statistical comparisons of the removal of lipstick from pairs of the experimental fabrics with Scotchgard revealed the fact that fabric without durable press or fabric softener were superior to fabrics with wet fixation durable press by a highly significant difference ($P < 0.001$). The untreated fabrics were superior to the fabrics with wet fixation-Mykon finish by a lower significant difference ($P < 0.05$). The cotton fabric with DMDHEU-Valspex were surpassed by fabrics treated with wet fixation-Valspex. The differences were significant, $P < 0.02$ and $P < 0.001$, respectively. The differences between the cotton fabric to which DMDHEU was applied and those to which wet fixation durable press with the addition of fabric softeners was highly significant ($P < 0.001$). Two less significant differences were experienced between fabrics finished with DMDHEU when compared to fabrics with only wet fixation

treatment and fabrics with wet fixation-Valspex when compared to fabrics with wet fixation-Mykon. The fabric treated with wet fixation-Valspex was surpassed in stain removal by fabrics with wet fixation at a highly significant difference ($P < 0.001$).

70-30 Cotton-Polyester Finished with Scotchgard FC-218 Soil Release Agent. The mean stain removal ratings of the 70-30 cotton-polyester fabric with Scotchgard without durable press or fabric softener was surpassed by fabrics treated with DMDHEU in addition to Scotchgard by a difference which was significant ($P < 0.02$). The fabric with DMDHEU without fabric softener was surpassed by fabrics with the same type durable press treatment with the addition of Valspex by a highly significant difference ($P < 0.001$). On the other hand, fabrics finished with DMDHEU-Valspex were superior in stain removal when compared to fabrics with wet fixation-Valspex by a difference which was significant ($P < 0.01$).

The Scotchgard treated fabrics with DMDHEU-Mykon were exceeded by fabrics with DMDHEU without fabric softener by a difference which was significant ($P < 0.05$). Conversely, the DMDHEU-Mykon treated fabrics exceeded the fabrics finished with wet fixation-Valspex by a difference which was significant ($P < 0.01$). The stain removal ratings of fabrics with DMDHEU and those with wet fixation-Valspex surpassed the other fabric finishes by a significant difference ($P < 0.01$).

The comparison of fabrics finished with DMDHEU also rated superior in stain removal to fabric with wet fixation-Valspex by a highly significant difference ($P < 0.001$).

50-50 Cotton-Polyester Finished with Scotchgard FC-218 Soil Release Agent. The effect of stain removal from the 50-50 cotton-polyester fabric with Scotchgard, but without durable press or fabric softener surpassed fabric finished with wet fixation-Valspex by a difference which was significant ($P < 0.05$). The difference in stain removal of fabric treated with DMDHEU-Valspex exceeded fabrics finished with wet fixation-Valspex by a significant difference ($P < 0.05$). On the other hand, the fabric treated with wet fixation-Valspex was surpassed by fabrics treated with wet fixation durable press by a significant difference ($P < 0.02$). Fabrics treated with durable press with the addition of fabric softeners indicated slight superior stain release ratings.

35-65 Cotton-Polyester Finished with Scotchgard FC-218 Soil Release Agent. The statistical comparisons of 35-65 cotton-polyester with Scotchgard in combination with the different finishes revealed that fabric without durable press or softener surpassed fabric with wet fixation-Valspex by a significant difference ($P < 0.05$). The difference between the fabric with wet fixation-Valspex and those with

wet fixation-Mykon and wet fixation durable press alone was also significantly different ($P < 0.05$). There were slight indications that fabric with DMDHEU-Valspex and fabric with DMDHEU-Mykon surpassed the fabric finished with wet fixation-Valspex.

100 Per Cent Cotton Finished with Rhoplex SR-488
Soil Release Agent. Stain release of fabrics treated with Rhoplex without durable press and fabric softeners were surpassed by fabrics with DMDHEU with fabric softeners by differences which were significant ($P < 0.05$). Differences in stain removal of fabrics with DMDHEU with Valspex and Mykon when compared to fabrics with wet fixation without fabric softeners was significant. The cotton fabric treated with DMDHEU-Mykon exceeded fabric with wet fixation durable press in stain removal by a difference which was distinctly significant ($P < 0.02$).

70-30 Cotton-Polyester Finished with Rhoplex SR-488
Soil Release Agent. Statistical comparisons of the mean stain release measurements of cotton-polyester fabric finished with Rhoplex as well as with durable press in combination with fabric softeners and those without fabric softeners showed only slight indications. The application of wet fixation durable press with Valspex finish indicated that these fabrics were less susceptible to stains.

35-65 Cotton-Polyester with Rhoplex SR-488 Soil Release Agent. The statistical comparisons of the 35-65 cotton-polyester fabric with Rhoplex and durable press were not significantly different in stain removal except for the following two comparisons. The fabric with DMDHEU-Valspex surpassed fabric without durable press and fabric softener by a significant difference ($P < 0.05$). The fabric treated with DMDHEU-Valspex also surpassed fabric finished with wet fixation durable press without fabric softener by a difference which was distinctly significant ($P < 0.01$). There were slight indications that fabrics treated with durable press with the addition of fabric softeners released more stain than did the fabrics without durable press or fabrics with durable press without fabric softener.

