THE COMPARATIVE SERVICE QUALITIES OF SILK AND RAYON DRESS CREPES IN RELATION TO PRICE

by

Eula Carlson

B. S., Kansas State College
of Agriculture and Applied Science, 1939

A THESIS

submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

Department of Clothing and Textiles

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1940

TABLE OF CONTENTS

	Page
INTRODUCTION	1
STATUS OF KNOWLEDGE	2
PROCEDURE	6
Analysis of Fabrics	9
Serviceability Tests	11
FINDINGS AND DISCUSSION	14
Serviceability of Fabrics	15
CONCLUSIONS	35
ACKNOWLEDGMENT	37
LITERATURE CITED	38

INTRODUCTION

Rayon rose to a commanding position in high fashion merchandise in 1939. This was due in a large measure to the perfection of finer denier yarn and higher filament counts, which resulted in fabrics of extraordinary beauty and quality. Designers were quick to appreciate that with an advancing price on raw silk due to political conditions in the Orient, a profitable use could be made of the finer denier rayon yarns (6).

The use of rayon has advanced to undreamed of heights during the past decade. The census figures show a clear picture of what has happened. In the case of rayon woven goods, production increased 397.8 percent in 10 years bringing the number of yards to 1¼ billion in 1939. In the case of silk, there was a decrease of 83.7 percent, and only 80 million yards of silk woven goods were produced in 1939 (10).

A major progressive step in the rayon industry came when rayon crepe fabrics were satisfactorily produced. It was discovered that rayon yarns, except acetate, could be twisted highly and made into crepe. This discovery opened one of the largest fields for increased rayon yarn consump-

tion. It was found that rayon could be made to give a deeper pebble and a greater variety of crepe effects than was possible with silk. Because of the recent improvements in the rayon crepes it is difficult to distinguish them from silk crepes in appearance and handle. The comparative serviceability of rayon crepes with silk crepes is of vital interest to the consumer.

The purpose of this study was to determine the comparative serviceability of silk and rayon dress crepes of similar prices, and also to find if price is an indication of the serviceability of yard goods of this type.

STATUS OF KNOWLEDGE

Little information is available on the comparison of the service qualities of pure dye silk, and on viscose rayon dress crepes, of similar construction; however, there are a number of reports of studies on silk fabrics and on rayon fabrics which have some bearing on the present problem.

The strength of synthetic material in the form of continuous filament yarns is less than silk yarns, according to Allen (2). If equally strong fabrics are to be produced, those consisting of rayon must be decidedly heavier than those of silk. Thus when obtained in rayons the pebble or

crepe effect is of a definitely coarser type he stated. It is easier to exceed the elastic limit in rayon yarns and filaments than in silk, and the pronounced plasticity of rayon in comparison with silk renders the manufacture of rayon crepes really difficult compared with that of silk crepes. Allen further stated that even in the newest varieties of rayon the elastic properties are not equal to those of the natural fibers.

However, since 1936 many improvements have been made in rayon crepes. Hall (8) reported that tests of the strength in the warp and filling directions showed that rayon crepes, though weak in comparison with natural silk crepes of similar weight, were strong enough to meet the normal requirements in garments.

Whitlock (17) made a study of eight pieces of silk material which were made into 20 dresses. All except one, a spun silk, were flat crepes. The dresses were worn by individuals for the purpose of testing actual wear received from the garment. She found that all the silks tested poor or very poor in fastness to light; 2 of the dresses shrank; and 10 of the dresses were injured by perspiration in color or strength.

In a study of the reasons for discarding inexpensive rayon dresses Gregory and Mack (7) found that seam slippage

was one of the chief causes for dresses wearing out. The viscose crepes were highly resistant to slippage when tested dry, Crawford (4) stated. However, Gregory and Mack found that the standard test for seam slippage did not predict seam slippage during wear with a satisfactory degree of accuracy, since many more dresses pulled out at the seams than the test indicated.

Dodson (5) tested 82 silk and rayon dress fabrics believed to be typical of those in use for women's dresses during the fall and winter of 1935-1936. All the fabrics, with the exception of one piece of chiffon, had a breaking strength above 30 pounds in warp and 20 pounds in filling, which she regarded as highly satisfactory rating from the standpoint of the breaking strength. In the 20 pure dye flat crepe silk fabrics the average breaking strength was 102 pounds in warp and 62 pounds in filling. In 10 rayon fabrics the average was 62 pounds in warp and 45 pounds in filling. When tested for slippage the 20 pieces of pure dye silk averaged 21 pounds and the rayon 15 pounds. Shrinkage from "cleaning dry" for the pure dye silks averaged 3.48 percent in the warp and 3.68 percent in filling; the 10 rayons, 2.01 percent in warp and 2.01 percent in filling. The heavy crepes, matelasses, and novelties shrank more than the other weaves. In some of these fabrics

shrinkage could not be eliminated by commercial pressing methods. In summarizing color fastness of the 18 pure dye silks, 6 were fast to light and 14 to "cleaning dry." Of the 10 rayons, 9 were fast to light and 8 to "cleaning dry." Dodson concluded that reasonable serviceability might be expected from fabrics whether pure dye silk, weighted silk, or rayon, other factors being equal. The relation of price to the serviceability of fabrics was investigated by Mack (11). In the study of 50 silk dresses it was found that an inferior fabric was used in the dresses bought for less than $20, and that a good fabric was not always used in the more expensive ones.

In general there was a somewhat higher yardage and a greater weight of actual silk in the more expensive dresses, although some of the cheaper garments were the equal of the more expensive ones in this regard. The fabrics of the low-priced dresses were without exception low in durability, although some of the higher-priced dresses were equally poor. Color fastness was not related to the price of the dress; one of the highest priced dresses fell in the lowest class as regards bleeding in perspiration, and some of the cheaper dresses ranked high in this regard. The dyes on many of the fabrics were fugitive to light and showed bleeding in water. Her study of silk yardage on the market showed that

the price per yard of the fabrics was not an indication of its weighting content or of its durability. It showed the synthetic fabrics to be as seriously in need of standardization and correct labeling as silk fabrics.

PROCEDURE

In selecting the materials for this study silk crepes and rayon crepes were chosen that were so much alike in appearance and handle that it was difficult for many people to distinguish the silk fabrics from the rayon. Fabrics believed to be typical of those in popular use for women's dresses during the spring were used. Four rayon crepes at $1.00, $1.25, $1.50, and $1.98 per yard, respectively, were obtained and four similar pure dye silk crepes of corresponding prices. Samples of the materials used are shown in Fig. 1.

Four of the pieces were purchased from an establishment in St. Louis; two were purchased in a local Manhattan store, one from a mail order house in Kansas City, and one from a department store in Denver, Colorado. Table 1 indicates where each was purchased, the price per yard, and width of each fabric.

EXPLANATION OF PLATE I

Samples of Fabrics Analyzed

Fig. 1. $1.00 rayon

Fig. 2. $1.00 silk

Fig. 3. $1.25 rayon

Fig. 4. $1.25 silk

Fig. 5. $1.50 rayon

Fig. 6. $1.50 silk

Fig. 7. $1.98 rayon

Fig. 8. $1.98 silk

PLATE I

Fig. 1

Fig. 2

Fig. 3

Fig. 4

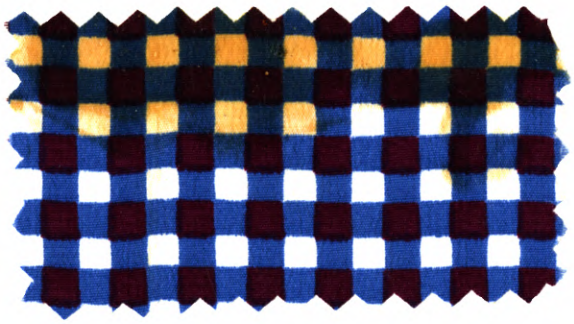

Fig. 5

Fig. 7

Fig. 8

Table 1. The price per yard, place purchased and width of the four viscose rayon crepes and the four pure dye silk crepes.

Price per Yard	Place Purchased	Width in Inches
$1.00 Rayon	Cole's Dry Goods Co., Manhattan	39
$1.25 Rayon	Welek's, St. Louis	38
$1.50 Rayon	Welek's, St. Louis	39½
$1.98 Rayon	Welek's, St. Louis	38
$1.00 Silk	Cole's Dry Goods Co., Manhattan	39
$1.25 Silk	Sears Roebuck and Co., Kansas City	39
$1.50 Silk	Denver Dry Goods Co., Denver	40
$1.98 Silk	Welek's, St. Louis	39

Analysis of Fabrics

The fiber content of the fabrics was identified microscopically from cross-sections of the fibers which were made with the Schwarz fiber microtome.

Analysis for width, thickness, thread count, and weight per square yard, were made by the methods approved by Committee D-13 (3).

Twist of the yarns expressed in number of turns per inch was determined on a Suter twist counter. The percentage of crimp of the yarns was determined by the microscopic method described by Schwarz (15) by which camera lucida drawings of the yarns in the fabric were made.