100 Per Cent Cotton Finished with Cirrasol PT Soil Release Agent. A statistical analysis of the data by means of the "t" test applied to various pairs of fabrics with respect to the removal of lipstick stain showed significant differences. The differences between fabrics treated with Cirrasol in addition to the DMDHEU durable press finish experienced superior ratings when compared to fabrics without durable press or fabrics with wet fixation. The differences were highly significant. The fabrics with DMDHEU without fabric softener were surpassed by fabrics with the corresponding durable press treatment with the addition of Valspex and

Mykon by significant levels of differences, $P < 0.05$ and $P < 0.02$, respectively.

70-30 Cotton-Polyester Finished with Cirrasol PT Soil Release Agent. The fabric treated with Cirrasol without durable press surpassed fabrics with DMDHEU-Mykon by a difference which was significant ($P < 0.02$). The untreated fabric also exceeded in stain removal when compared to fabrics with wet fixation durable press with the addition of softeners by a highly significant difference ($P < 0.001$). The stain release ratings of fabric treated with DMDHEU-Valspex as well as those treated with DMDHEU-Mykon surpassed in stain ratings fabrics with wet fixation durable press with each of the two fabric softeners. The differences were highly significant ($P < 0.001$). On the other hand, fabric with wet fixation-Valspex was exceeded in stain release when compared to fabric with wet fixation-Mykon and wet fixation without fabric softener. The differences were significant, $P < 0.01$ and $P < 0.001$, respectively. One other comparison revealed the fact that fabric treated with only wet fixation exceeded fabrics with wet fixation by a difference which was highly significant ($P < 0.001$).

50-50 Cotton-Polyester Finished with Cirrasol PT Soil Release Agent. The statistical comparisons of the

50-50 cotton-polyester fabrics without durable press or fabric softener were less vulnerable to staining than fabrics treated with durable press or fabric softeners. The differences were highly significant ($P < 0.001$). It was also noted that fabrics with durable press finishes without fabric softeners surpassed fabrics with corresponding treatment with the addition of Valspex or Mykon at highly significant differences.

35-65 Cotton-Polyester Finished with Cirrasol PT Soil Release Agent. The mean stain removal ratings of 35-65 cotton-polyester fabrics with Cirrasol, but without durable press finish surpassed the DMDHEU treated fabrics with the addition of Valspex or Mykon by differences which were significant ($P < 0.05$). The untreated fabrics were also superior in stain release of lipstick when compared to fabrics with wet fixation and the fabric softeners by highly significant differences ($P < 0.001$). The cotton-polyester fabrics finished with DMDHEU-Valspex and DMDHEU-Mykon surpassed those fabrics with wet fixation durable press by a difference which was significant ($P < 0.01$). On the other hand, fabrics finished with wet fixation durable press with fabric softeners were surpassed by fabrics finished with wet fixation durable press by highly significant differences.

RANK ORDER OF REMOVAL
OF LIPSTICK STAIN

Comparison of Fiber Content of Fabrics without Durable Press, Fabric Softener, or Soil Release. The 100 per cent cotton received the highest rank with 35-65 cotton-polyester receiving the lowest rank; the other two blends fell between these two extremes. The following rank order was established as a result of statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	4

Comparison of Fiber Content of Fabrics with Mission Valley Soil Release, but without Durable Press or Fabric Softener. Comparisons of the removal of lipstick from fabrics experienced no significant difference in mean stain release scores, throughout, with low scores for all fabrics. The statistical comparisons of fiber content according to rank order for the stained and laundered fabrics are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics with Scotchgard FC-218 Soil Release Agent, but without Durable Press or Fabric Softener. The all cotton exceeded in stain release of lipstick when compared to each of the different fabric blends. The following rank order was established as a result of statistical comparisons of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics with Rhoplex SR-488 Soil Release Agent, but without Durable Press or Fabric Softener. No significant difference was experienced for the different fabric blends in the removal of lipstick stain. The rank order of statistical comparisons established from the mean stain release rating of the different fiber contents follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics with Cirra-sol PT Soil Release, but without Durable Press or Fabric Softeners. The all cotton was surpassed in stain release by each of the different fabric blends in the removal of lipstick stain from the stained and laundered specimens. The following rank order was established as a result of statistical comparisons of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, but without Soil Release Agent. All of the cotton-polyester fabric blends were surpassed by the 100 per cent cotton in the release of lipstick stain from the laundered specimens. The following rank order was established as a result of statistical comparisons of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. The 50-50 cotton-polyester blend was surpassed in stain removal of lipstick by the 100 per cent cotton and the other fabric blends. The following rank order was determined by statistical comparisons of the mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. No significant difference was evident in stain removal of lipstick from the experimental fabrics. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The all cotton and the 35-65 cotton-polyester blend surpassed the other two fabric blends in the removal of lipstick. The following rank order was determined by statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. The mean scores of stain removal of lipstick from the experimental fabrics revealed no significant difference. The following rank order was established as a result of statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, but without a Soil Release Agent. The 100 per cent cotton surpassed each of the other fabric blends in stain removal of lipstick; the 50-50 cotton-polyester received the second highest score while the other two fabric blends rated extremely low. The following rank order was established as a result of statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	4
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	4