For determining yarn counts, samples eight inches square were used. After drying and weighing, the warp and filling yarns were raveled, counted, and put into groups. The combined weights of the raveled threads of the warp and filling were compared with the weight of the original piece of fabric. The small discrepancy was divided equally between the warp and filling. The total length of the warp and filling was found by multiplying the number of yarns by the length of the specimen, and adding the amount due to crimp. The yarn counts were then determined in deniers which is the number of deniers (.05 gram) per 450 meters.

Quantitative analysis of total sizing, finishing, and other non-fibrous material was determined by the method approved by Committee D-13 (3). Qualitative analysis for softeners, organic and mineral deliquescents and agglutinant finishing materials was determined by the method of the American Association of Textile Chemists and Colorists (1).

The silk crepes were analyzed for weighting by the method of Mease (12). Quantitative analyses of soluble

finishing materials and weighting were made. Soluble finishing materials were removed by immersing the samples in diethyl ether then in ethyl alcohol and finally in distilled water. The more firmly held weighting and finishing materials were then removed. For this the specimen was immersed in a solution containing two percent of hydrofluoric acid and two percent of hydrochloric acid, and then in a two percent solution of sodium carbonate. The inorganic weighting materials were identified by burning a sample of the fabric after it had been dipped in a solution of sodium carbonate and potassium carbonate, allowing the fused portions to drop into a diluted hydrochloric acid solution, and then testing the acid solution for silica, lead, aluminum, tin, zinc, and phosphate.

Serviceability Tests

Shrinkage was determined by marking on the fabric, no nearer the selvedge than one-tenth the width of the fabric, a 10-inch square whose sides were placed parallel with the warp and filling threads. The square was then measured after 1, 5, and 10 dry cleanings, and the percentage of shrinkage in length and width determined.

Colorfastness to cleaning, to light, and to perspiration using both the acid and basic solutions full strength was determined by the methods approved for woven dress fabrics by the Bureau of Standards (18).

The breaking strength and elongation of the fabrics were tested in warp and filling, both wet and dry, by the raveled strip method designated by Committee D-13 (3). The tests were made on the control fabrics and after 5 and 10 dry cleanings.

Resistance to yarn slippage after one dry cleaning was tested by the method approved by Committee D-13 (3).

The effect of abrasion or wear was determined by abrading samples 24 by 6 inches with crocus cloth for 100 strokes with the M. I. T. model abrasion machine (9), (16). The one inch roller was used for flexing, and the weights supplying the tension totalled six pounds.

Crease resistance was determined by the crease angle method developed by Schiefer (14). Ten specimens, two inches long and one-half inch wide, in both the warp and filling were tested. Each sample was folded by bringing the two ends together with a pair of forceps. The loop of the specimen was placed under a glass plate and a load of one pound applied. The load was removed at the end of three minutes, and the sample was suspended freely at the

middle over a horizontal wire approximately 1 mm. in diameter. At the end of three minutes the angle between the ends was measured on an angular scale placed directly back of the test specimens. To take account of the natural drooping of the ends of each specimen, the angular deflection was determined both before and after the application of the load. The ratio of the angle of a specimen after the load is applied to the angle before the application of the load is designated as the "resilience ratio."

The fabrics were sent to the Manhattan Dry Cleaners for repeated dry cleaning and pressing. Skellysolve, a form of the Stoddard Solvent, containing one percent Sanitone was used for the cleaning solution. For each 35 pounds of clothes, the Sanitone absorbed 30 ounces of moisture which was constantly being added as the cleaning solution was circulated through a filtering and humidifying system. The samples were rotated in a drum with other clothes for 10 minutes and were then removed, dried, and pressed with a steam press.

FINDINGS AND DISCUSSION

The fiber content of the rayon crepes was found to be 100 percent viscose rayon and that of the silk crepes 100 percent silk.

In all the fabrics tested, warp yarns had no twist. The filling yarns were highly twisted, the rayons varying from 44 to 57 turns per inch, and silks from 55 to 66. The silk yarns were more highly twisted than the rayon yarns which is in accordance with findings reported by Allen (2).

Yarn counts showed that the silk threads were finer than the rayon, and also that filling threads were coarser than warp threads in every case except the $1.25 silk. In the filling the silk varied from 48.3 to 114.0 denier; in the warp, from 36.4 to 53.0. Rayon yarn counts varied in the filling from 79.4 to 119.0 denier; the warp from 57.5 to 73.5.

The percentage of sizing and weighting materials was low. The rayons varied from .7 percent to 2.8 percent sizing. Each contained gums, (tragacanth, tragasol, and mucilages). A higher percentage of sizing and weighting was found in the silk crepes. The total percentage varied

from 6.0 to 10.7 percent. Inorganic weighting was low, ranging from 1.2 to 2.4 percent. Tin was found in the $1.98 silk. The silk materials did not lend themselves to certain tests for weighting because the presence of dye obscured the color of the resulting compounds.

The weight per square yard was approximately one ounce more for the rayon crepes than for the silk. The thickness was slightly less for the silks than for the rayons, and dry cleaning increased the thickness somewhat. A summary of the results of fabric analysis will be found in Tables 2 and 3.

Serviceability of Fabrics

The rayon crepes shrank more in the warp than the silk crepes after dry cleaning; shrinkage in the filling was approximately the same for rayon and silk. The rayons shrank from 8.2 to 15.0 percent in the warp, and the silks .6 to 4.4 percent, after dry cleanings. Results show that price per yard was no indication of the percentage of shrinkage. Table 3 gives the data on shrinkage.

Colorfastness was higher in general for the silk crepes than for the rayon crepes. According to Whitlock (17), colorfastness to light measured by the fadeometer tests

Table 2. Fiber content, percentage of finishing, yarn counts, twist, and crimp of the four viscose rayon, and four pure dye silk crepes.

Fabric	Fiber	Finishes in Percent			Weave	Yarn Counts in Denier		Twists in Turns per Inch	Percentage Crimp	
		Sizing	Weighting	Total		Warp	Filling	Filling	Warp	Filling
$1.00 Rayon	100% viscose	2.8	---	2.8	Plain	73.5	119.0	50 ± 1.4	18.2	5.0
$1.25 Rayon	100% viscose	1.7	---	1.7	Plain	70.8	79.4	57 ± 2.4	6.6	4.8
$1.50 Rayon	100% viscose	0.7	---	0.7	Plain	69.6	85.5	44 ± 3.3	8.2	4.7
$1.98 Rayon	100% viscose	0.9	---	0.9	Plain	57.5	111.3	47 ± 2.2	11.6	15.7
$1.00 Silk	100% silk	8.7	2.1	10.8	Plain	43.6	62.0	66 ± 1.6	13.3	5.7
$1.25 Silk	100% silk	5.5	1.2	6.7	Plain	49.4	48.3	55 ± 3.4	9.5	3.3
$1.50 Silk	100% silk	4.4	1.6	6.0	Plain	53.0	62.0	61 ± 2.7	10.0	4.9
$1.98 Silk	100% silk	5.0	2.4	7.4	Plain	36.4	114.0	66 ± 2.0	11.1	3.6

Table 3. The weight per square yard, thickness, and percentage of shrinkage of the four viscose rayon crepes and the four pure dye silk crepes before and after five and ten dry cleanings.

Fabric	Number of Dry Cleanings	Weight per Square Yard in Ounces	Thickness in Inches		Number of Dry Cleanings	Shrinkage in Percent	
			Before Abrasion	After Abrasion		Warp	Filling
$1.00 Rayon	0	2.98	.0097	.0103	1	2.5	1.3
	5	3.27	.0119	.0126	5	11.3	1.0
	10	3.67	.0139	.0140	10	15.0	5.0
$1.25 Rayon	0	2.56	.0068	.0075	1	4.4	3.8
	5	2.79	.0090	.0091	5	7.5	1.3
	10	2.96	.0101	.0105	10	10.0	1.9
$1.50 Rayon	0	2.68	.0075	.0079	1	1.3	1.3
	5	2.92	.0096	.0096	5	8.2	3.1
	10	3.23	.0102	.0096	10	8.2	1.3
$1.98 Rayon	0	3.16	.0146	.0160	1	1.9	2.5*
	5	3.56	.0152	.0147	5	12.5	0.0
	10	3.72	.0167	.0152	10	14.0	1.3
$1.00 Silk	0	2.14	.0081	.0084	1	1.3	0.0
	5	2.13	.0090	.0093	5	2.5	0.0
	10	2.11	.0090	.0094	10	3.8	0.6
$1.25 Silk	0	1.86	.0064	.0073	1	2.5	1.3
	5	1.93	.0082	.0090	5	5.0	1.3
	10	1.90	.0081	.0091	10	6.3	1.9
$1.50 Silk	0	2.03	.0073	.0069	1	1.3	0.6
	5	1.99	.0084	.0089	5	4.4	3.8
	10	2.06	.0093	.0094	10	5.0	4.4
$1.98 Silk	0	2.43	.0116	.0121	1	3.8	0.6
	5	2.47	.0121	.0125	5	5.0	1.3
	10	2.43	.0137	.0130	10	6.9	3.8

*Stretch.

coincided fairly well with that during wear, but some fabrics resist fading better than the tests indicate. Two of the rayon crepes and two of the silk crepes faded when exposed to 20 hours in the fadeometer. The silk crepes were better in resisting fading to perspiration. Dry cleaning did not fade either the silk or rayon crepes. However, the white in the silk ones turned slightly yellow while the rayons remained white. Color fastness seemed to be unrelated to price per yard in either the silk or rayon crepes which agrees with the findings of Phillips and Mack (13). Colorfastness to light, perspiration, and dry cleaning and pressing are presented in Table 4.