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Mission Valley Soil Release Agent. Comparisons of the removal of lipstick from fabrics revealed no significant difference in mean stain release scores. The following rank order was established as a result of statistical comparison of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Scotchgard FC-218 Soil Release Agent. No significant difference in the removal of lipstick from the experimental fabrics was experienced; each rated in third place. The following rank was established according to the statistical comparison of mean stain release scores of the experimental fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The 100 per cent cotton and 35-65 cotton-polyester blend exceeded the other two fabric blends in release of lipstick stain. The statistical comparisons of the mean stain removal from the experimental fabrics are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, Mykon Fabric Softener, and Cirrasol PT Soil Release Agent. Mean scores of the stain removal of lipstick from the experimental fabrics revealed no significant difference; all of the scores were comparatively low. The following rank order was established as a result of a statistical comparison of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, but without Fabric Softener or Soil Release Agent. The 100 per cent cotton and 70-30 cotton-polyester blend received the highest rank with 35-65 cotton-polyester blend falling to fourth place; the 50-50 blend fell between these two extremes. The following rank order was established as a result of statistical comparisons of mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	4

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press, with Mission Valley Soil Release Agent, but without a Fabric Softener. All cotton and 70-30 cotton-polyester exceeded in stain removal of lipstick when compared with the other two fabric blends. The rank order was established as a result of statistical comparisons of the mean stain release obtained from laundering the stained fabrics of the different fiber contents are shown in the following summarization:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. The 100 per cent cotton and 70-30 cotton-polyester blend surpassed in stain release of lipstick when compared to the other two fabric blends. The following rank order was established by statistical

comparisons of the mean stain release made with respect to the fabrics of different fiber content falling within the category under discussion:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Rhoplex SR-488 Soil Release, but without Fabric Softener. All cotton exceeded the cotton-polyester blends in the removal of lipstick stain from the experimental fabrics. The following rank order was established as a result of statistical comparisons of the mean stain release scores of fabrics:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with DMDHEU Durable Press and Cirrasol PT Soil Release Agent, but without a Fabric Softener. The 35-65 cotton-polyester fabric blend was exceeded in stain removal of lipstick by the 100 per cent cotton and the other fabric blends. The rank

order obtained from the laundered stained fabrics of different fiber content by means of statistical comparisons are as follows:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	2
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, but without Soil Release Agent. No significant difference was observed in stain removal of lipstick from the experimental fabrics; all received relatively low ratings. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	4
50-50 Cotton-Polyester	4
35-65 Cotton-Polyester	4

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Mission Valley Soil Release Agent. Cotton as well as the

different fabric blends each received a rank of three in the removal of lipstick stain from the experimental fabrics. The rank order established as a result of statistical comparisons of the laundered stained fabrics of different fiber content are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Scotchgard FC-218 Soil Release Agent. No significant difference was evident in the stain removal of lipstick, all cotton as well as the different fabric blends rated extremely low. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	4
50-50 Cotton-Polyester	4
35-65 Cotton-Polyester	4

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Rhoplex SR-488 Soil Release Agent. Both the 35-65 and 50-50 cotton-polyester blends exceeded in stain removal of lip-stick when compared to cotton and the 70-30 fabric blend. The rank order obtained from statistical comparisons of the laundered stained fabrics of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Valspex Fabric Softener, and Cirrasol PT Soil Release Agent. Fabrics with the highest polyester content received the highest ranks while fabrics with greater cotton percentage received lower ranks, although the mean scores were relatively low. The rank order of statistical comparisons established from the mean stain release rating of the different fiber content follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	4
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, but without Soil Release Agent. The 70-30 cotton-polyester blend fabrics exceeded all other fabrics in this category in the removal of lipstick stain. The rank order established as a result of statistical comparisons of the mean stain release scores are as follow:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	4
35-65 Cotton-Polyester	4

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Mission Valley Soil Release Agent. Each of the different experimental fabrics in this category received a rank of three in the removal of lipstick stain. The following rank order was established as a result of statistical comparisons of the mean stain release scores of the laundered and stained specimens:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener and Scotchgard FC-218 Soil Release Agent. The comparisons of the removal of lipstick from the fabrics experienced no significant difference in mean stain release scores. The following rank order was established as a result of statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Rhoplex SR-488 Soil Release Agent. The 35-65 cotton-polyester fabric blend exceeded in stain removal when compared to the other fabrics in this category. The rank order established as a result of statistical comparisons of the mean stain release obtained from the laundered fabrics of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	2