The crease resistance for the silk crepes was slightly higher than for rayons. In the warp, the resilience ratio for silk varied from 72 to 82 percent; the rayon from 55 to 77 percent. In the filling the percentage for silk varied from 54 to 84; for the rayons, from 51 to 76. Dry cleaning had no particular effect on crease resistance although the materials were more limp after cleaning. The resilience ratio is presented in Table 5.

No slippage was found for either the silk or rayon crepes after one dry cleaning.

Table 4. Colorfastness of the four viscose rayon crepes and the four pure dye silk crepes to light, perspiration and dry cleaning and pressing.

Fabric	Colorfastness*			
	Light	Perspiration		Dry Cleaning and Pressing
		Acid	Basic	
$1.00 Rayon	2	2	2	1
$1.25 Rayon	3	2	2	1
$1.50 Rayon	1	3	3	1
$1.98 Rayon	1	3	3	1
$1.00 Silk	1	2	3	1
$1.25 Silk	2	1	1	1
$1.50 Silk	1	2	2	1
$1.98 Silk	3	1	1	1

*1 - no fading
2 - slight fading
3 - much fading.

Table 5. The resilience ratio in percentage of the eight original fabrics and after five and ten dry cleanings.

Fabric	Number of Dry Cleanings	Resilience Ratio					
		Warp			Filling		
		Angle 1	Angle 2	Percent	Angle 1	Angle 2	Percent
$1.00 Rayon	0	126	85	67	108	63	58
	5	108	79	73	88	64	73
	10	82	65	73	82	56	68
$1.25 Rayon	0	129	75	58	98	50	51
	5	130	72	55	101	54	53
	10	108	66	61	82	57	70
$1.50 Rayon	0	128	76	60	97	51	52
	5	124	70	56	97	65	67
	10	108	63	63	91	60	66
$1.98 Rayon	0	131	101	77	78	57	74
	5	104	71	68	80	61	76
	10	92	66	72	73	53	73
$1.00 Silk	0	166	119	72	112	64	57
	5	149	110	74	116	77	66
	10	134	96	72	108	79	73
$1.25 Silk	0	149	102	68	87	58	67
	5	143	113	78	97	65	67
	10	130	107	82	87	69	79
$1.50 Silk	0	154	118	77	100	67	67
	5	151	114	76	113	79	71
	10	128	100	78	94	65	69
$1.98 Silk	0	144	116	81	88	74	84
	5	127	93	73	116	85	73
	10	105	89	76	100	75	75

The dry, wet and abraded elongation for the eight fabrics tested, before and after dry cleaning, are presented in Table 6 and Figs. 9 to 12. The number of dry cleanings had little effect on the elongations of the fabrics tested, either dry, wet, or after abrasion. In both the rayon crepes and the silk crepes, the warp elongations were higher than the filling elongations. The high twist in the filling may have reduced the percentage of elongation. The silk fabrics showed greatest elongation when wet except for the $1.98 silk crepe in which the dry elongation was highest. The abraded elongations for the silk crepes were lower than were the dry or wet elongations of the fabrics. The dry elongation of the four viscose rayon crepes was greater than either the wet or abraded elongations.

Table 6. Elongation of the four viscose rayon crepes and the four pure dye silk crepes on the original and after five and ten dry cleanings.

Fabric	Number of Dry Cleanings	Elongation in Inches						Elongation in Percent					
		Warp			Filling			Warp			Filling		
		Dry	Wet	After Abrasion	Dry	Wet	After Abrasion	Dry	Wet	After Abrasion	Dry	Wet	After Abrasion
$1.00 Rayon	0	.40 ± .02	.16 ± .03	.46 ± .02	.67 ± .01	.18 ± .02	.19 ± .01	13	5	15	22	6	6
	5	.66 ± .02	.47 ± .04	.46 ± .02	.46 ± .01	.30 ± .02	.22 ± .01	22	16	15	15	10	7
	10	.56 ± .02	.52 ± .03	.69 ± .02	.46 ± .02	.41 ± .03	.18 ± .01	19	17	23	15	14	6
$1.25 Rayon	0	.41 ± .02	.42 ± .01	.28 ± .02	.35 ± .03	.11 ± .02	.43 ± .01	14	14	9	12	4	14
	5	.61 ± .01	.63 ± .02	.57 ± .01	.47 ± .02	.32 ± .04	.53 ± .01	20	21	19	16	11	18
	10	.61 ± .01	.64 ± .01	.37 ± .03	.37 ± .03	.41 ± .02	.39 ± .02	30	21	12	12	14	12
$1.50 Rayon	0	.71 ± .01	.40 ± .04	.35 ± .02	.57 ± .02	.16 ± .05	.37 ± .02	24	13	12	19	5	12
	5	.86 ± .01	.75 ± .03	.62 ± .02	.46 ± .05	.40 ± .01	.50 ± .03	29	25	31	15	13	17
	10	.66 ± .02	.82 ± .03	.72 ± .03	.25 ± .02	.36 ± .03	.28 ± .02	22	27	34	8	12	9
$1.98 Rayon	0	.48 ± .02	.24 ± .04	.25 ± .03	.61 ± .02	.09 ± .01	.26 ± .02	16	8	8	20	3	9
	5	.73 ± .01	.54 ± .03	.40 ± .03	.52 ± .02	.30 ± .02	.19 ± .01	27	15	13	17	10	6
	10	.46 ± .02	.40 ± .03	.47 ± .05	.24 ± .02	.43 ± .03	.30 ± .02	15	13	16	8	14	10
$1.00 Silk	0	.52 ± .02	.54 ± .02	.44 ± .02	.39 ± .05	.33 ± .03	.32 ± .01	17	18	15	12	11	11
	5	.49 ± .02	.68 ± .01	.27 ± .01	.38 ± .01	.50 ± .03	.30 ± .02	16	23	9	13	17	10
	10	.53 ± .03	.50 ± .03	.37 ± .02	.39 ± .02	.42 ± .02	.43 ± .01	18	17	12	12	14	14
$1.25 Silk	0	.42 ± .02	.61 ± .01	.29 ± .07	.48 ± .04	.36 ± .01	.40 ± .01	14	20	10	16	12	13
	5	.47 ± .01	.63 ± .03	.32 ± .01	.45 ± .02	.55 ± .02	.37 ± .01	16	21	11	15	18	12
	10	.37 ± .01	.62 ± .03	.35 ± .01	.37 ± .03	.45 ± .02	.35 ± .01	12	21	12	12	13	12
$1.50 Silk	0	.60 ± .01	.65 ± .02	.47 ± .01	.58 ± .01	.59 ± .02	.47 ± .01	20	22	16	19	20	16
	5	.64 ± .01	.79 ± .02	.56 ± .01	.57 ± .01	.72 ± .02	.39 ± .01	21	26	19	19	24	12
	10	.54 ± .01	.73 ± .02	.57 ± .02	.49 ± .02	.77 ± .01	.28 ± .01	18	26	19	16	26	9
$1.98 Silk	0	.63 ± .01	.45 ± .01	.27 ± .01	.71 ± .01	.62 ± .02	.55 ± .02	21	15	9	24	21	18
	5	.68 ± .01	.64 ± .03	.19 ± .01	.74 ± .02	1.02 ± .08	.68 ± .02	33	21	6	25	34	23
	10	.41 ± .03	.60 ± .03	.29 ± .02	.61 ± .01	1.00 ± .02	.47 ± .04	14	20	10	20	33	16

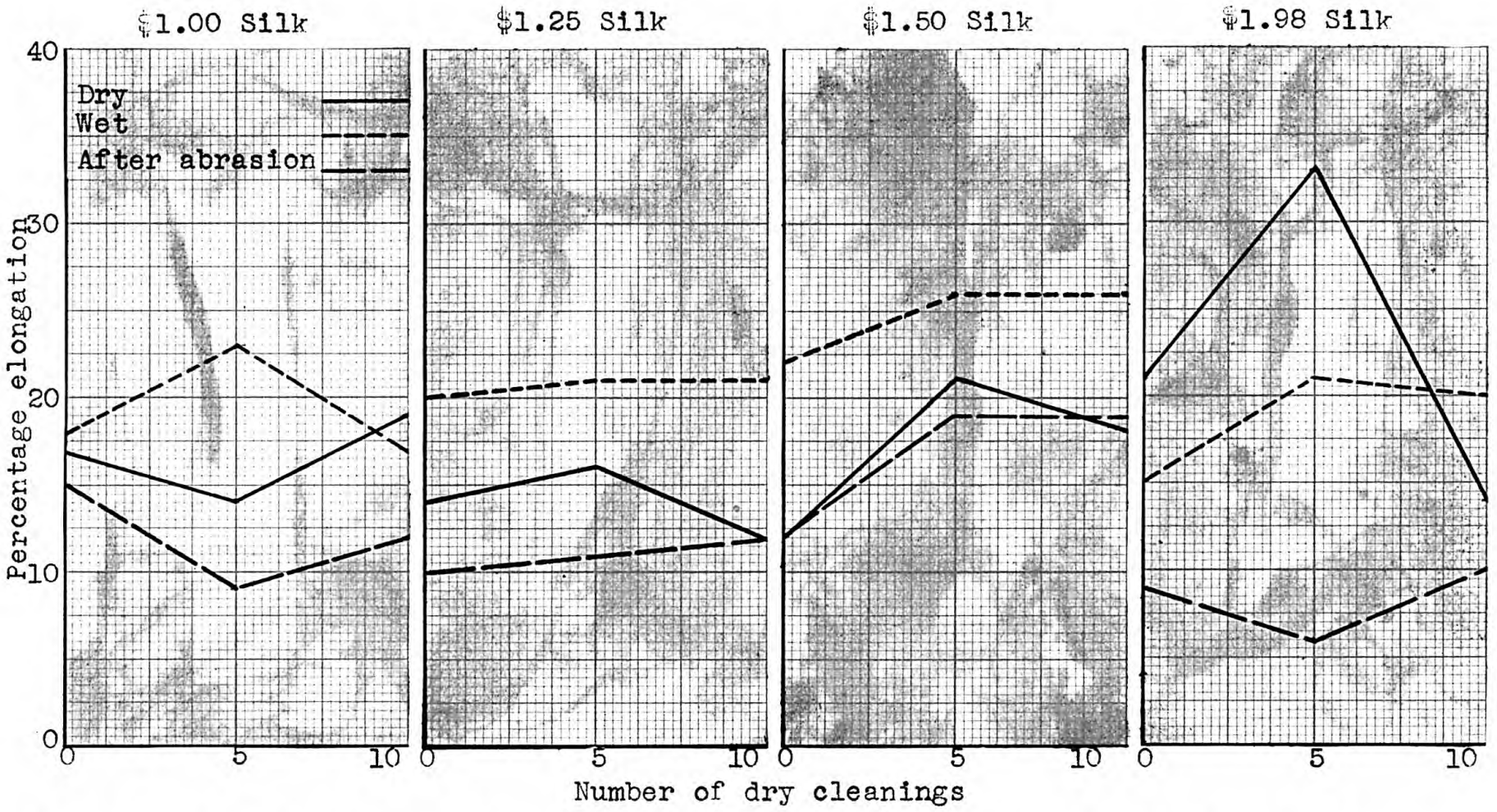

Fig. 9. Percentage elongation of four pure dye silk crepes, dry, wet, and after abrasion of warp, on controls and after five and ten dry cleanings.

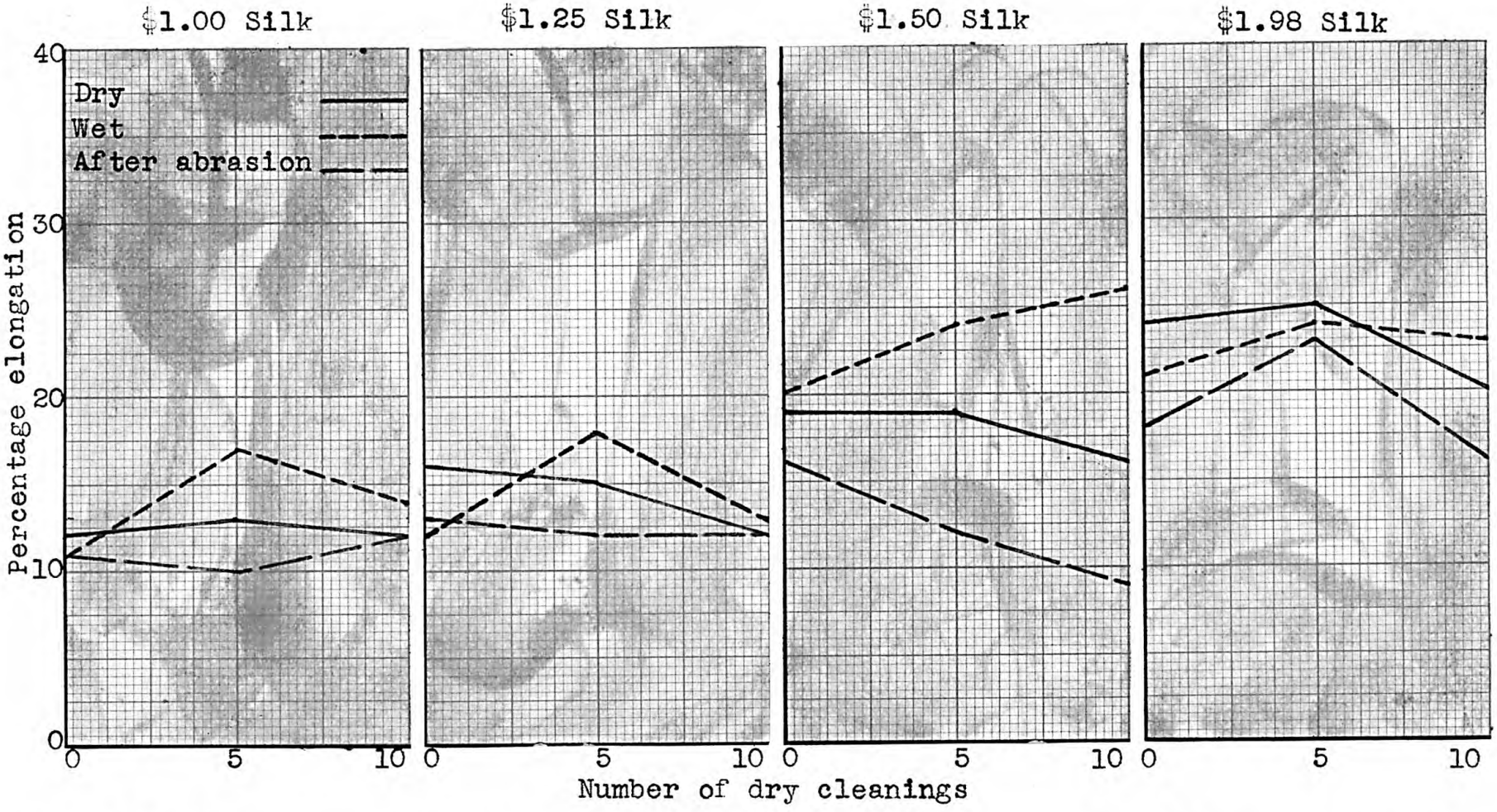

Fig. 10. Percentage elongation of four pure dye silk crepes of filling, on controls and after five and ten dry cleanings.