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, Mykon SF Fabric Softener, and Cirrasol PT Soil Release Agent. Each of the different cotton-polyester blend fabrics surpassed cotton in the removal of lipstick stain. The rank order established as a result of statistical comparisons of the mean stain release from laundered fabrics of different fiber content falling within this category are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press, but without Fabric Softener or Soil Release Agent. Comparisons of the removal of lipstick from the fabrics experienced no significant differences in the stain release scores of lipstick; ratings were extremely low. The following rank order was established as a result of statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	4
50-50 Cotton-Polyester	4
35-65 Cotton-Polyester	4

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press with Mission Valley Soil Release Agent, but without Fabric Softener. No significant difference was evident in stain removal of lipstick from the experimental fabrics; all received relatively low scores. The rank order established from statistical comparisons of the mean stain release obtained from laundering the stained fabrics are presented in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Scotchgard FC-218 Soil Release Agent, but without Fabric Softener. The 50-50 cotton-polyester blend exceeded the other blends and 100 per cent cotton in the removal of lipstick stain from the experimental fabrics. The rank order established as a result of statistical comparisons of the mean stain release obtained from laundering the stained specimens of different fiber content are shown in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	3

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Rhoplex SR-488 Soil Release Agent, but without a Fabric Softener. The 35-65 cotton-polyester fabric blend exceeded the other blends as well as all cotton in the removal of lipstick stain from the experimental fabrics. The rank order established from statistical comparisons of the mean stain release obtained from laundering the stained fabrics are presented in the following summary:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	3
70-30 Cotton-Polyester	3
50-50 Cotton-Polyester	3
35-65 Cotton-Polyester	4

Comparison of Fiber Content of Fabrics Finished with Wet Fixation Durable Press and Cirrasol PT Soil Release Agent, but without Fabric Softener. The different cotton-polyester fabric blends each exceeded all cotton in the release of lipstick stain. The following rank order was established as a result of statistical comparisons of the mean stain release scores:

<u>Fiber Content</u>	<u>Rank Order</u>
100 Per Cent Cotton	4
70-30 Cotton-Polyester	2
50-50 Cotton-Polyester	2
35-65 Cotton-Polyester	2

S U M M A R Y G

EVALUATION OF LIPSTICK STAIN REMOVAL AS A RESULT OF ONE LAUNDERING AFTER THE FABRICS WITH NO DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	4.0	4.0	3.0	3.0	3.6	2
B	70-30 Cotton- Polyester	4.0	3.0	3.0	3.0	2.0	2.0	2.7	3
C	50-50 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	2.0	2.8	3
D	35-65 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.5	3.0	2.0	2.0	1.5	1.5	2.2	3
B	70-30 Cotton- Polyester	4.0	3.5	2.5	1.5	2.0	2.0	2.6	3
C	50-50 Cotton- Polyester	4.0	3.0	2.0	2.0	2.0	1.5	2.4	3
D	35-65 Cotton- Polyester	4.0	3.0	2.5	2.0	2.0	1.5	2.5	3

S U M M A R Y G, ContinuedEVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS WITH NO
DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.5	3.0	3.0	3.0	2.5	3.2	2
B	70-30 Cotton- Polyester	4.0	2.0	2.0	2.5	2.0	2.0	2.4	3
C	50-50 Cotton- Polyester	3.5	3.5	3.0	2.5	2.0	2.0	2.7	3
D	35-65 Cotton- Polyester	3.5	3.5	3.0	3.0	2.5	2.0	2.9	3

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	2.5	2.5	2.0	2.0	2.5	3
B	70-30 Cotton- Polyester	3.5	3.0	2.0	2.0	2.0	2.0	2.4	3
C	50-50 Cotton- Polyester	3.0	3.0	2.5	1.5	1.5	1.5	2.2	3
D	35-65 Cotton- Polyester	4.0	3.0	2.0	2.0	1.5	1.5	2.3	3

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS WITH NO.
DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
B	70-30 Cotton- Polyester	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
C	50-50 Cotton- Polyester	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
D	35-65 Cotton- Polyester	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	15.5	14.5	12.5	12.5	10.5	10.0	75.5	3
B	70-30 Cotton- Polyester	19.5	14.5	12.5	12.0	11.0	11.0	80.5	1
C	50-50 Cotton- Polyester	17.5	15.5	13.5	12.0	11.5	10.0	80.0	1
D	35-65 Cotton- Polyester	16.5	13.5	11.5	11.0	10.0	10.0	72.5	4
	Total	69.0	58.0	50.0	47.5	43.0	41.0	308.5	

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS WITH DMDHEU DURABLE PRESS
AND VALSPEX (P-167) FABRIC SOFTENER HAD BEEN LAUNDERED
THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	3.0	3.0	3.0	2.0	2.0	2.0	2.5	3
C	50-50 Cotton- Polyester	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3
D	35-65 Cotton- Polyester	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	4.0	3.5	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton- Polyester	4.0	4.0	4.0	4.0	3.5	3.5	2.8	3
D	35-65 Cotton- Polyester	4.0	4.0	3.5	3.0	3.0	3.0	3.4	2