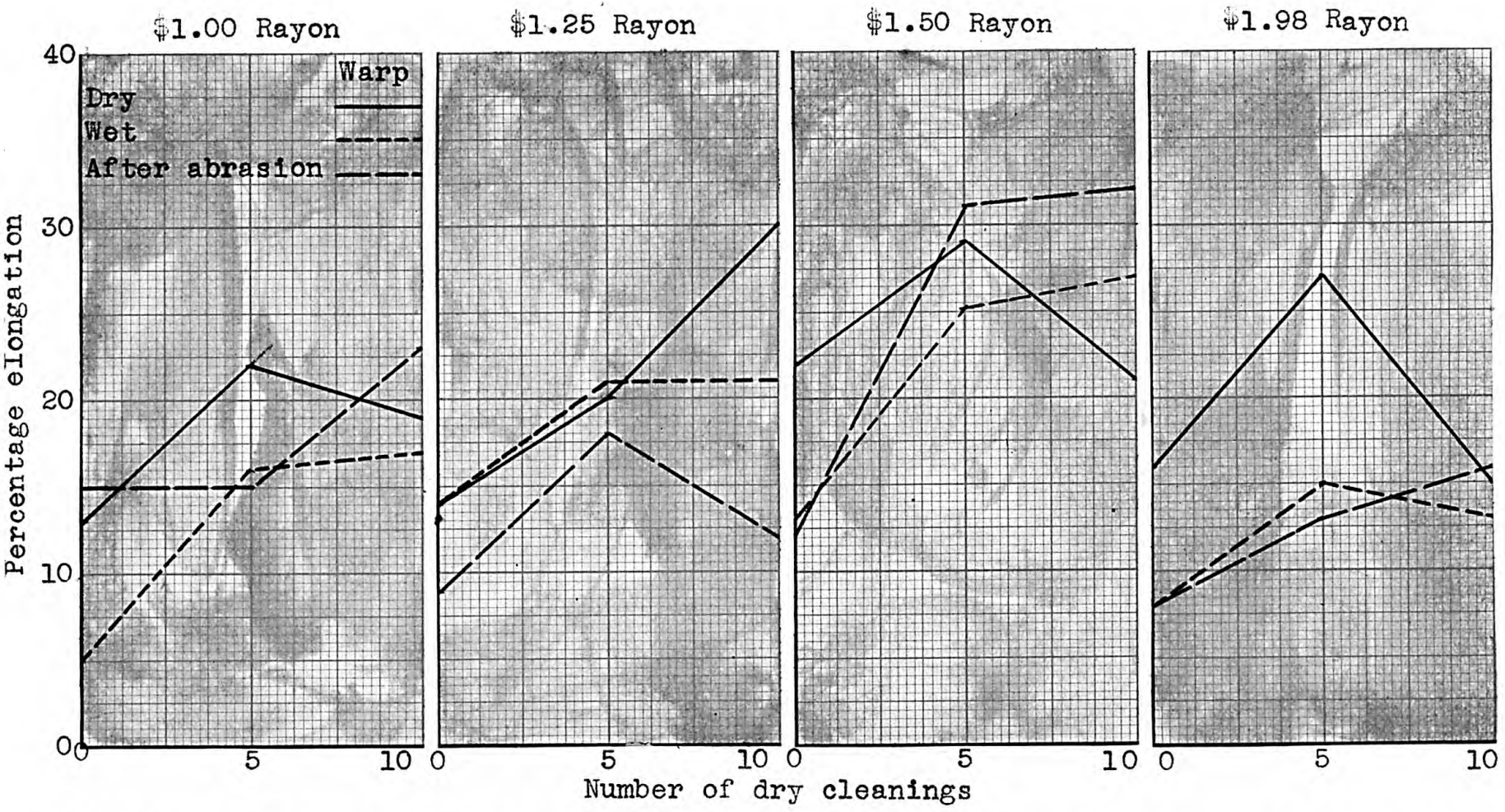

Fig. 11. Percentage elongation of four viscose rayon crepes of warp, on controls and after five and ten dry cleanings.

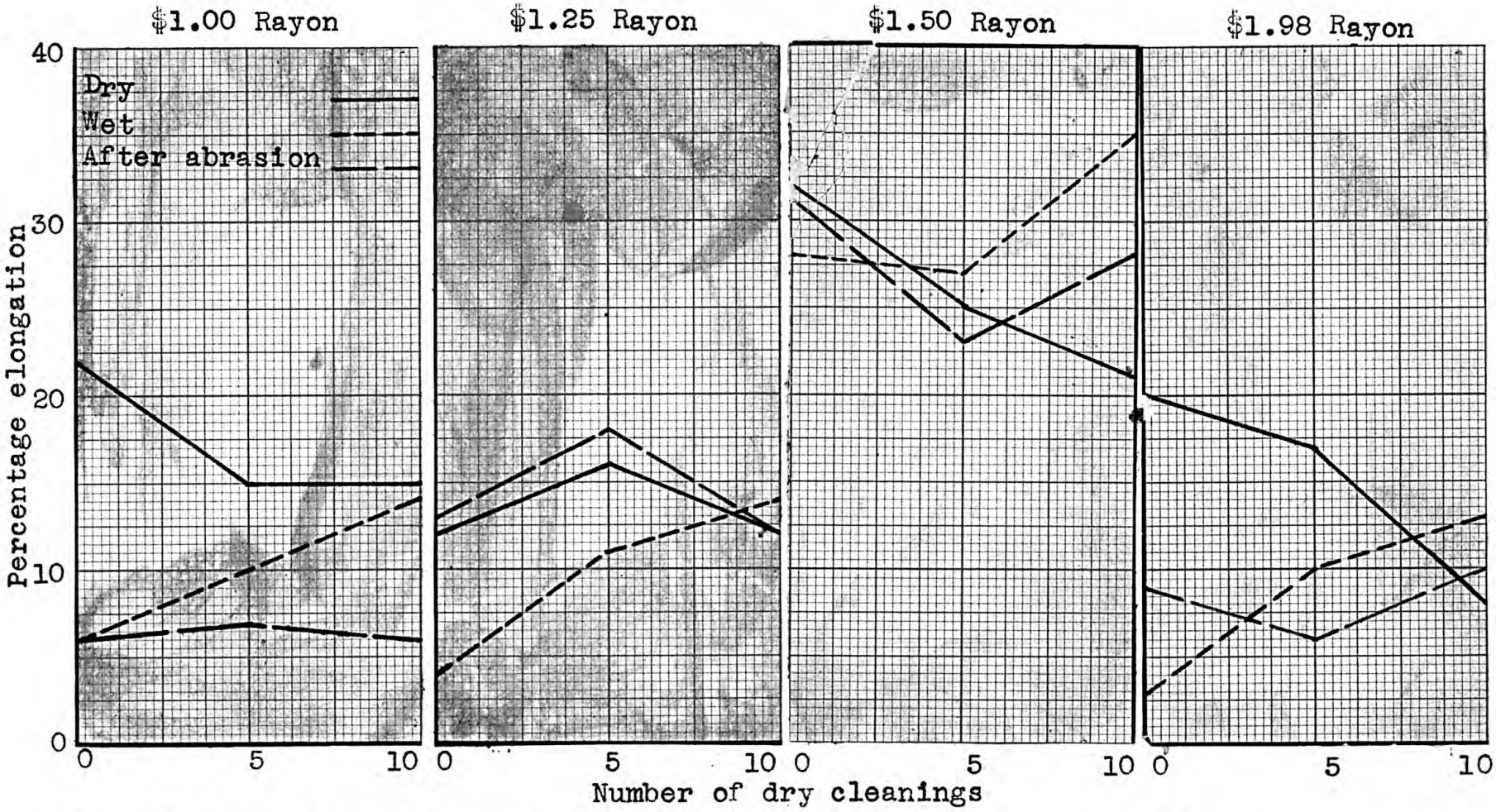

Fig. 12. Percentage elongation of four viscose rayon crepes of filling, on controls and after five and ten dry cleanings.

Among the fabrics studied, silk crepe controls had a greater breaking strength than rayon crepes in both warp and filling for dry, wet, and abrasion tests. This is illustrated by Figs. 13 and 14. Dry breaking strength in the warp of the silk crepes varied from 37.6 to 55.2 pounds; for the rayon crepes from 12.6 to 27.5 pounds. Dry breaking strength fillingwise was less than the warp for both the silk and rayon crepes. The silk crepes varied from 16.1 to 26.3 pounds and the rayon crepes from 7.2 to 14.1. Wet breaking strength decreased much more for rayons than for silks. The wet breaking strength in the warp of the silk crepes varied from 17.1 to 35.2 pounds and of the rayon crepes from 3.3 to 9.8 pounds. Wet breaking strength of the filling of silk crepes varied from 6.5 to 17.3 pounds, and for the rayon crepes from 1.3 to 2.9 pounds.

The rayon crepes withstood abrasion better, as a whole, than the silk fabrics. The percentage breaking strength after abrasion of the controls varied from 45.8 percent to 102.8 percent in warp and for the silk from 35.9 to 83.8 percent. In the filling there was a wider variation in the rayon from 31.1 to 117.5 percent and for the silk from 66.5 to 87.2 percent. The $1.25 rayon was unusual in that the breaking strength after abrasion for the control and after 5 and 10 dry cleanings was higher than for the unabraded

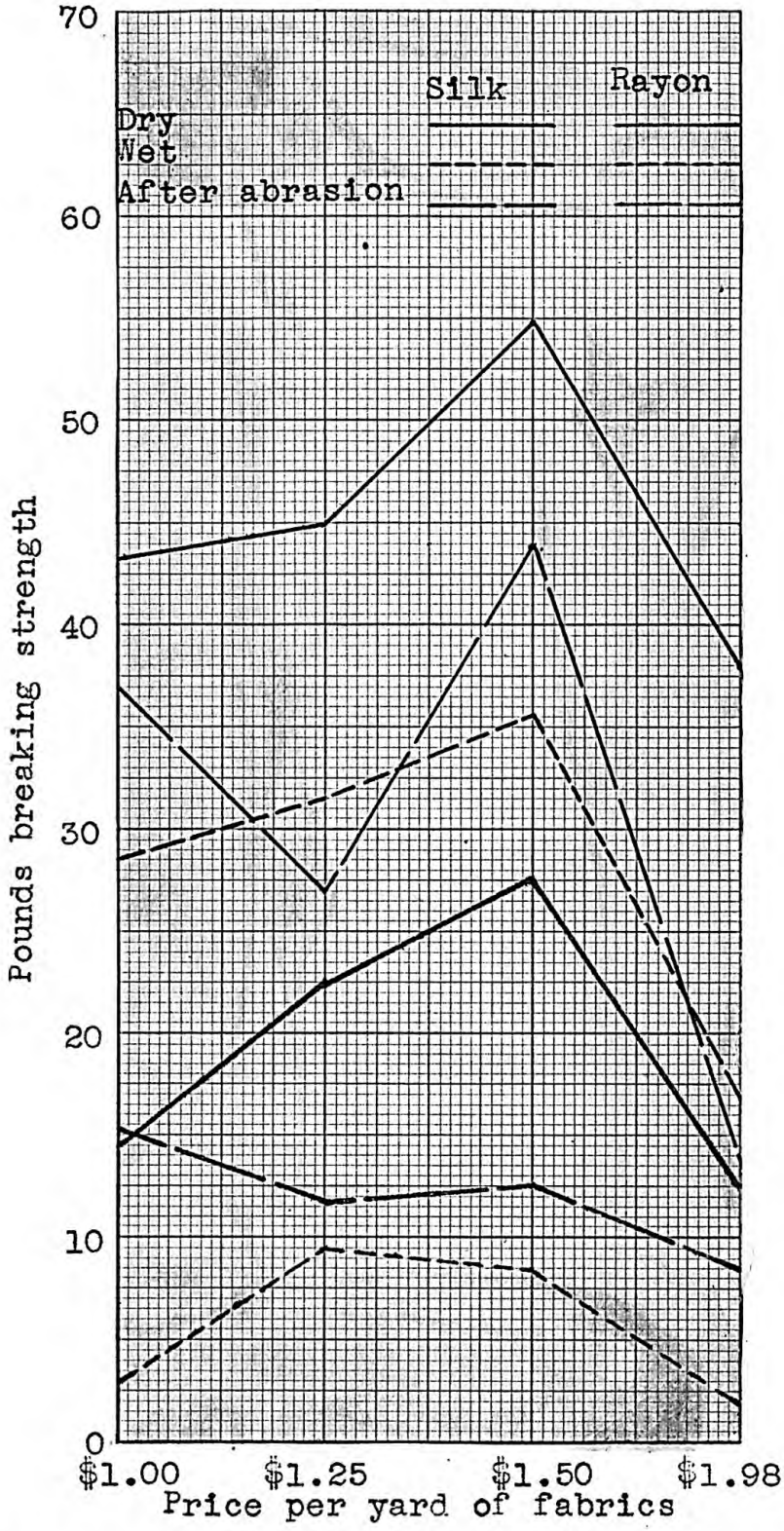

Fig. 13. Breaking strength in relation to price of four pure dye silk and four viscose rayon crepes of warp on controls.

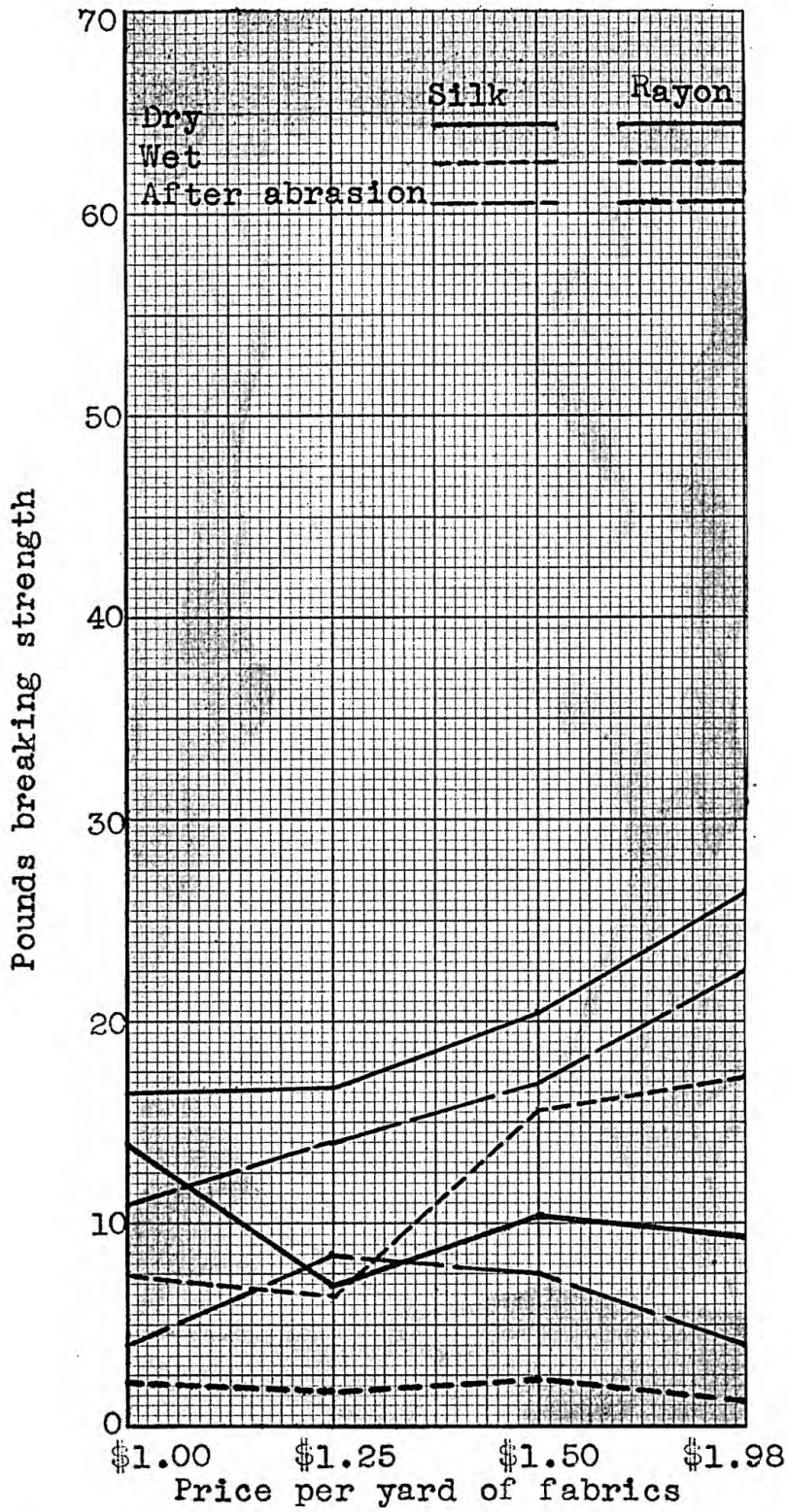

Fig. 14. Breaking strength in relation to price of four pure dye silk and four viscose rayon crepes of filling controls.

fabric. A small amount of abrasion may tend to mat the fibers together and therefore increase the breaking strength. Dry cleaning had little effect on the warp breaking strength of the rayons, but tended to decrease the filling breaking strength after five dry cleanings. Dry cleaning had little effect on either the warp or filling breaking strength of the silk crepes.

Breaking strength of the fabrics for dry, wet, and after abrasion of the original and after 5 and 10 dry cleanings is given in Tables 7 and 8, and in Figs. 15 and 16. The breaking strength in pounds was corrected for shrinkage by dividing the breaking strength by the thread count of that sample and multiplying by the thread count of the control. The percentage breaking strength was determined by dividing the corrected breaking strength by the breaking strength of the dry control and multiplying by one hundred.

Table 7. Warp breaking strength and thread count of the fabrics dry, wet, and after abrasion of the original and after five and ten dry cleanings.