S U M M A R Y G, ContinuedEVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND VALSPEX (P-167)FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	2.0	3.0	3.0	3.0	3.0	3.0	2.8	3
B	70-30 Cotton- Polyester	3.0	3.0	2.5	2.5	3.0	2.5	2.7	3
C	50-50 Cotton- Polyester	3.5	3.0	3.0	2.0	2.0	2.5	2.7	3
D	35-65 Cotton- Polyester	3.0	3.0	2.0	3.0	2.5	2.5	2.7	3

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	2.0	3.0	3.0	3.5	3.0	3.0	2.9	3
C	50-50 Cotton- Polyester	3.0	3.5	2.5	2.0	2.0	2.0	2.5	3
D	35-65 Cotton- Polyester	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND VALSPEX (P-167)

FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	2.0	2.0	3.0	3.0	3.0	3.0	2.7	3
B	70-30 Cotton- Polyester	2.5	2.5	3.0	3.0	3.0	3.0	2.8	3
C	50-50 Cotton- Polyester	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3
D	35-65 Cotton- Polyester	2.0	3.0	3.0	3.0	3.0	3.0	2.8	3

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	13.0	14.0	15.0	15.0	15.0	15.0	87.0	1
B	70-30 Cotton- Polyester	14.5	15.0	14.5	14.0	14.0	13.5	85.5	3
C	50-50 Cotton- Polyester	14.5	14.5	13.5	12.0	11.5	12.0	78.0	4
D	35-65 Cotton- Polyester	14.5	15.5	14.0	14.5	14.0	14.0	86.5	2
	Total	56.0	59.0	57.0	56.0	54.5	54.5	337.0	

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS WITH DMDHEU DURABLE PRESS
AND MYKON SF FABRIC SOFTENER HAD BEEN LAUNDERED
THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	3.0	1.0	1.0	1.0	1.0	2.0	1.5	4
C	50-50 Cotton- Polyester	2.0	2.0	2.0	3.0	3.0	3.0	2.5	3
D	35-65 Cotton- Polyester	1.0	1.0	2.0	2.0	2.0	1.0	1.5	4

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
D	35-65 Cotton- Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2

S U M M A R Y G, ContinuedEVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND MYKON SF FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	3.0	3.0	2.0	1.5	1.5	2.5	3
B	70-30 Cotton- Polyester	4.0	3.0	3.0	2.5	2.5	2.5	2.8	3
C	50-50 Cotton- Polyester	3.5	3.0	2.0	2.0	2.0	1.5	2.3	3
D	35-65 Cotton- Polyester	3.0	3.0	2.0	3.0	2.5	2.5	2.7	3

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
B	70-30 Cotton- Polyester	4.0	3.0	2.5	2.5	3.0	2.5	2.9	3
C	50-50 Cotton- Polyester	3.5	3.0	3.0	3.0	1.5	2.0	2.7	3
D	35-65 Cotton- Polyester	4.0	3.0	3.0	3.0	3.0	2.5	3.6	2

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND MYKON SF FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	2.5	2.0	2.0	2.6	3
B	70-30 Cotton- Polyester	3.0	2.5	2.5	2.5	2.0	2.0	2.4	3
C	50-50 Cotton- Polyester	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3
D	35-65 Cotton- Polyester	2.5	3.0	3.0	2.5	2.5	2.5	2.7	3

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	17.0	15.0	15.0	13.5	12.5	12.5	85.5	1
B	70-30 Cotton- Polyester	17.0	12.5	12.5	13.5	11.5	12.0	79.0	2
C	50-50 Cotton- Polyester	14.5	13.5	12.5	12.0	12.0	12.0	76.5	4
D	35-65 Cotton- Polyester	13.5	13.0	13.0	13.5	13.0	11.5	77.5	3
	Total	62.0	54.0	53.0	52.5	49.0	48.0	318.5	

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS WITH DMDHEU DURABLE PRESS
AND NO FABRIC SOFTENER HAD BEEN LAUNDERED
THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
B	70-30 Cotton-Polyester	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2
C	50-50 Cotton-Polyester	3.0	3.0	3.0	2.0	2.0	2.0	2.5	3
D	35-65 Cotton-Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	4.0	4.0	3.0	3.0	3.0	3.5	2
B	70-30 Cotton-Polyester	4.0	3.0	3.0	3.0	2.5	2.5	3.0	2
C	50-50 Cotton-Polyester	4.0	3.0	3.0	2.0	1.5	1.0	2.4	3
D	35-65 Cotton-Polyester	4.0	3.0	2.5	2.0	2.0	1.5	2.5	3

S U M M A R Y - G, ContinuedEVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	3.5	3.5	3.5	3.0	3.6	2
B	70-30 Cotton- Polyester	4.0	3.5	3.5	3.5	3.5	3.5	3.6	2
C	50-50 Cotton- Polyester	3.5	3.5	2.5	2.5	1.5	1.0	2.4	3
D	35-65 Cotton- Polyester	4.0	2.5	2.5	2.5	1.5	1.0	2.5	3