Fabric	Number of Dry Cleanings	Thread Count Warp Before Abrasion	Thread Count Warp After Abrasion	Warp Breaking Strength Pounds Dry	Pounds Wet	Pounds After Abrasion	Corrected Dry	Corrected Wet	Corrected After Abrasion	Percent Dry	Percent Wet	Percent After Abrasion
$1.00 Rayon	0	156	158	14.8 ± 0.64	3.3 ± 0.3	15.4 ± 0.82	14.8	3.3	15.2	100.0	22.3	102.8
	5	165	146	21.0 ± 0.99	6.2 ± 0.5	13.5 ± 0.61	19.9	5.9	14.4	134.3	39.9	97.5
	10	166	156	16.2 ± 0.52	4.6 ± 0.3	17.9 ± 0.49	15.2	4.3	17.9	102.8	29.1	120.8
$1.25 Rayon	0	164	160	22.7 ± 0.94	9.8 ± 0.3	11.2 ± 0.59	22.7	9.8	11.5	100.0	43.2	50.6
	5	164	163	30.1 ± 0.44	12.0 ± 0.7	23.9 ± 0.87	30.1	12.0	24.0	132.5	52.8	105.8
	10	167	165	28.1 ± 0.64	13.8 ± 0.6	16.4 ± 1.54	27.6	13.5	16.3	121.6	59.5	71.9
$1.50 Rayon	0	169	165	27.5 ± 0.62	8.3 ± 0.7	12.3 ± 0.65	27.5	8.3	12.6	100.0	32.0	45.8
	5	164	169	33.2 ± 0.37	14.1 ± 0.5	22.3 ± 0.76	34.2	14.5	22.3	124.5	52.7	81.2
	10	168	170	25.2 ± 0.72	13.9 ± 0.5	25.3 ± 1.48	25.3	14.0	25.2	92.2	50.9	91.6
$1.98 Rayon	0	206	192	12.6 ± 0.49	3.3 ± 0.3	5.6 ± 0.37	12.6	3.3	6.0	100.0	26.2	47.7
	5	204	195	15.3 ± 0.32	5.2 ± 0.1	9.8 ± 0.66	15.5	5.3	10.6	123.1	42.1	84.2
	10	197	199	13.2 ± 0.40	3.0 ± 0.3	9.7 ± 0.93	13.8	3.2	10.0	109.5	25.4	79.4
$1.00 Silk	0	178	173	43.2 ± 1.97	28.6 ± 1.1	36.0 ± 0.47	43.2	28.6	37.0	100.0	66.2	83.8
	5	181	180	47.1 ± 1.10	32.5 ± 0.8	21.3 ± 1.43	46.5	32.0	21.1	107.5	74.3	48.8
	10	176	177	47.3 ± 1.65	26.8 ± 0.3	31.0 ± 0.84	47.8	27.0	31.2	110.5	62.5	72.5
$1.25 Silk	0	172	180	45.0 ± 1.31	31.6 ± 0.3	28.7 ± 0.82	45.0	31.6	27.2	100.0	70.3	60.5
	5	184	178	45.8 ± 0.69	34.4 ± 0.9	28.9 ± 0.67	42.7	32.2	27.7	94.8	71.5	61.6
	10	182	180	39.8 ± 1.47	30.2 ± 1.1	31.7 ± 0.65	37.6	28.8	30.3	83.6	63.8	67.3
$1.50 Silk	0	177	176	55.2 ± 1.73	35.2 ± 1.2	44.2 ± 1.38	55.2	35.2	44.5	100.0	63.8	80.5
	5	181	169	58.4 ± 0.88	40.8 ± 0.1	45.5 ± 0.99	57.1	40.0	47.6	103.5	72.5	86.4
	10	182	182	55.7 ± 1.21	38.0 ± 0.2	44.6 ± 1.43	54.3	37.0	43.4	98.5	67.2	78.6
$1.98 Silk	0	191	185	37.6 ± 0.41	17.1 ± 0.5	13.0 ± 0.04	37.6	17.1	13.5	100.0	45.5	35.9
	5	196	187	36.3 ± 0.53	20.9 ± 0.6	5.4 ± 0.03	35.4	20.2	5.7	96.8	53.5	15.1
	10	198	188	23.8 ± 1.94	17.3 ± 0.1	15.8 ± 0.03	23.0	16.7	16.1	61.3	44.5	43.0

Table 8. Filling breaking strength and thread count of the fabrics for dry, wet, and after abrasion on the original and after five and ten dry cleanings.

Fabric	Number of Dry Cleanings	Thread Count Filling Before Abrasion	Thread Count Filling After Abrasion	Filling Breaking Strength Pounds Dry	Pounds Wet	Pounds After Abrasion	Corrected Dry	Corrected Wet	Corrected After Abrasion	Percent Dry	Percent Wet	Percent After Abrasion
$1.00 Rayon	0	72	72	14.1 ± 0.33	2.9 ± 0.40	4.4 ± 0.05	14.1	2.9	4.4	100.0	20.5	31.1
	5	81	80	10.0 ± 0.40	3.0 ± 0.40	3.8 ± 0.13	8.9	2.7	3.4	63.3	19.2	24.1
	10	82	82	7.0 ± 0.30	3.7 ± 0.30	3.9 ± 0.17	6.1	3.2	3.4	43.3	22.7	24.1
$1.25 Rayon	0	83	85	7.5 ± 0.03	1.5 ± 0.20	8.8 ± 0.27	7.2	1.5	8.6	100.0	20.8	117.5
	5	90	88	10.1 ± 0.23	4.1 ± 0.20	11.5 ± 0.26	9.3	3.7	10.9	129.2	51.4	151.8
	10	92	90	6.2 ± 0.21	4.8 ± 0.20	9.1 ± 0.53	5.6	4.3	8.4	77.8	59.7	116.6
$1.50 Rayon	0	84	83	10.5 ± 0.02	2.6 ± 0.30	7.3 ± 0.27	10.5	2.6	7.4	100.0	24.8	70.5
	5	89	91	9.9 ± 0.44	5.0 ± 0.10	9.3 ± 0.39	9.4	4.7	8.6	89.5	44.8	81.6
	10	93	89	7.5 ± 0.34	3.8 ± 0.30	6.8 ± 0.43	6.8	3.4	6.4	64.7	32.3	60.8
$1.98 Rayon	0	79	79	9.1 ± 0.22	1.3 ± 0.02	4.6 ± 0.18	9.1	1.3	4.6	100.0	14.4	50.5
	5	86	88	11.9 ± 0.15	1.7 ± 0.02	3.8 ± 0.13	10.9	1.5	3.4	119.8	16.5	37.4
	10	91	88	6.0 ± 0.61	3.5 ± 0.20	5.7 ± 0.26	5.2	3.0	5.1	57.2	33.0	56.0
$1.00 Silk	0	87	87	16.1 ± 0.03	7.7 ± 0.50	10.7 ± 0.27	16.1	7.7	10.7	100.0	47.8	66.5
	5	92	90	16.0 ± 0.30	8.9 ± 0.40	11.8 ± 0.62	15.1	8.4	11.4	93.8	52.1	71.0
	10	90	89	19.0 ± 0.60	8.0 ± 0.70	18.6 ± 0.38	18.4	7.7	18.2	114.5	47.8	113.0
$1.25 Silk	0	85	86	16.9 ± 0.80	6.5 ± 1.10	14.3 ± 0.36	16.9	6.5	14.2	100.0	38.5	84.1
	5	93	90	18.2 ± 0.37	12.5 ± 0.50	14.2 ± 0.44	16.7	11.4	13.4	98.8	67.5	79.5
	10	91	93	16.9 ± 0.14	10.2 ± 0.10	12.8 ± 0.40	15.8	9.5	11.7	93.5	56.3	69.3
$1.50 Silk	0	87	87	20.5 ± 0.44	15.9 ± 0.40	16.6 ± 0.43	20.5	15.9	16.6	100.0	77.6	81.0
	5	90	88	22.2 ± 0.20	15.3 ± 0.40	14.8 ± 0.61	21.5	14.8	14.6	104.8	72.3	71.3
	10	91	91	19.5 ± 0.39	17.3 ± 0.30	8.8 ± 0.33	18.4	16.6	8.7	89.8	81.0	42.3
$1.98 Silk	0	82	82	26.3 ± 0.65	17.3 ± 0.50	22.9 ± 0.48	26.3	17.3	22.9	100.0	66.0	87.2
	5	86	88	34.0 ± 0.67	27.6 ± 0.80	27.9 ± 0.75	31.6	25.6	26.0	120.0	97.5	99.0
	10	85	85	28.6 ± 0.59	17.0 ± 0.02	28.4 ± 1.80	27.6	16.4	19.7	105.0	62.5	74.9