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	4.0	3.5	3.0	2.5	2.5	2.5	3.0	2
B	70-30 Cotton- Polyester	4.0	4.0	4.0	3.0	1.5	1.0	2.9	3
C	50-50 Cotton- Polyester	4.0	3.5	3.0	3.0	2.0	1.0	2.7	3
D	35-65 Cotton- Polyester	4.0	4.0	3.5	2.0	1.5	1.0	2.7	3

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH DMDHEU DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	4.0	4.0	3.5	3.5	3.0	3.0	3.5	2
B	70-30 Cotton- Polyester	4.0	4.0	3.0	3.0	3.0	3.0	3.3	2
C	50-50 Cotton- Polyester	4.0	3.5	3.5	3.5	3.0	3.0	3.4	2
D	35-65 Cotton- Polyester	2.5	3.0	3.0	2.5	2.5	2.5	2.7	3

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	19.0	18.5	17.0	15.5	15.0	14.5	99.5	1
B	70-30 Cotton- Polyester	19.0	17.0	16.5	15.5	13.5	13.0	94.5	2
C	50-50 Cotton- Polyester	18.5	16.5	15.0	13.0	9.5	8.0	80.5	3
D	35-65 Cotton- Polyester	15.5	13.5	12.5	10.0	8.5	7.0	67.0	4
	Total	72.0	65.5	61.0	54.0	46.5	42.5	341.5	

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND VALSPEX (P-167) FABRIC SOFTENER HAD
BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
B	70-30 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
C	50-50 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
D	35-65 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.0	3.0	2.0	2.0	2.5	2.5	2.5	3
B	70-30 Cotton- Polyester	3.5	2.5	2.5	2.5	2.0	2.0	2.5	3
C	50-50 Cotton- Polyester	3.0	3.0	2.5	2.5	2.5	2.0	2.6	3
D	35-65 Cotton- Polyester	3.5	2.5	2.0	2.0	1.5	1.5	2.2	3

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND VALSPEX (P-167)
FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	2.0	2.0	2.0	2.0	1.5	1.5	1.4	4
B	70-30 Cotton- Polyester	2.0	2.0	2.0	1.0	1.0	1.0	1.5	4
C	50-50 Cotton- Polyester	2.5	2.5	2.0	1.0	1.0	1.0	1.7	4
D	35-65 Cotton- Polyester	3.0	2.5	2.0	1.5	1.0	1.0	1.8	4

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.5	3.5	3.0	2.0	2.0	1.0	2.5	3
B	70-30 Cotton- Polyester	4.0	3.0	2.5	1.5	1.0	1.0	2.2	3
C	50-50 Cotton- Polyester	4.0	4.0	3.5	2.5	2.5	2.0	3.1	2
D	35-65 Cotton- Polyester	4.0	4.0	3.5	2.5	2.5	2.5	3.2	2

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND VALSPEX (P-167) :
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	1.5	1.0	1.0	1.0	1.5	1.5	1.2	4
B	70-30 Cotton- Polyester	2.0	1.5	1.5	1.0	1.0	1.0	1.3	4
C	50-50 Cotton- Polyester	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3
D	35-65 Cotton- Polyester	2.0	1.5	2.5	2.0	2.0	2.0	2.0	3

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	11.0	10.5	9.0	8.5	8.5	7.5	55.0	3
B	70-30 Cotton- Polyester	11.5	10.0	9.5	6.5	6.0	6.0	49.5	4
C	50-50 Cotton- Polyester	12.5	12.5	11.0	9.0	9.0	8.0	62.0	1
D	35-65 Cotton- Polyester	13.5	11.5	11.0	9.0	8.0	8.0	61.0	2
	Total	48.5	44.5	40.5	33.0	30.5	29.5	228.5	

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND MYKON SF FABRIC SOFTENER HAD
BEEN LAUNDERED THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fabric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	2.0	2.0	2.7	3
C	50-50 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
D	35-65 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	4.0	3.0	3.0	2.0	1.0	1.0	2.3	3
B	70-30 Cotton- Polyester	4.0	3.0	2.5	1.5	1.0	1.0	2.2	3
C	50-50 Cotton- Polyester	4.0	3.5	3.0	2.0	2.0	1.5	2.7	3
D	35-65 Cotton- Polyester	4.0	3.5	2.5	1.5	1.5	1.0	2.3	3

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND MYKON SF
FABRIC SOFTENER

PART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	2.5	2.0	3.0	2.5	2.5	2.5	2.5	3
B	70-30 Cotton- Polyester	3.0	2.5	2.5	2.0	2.0	1.0	2.2	3
C	50-50 Cotton- Polyester	3.5	3.0	3.0	2.5	1.5	1.5	2.5	3
D	35-65 Cotton- Polyester	3.0	3.0	3.0	3.0	2.5	2.0	2.7	3

PART IV: RHIOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.5	3.5	3.0	3.0	1.5	1.5	2.7	3
B	70-30 Cotton- Polyester	3.5	3.5	3.0	2.5	2.0	2.0	2.7	3
C	50-50 Cotton- Polyester	3.5	3.5	3.0	2.0	2.0	1.5	2.6	3
D	35-65 Cotton- Polyester	4.0	4.0	3.5	2.5	2.5	2.5	3.2	2

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND MYKON SF
FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	1.5	1.5	1.0	1.0	1.0	1.0	1.2	4
B	70-30 Cotton- Polyester	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3
C	50-50 Cotton- Polyester	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3
D	35-65 Cotton- Polyester	2.0	1.5	2.5	2.0	2.0	2.0	2.0	3

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	12.5	11.0	11.0	9.5	7.0	7.0	58.0	3
B	70-30 Cotton- Polyester	15.5	13.0	13.0	10.5	9.0	8.0	69.0	1
C	50-50 Cotton- Polyester	14.0	13.0	12.0	9.5	8.5	7.5	44.5	4
D	35-65 Cotton- Polyester	14.0	13.0	12.5	10.0	9.5	8.5	67.5	2
	Total	56.0	50.0	48.5	39.5	34.0	31.0	239.0	

S U M M A R Y G, Continued

EVALUATION OF LIPSTICK STAIN REMOVAL AS A RESULT OF ONE
LAUNDERING AFTER THE FABRICS FINISHED WITH WET FIXATION
DURABLE PRESS AND NO FABRIC SOFTENER HAD BEEN LAUNDERED
THE DESIGNATED NUMBER OF TIMES

PART I: NO STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
B	70-30 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
C	50-50 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4
D	35-65 Cotton- Polyester	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4

PART II: MISSION VALLEY STAIN REMOVAL AGENT

A	100% Cotton	3.5	3.5	3.0	2.5	2.0	1.0	2.6	3
B	70-30 Cotton- Polyester	3.5	2.5	2.5	2.0	2.0	2.0	2.4	3
C	50-50 Cotton- Polyester	3.5	3.0	2.5	1.5	1.5	1.5	2.2	3
D	35-65 Cotton- Polyester	4.0	3.0	2.0	1.5	2.0	1.5	2.3	3

S U M M A R Y G, ContinuedEVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND NO FABRIC SOFTENERPART III: SCOTCHGARD FC-218 STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	3.0	3.0	3.0	3.0	2.5	2.5	2.8	3
B	70-30 Cotton- Polyester	3.0	3.0	3.0	3.0	2.5	2.0	2.7	3
C	50-50 Cotton- Polyester	4.0	4.0	3.0	3.0	2.5	2.0	3.6	2
D	35-65 Cotton- Polyester	3.0	3.0	3.0	3.0	2.5	2.0	2.7	3

PART IV: RHOPLEX SR STAIN REMOVAL AGENT

A	100% Cotton	3.0	2.5	2.5	2.5	2.0	2.0	2.4	3
B	70-30 Cotton- Polyester	3.0	3.0	3.0	1.5	1.0	1.0	2.1	3
C	50-50 Cotton- Polyester	3.0	2.5	2.5	2.5	2.0	1.5	2.3	3
D	35-65 Cotton- Polyester	3.5	3.0	2.0	1.0	1.0	1.0	1.9	4

EVALUATION OF LIPSTICK STAIN REMOVAL FROM FABRICS FINISHED
WITH WET FIXATION DURABLE PRESS AND NO FABRIC SOFTENER

PART V: CIRRASOL PT STAIN REMOVAL AGENT

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Mean	Rank
A	100% Cotton	1.5	1.0	1.0	1.0	1.0	2.0	1.2	4
B	70-30 Cotton- Polyester	4.0	3.0	3.0	3.0	3.0	3.0	3.2	2
C	50-50 Cotton- Polyester	4.0	3.5	3.0	3.0	3.0	3.0	3.2	2
D	35-65 Cotton- Polyester	4.0	4.0	3.5	3.5	3.5	3.5	3.6	2

SUMMARIZATION OF TOTAL SCORES AND RANK ORDERS OF SCORES

Fab- ric	Fiber Content	Stain Ratings After Designated Number of Launderings							
		0	5	10	15	20	25	Total	Rank
A	100% Cotton	12.0	11.0	10.5	10.0	8.5	8.5	60.5	4
B	70-30 Cotton- Polyester	14.5	12.5	12.5	10.5	9.5	9.0	68.5	3
C	50-50 Cotton- Polyester	15.5	14.0	12.0	11.0	10.0	9.0	71.5	1
D	35-65 Cotton- Polyester	15.5	14.0	11.5	10.0	10.0	9.0	70.0	2
	Total	57.5	51.5	46.5	41.5	38.0	35.5	270.5	

S U M M A R Y

This investigation was concerned with water-borne and lipstick stain removal performance of 140 experimental fabrics which differed in fiber content and in the special finishes which had been applied to them. The fabrics were divided into seven groups. Each group contained the following blends of fabrics: 100 per cent cotton, 70-30 cotton-polyester, 50-50 cotton-polyester, and 35-65 cotton-polyester. The fabrics were treated with different finish combinations consisting of conventional and wet fixation durable press, Valspex (P-167) and Mykon SF fabric softeners, soil release agents of Mission Valley, Scotchgard FC-218, Rhoplex SR-488, and Cirrasol PT. One group of fabrics was left without special finishes, another group received only soil release treatment.

Initial properties of the fabrics were evaluated with regard to yarn count and weight per square yard. Performance evaluations made on the test fabrics included change in weight after each five laundering intervals, stain removal after designated number of launderings, and stain removal with respect to the different fabrics and finishes.

The data which resulted from the evaluations of the stained fabrics were analyzed by means of the classical "t"

test. The total and mean scores, and rank orders of scores were used for the comparison of data for stain removal from the different fabrics and finishes.

With regard to the initial properties of the experimental fabrics the 100 per cent cotton was the heaviest. As the polyester percentage of the fabric blends increased, the weights of the experimental fabrics tended to decrease accordingly. The 35-65 cotton-polyester blended fabrics were found to have greater variations in yarn count with lower warp and higher filling counts than did the other experimental fabrics. Yarn counts of the other experimental fabrics compared favorably.

The initial weight of the fabrics were compared to weights after the intervals of five, 10, 15, 20, and 25 laundering periods to determine the amount of finish lost during the laundering process. The experimental fabrics showed variations in the percentage of weight loss, with some fabrics experiencing a slight increase in weight. Fabrics having received the conventional application of durable press lost more weight than did the fabrics with the wet fixation treatment of applying durable press. All of the fabrics exhibited a weight loss after 10 launderings with the exception of fabrics treated with durable press applied by wet fixation without a fabric softener, and these showed a slight increase in weight.

The maximum loss of weight for the 100 per cent cotton fabrics was experienced by fabrics having the conventional application of durable press and Mykon SF fabric softener. Slight gains were evident for the all cotton fabrics with wet fixation durable press without fabric softener. The all cotton fabrics lost the most weight after the fifteenth laundering.

The 70-30 cotton-polyester blends lost the greatest amount of weight. The highest per cent of weight loss occurred after the tenth laundering interval. There was a noticeable change in weight loss with durable press treated fabrics in combination with fabric softeners.

The 50-50 cotton-polyester blends finished with the conventional durable press and fabric softeners experienced the greatest per cent of weight loss for this category. Fabrics with this finish displayed a progressive loss of weight throughout the laundering series. The same fabric blend showed considerable difference in the per cent of weight loss. Fabrics without durable press and fabric softener exhibited weight gains through the first five launderings..

It was noted that the 35-65 cotton-polyester blend lost a minimum amount of weight at each interval during the laundering series. A gradual weight loss was evident throughout the laundering series with the greatest per cent of weight loss occurring after the twenty-fifth laundering interval.

The mean scores of stain removal were statistically analyzed and were ranked for all experimental fabrics. It was noted that, as the polyester component decreased in fabric blends, higher rank orders resulted. The fabrics treated with Mission Valley and Scotchgard soil release agents exhibited repellency to staining, causing the staining material to be held up on the fabric surface, until some of the finish was lost during the laundering procedure. The water-borne liquid staining materials were not readily absorbed by the initial fabrics. It was noted that, as the number of launderings increased before staining the greater absorption of staining materials was shown by the test specimens.

The mean score for each fabric showed that stain removal ranked highest after the initial laundering periods. The stain removal scores following the initial laundering periods showed a progressive decline in stain release ratings as the number of launderings increased.

The rank orders of stain removal for fabrics stained with grape juice, mustard, and coffee with cream were similar. The stain release ratings were related to fiber content with fabrics having the highest polyester content receiving the highest rank. The nature of the two fibers under consideration account for much of the stain rating results since cotton is absorbent and polyester is hydrophobic.

Fabrics finished with the conventional application of durable press ranked higher in stain removal than did the

fabrics treated with wet fixation or fabrics without durable press treatment. Unfinished 100 per cent cotton retained more stain than did the fabrics composed of cotton-polyester blends. As the number of launderings increased before staining the finishes tended to be less effective.

The removal of catsup stain from the test fabrics presented a different trend. Each of the cotton-polyester blends received the highest ranks with all cotton falling in second place. As the number of launderings increased before staining a gradual decrease in stain rating was obvious, indicating that some of the finish was lost due to the laundering series. Fabrics treated with Scotchgard experienced greater stain removal of catsup than did the fabrics treated with the other soil release agents.

Lipstick stain was difficult to remove and ratings were not as high as those for the water-borne stains. The 100 per cent cotton moved into first place, receiving the highest rank for the removal of this stain. The 70-30 and 35-65 cotton-polyester blended fabrics ranked lowest, possibly because of the oleophilic nature of the polyester fiber.

The data which resulted from the analysis of the stained fabrics indicated that soil release finishes were effective in the initial laundering periods. A gradual decrease in stain removal was evident as the number of

laundryings increased. This would be an indication of the fact that finish was removed following the various number of laundryings to which the fabrics were subjected.

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