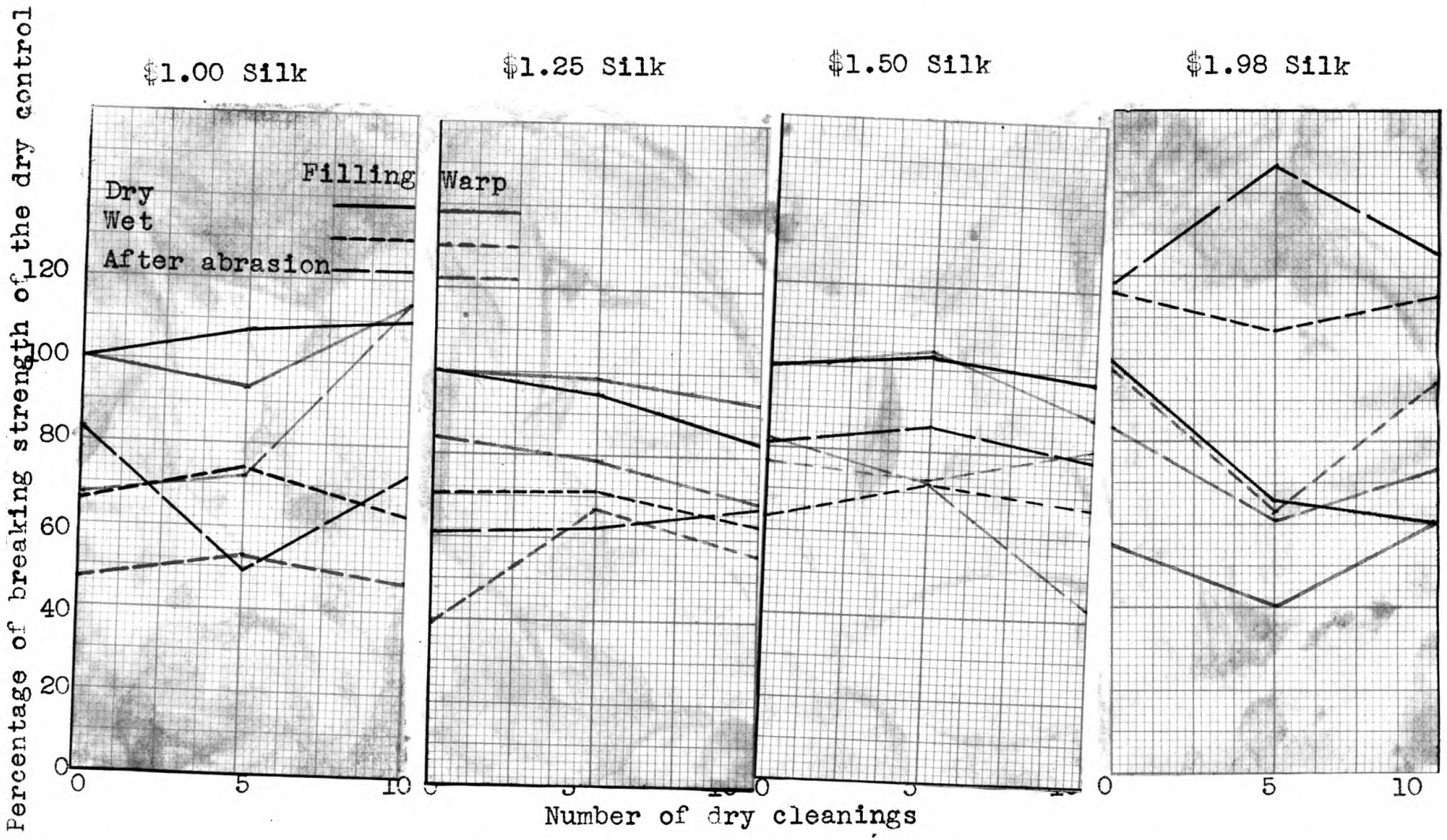

Fig. 15. Percentage breaking strength of four pure dye silk crepes of warp and filling on controls and after five and ten dry cleanings.

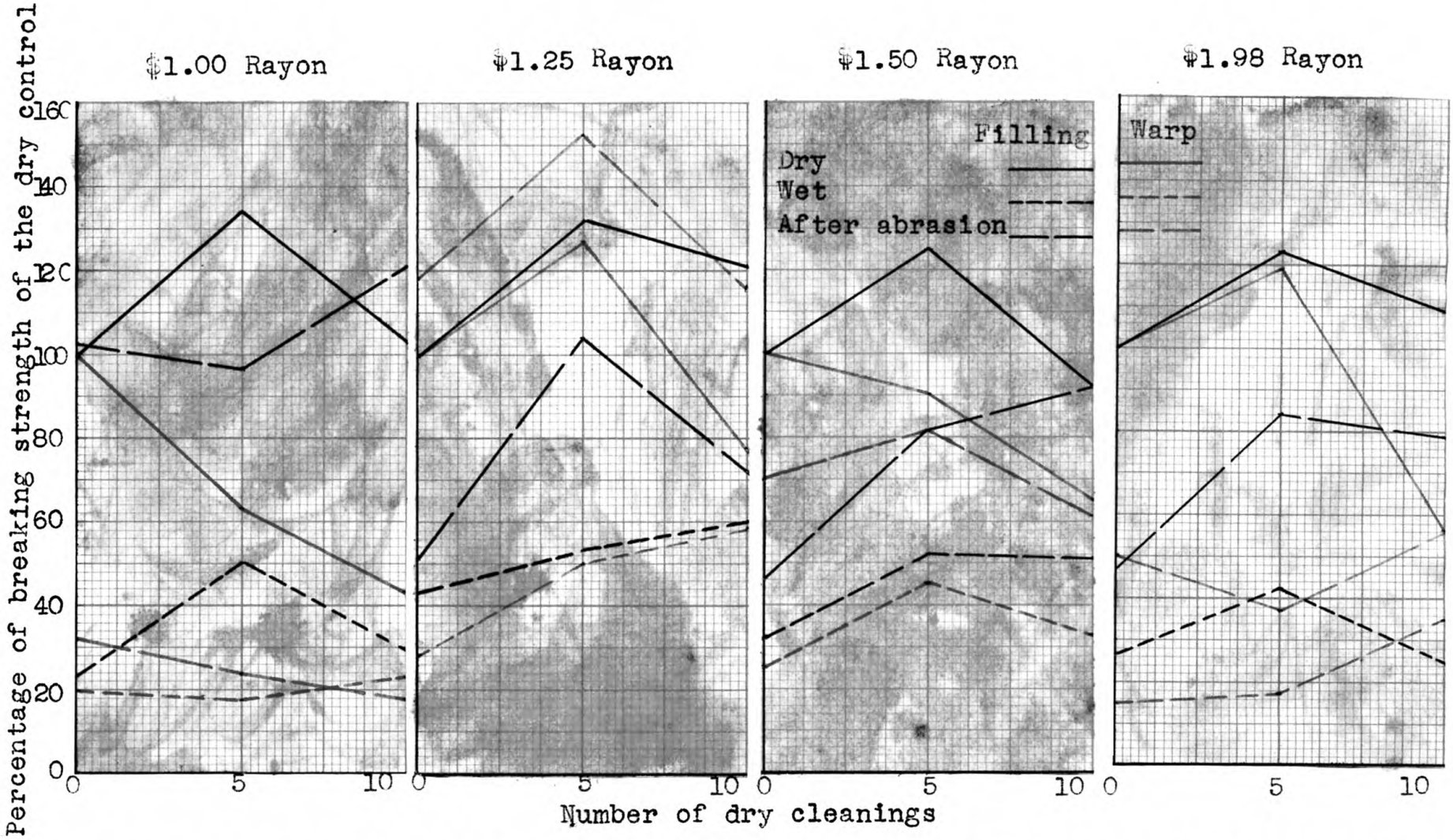

Fig. 16. Percentage breaking strength of four viscose rayon crepes of warp and filling on controls and after five and ten dry cleanings.

CONCLUSIONS

A study was made of the comparative service qualities of silk and rayon dress fabrics in relation to price. From the results the following conclusions were drawn.

1. The pure dye silk crepes were more serviceable than rayon crepes of the same price.
2. The percentage of shrinkage was less for the silk crepes than for the rayon crepes.
3. There was no apparent fading of the silk or rayon crepes after repeated dry cleanings and pressing.
4. The silk and rayon crepes possessed a comparable degree of color fastness to light but the silk crepes showed greater resistance to fading from perspiration.
5. The pure dye silk crepes had the highest breaking strength in both the warp and filling for dry, wet and abrasion tests.

6. The warp elongations were higher than the filling elongations in both the silk and rayon crepes.
7. There was no slippage in either the silk or rayon crepes.
8. Dry cleaning did not affect the serviceability of the materials appreciably.
9. No relationship seemed to exist between the price of the material and the durability of the fabrics.

ACKNOWLEDGMENT

Appreciation is expressed to Dr. Hazel Fletcher, Assistant Professor of Clothing and Textiles, who directed this study.

LITERATURE CITED

(1) 1937 Year Book.
American Association of Textile Chemists and Colorists. Vol. 14. New York. Howe Publishing Co. 646 p. 1937.

(2) Allen, J.
Rayon crepes compared with silk and other crepes. Textile Colorist, 58: 9-12. Jan. 1936.

(3) Committee D-13 on Textile Materials. In A. S. T. M. standards on textile materials. Philadelphia. American Society for Testing Materials. 324 p. 1939.

(4) Crawford, Madelyn.
Serviceability of certain rayon fabrics as determined by laboratory tests. Unpublished thesis. Kans. State Col. Agr. and Appl. Sci. 53 p. 1938.

(5) Dodson, Ethelwyn.
Serviceability tests on fall and winter dress fabrics. In A. S. T. M. standards on textile materials. Philadelphia. American Society for Testing Materials. 295 p. 1936.

(6) Fine fabrics experience most active year due to rayon developments. Rayon Textile Monthly, 21: 30-33. June, 1940.

(7) Gregory, Mary E. and Mack, Pauline Berry.
Why inexpensive rayon dresses are discarded. In Resume of an eight-year series of consumer studies on silk and rayon. Pennsylvania State College Bul. 220 p. 1939.

(8) Hall, W. J.
The serviceability of rayon crepes. Amer. Dyestuff Rptr. 26: Oct. 4, 1937.

(9) Haven, George B.
Industrial fabrics. New York. Wellington Sears Co. 741 p. 1938.

(10) How technological achievements transformed rayon into textiles industry's "Common Denominator." Rayon Textile Monthly, 21: 30-33. June, 1940.

(11) Mack, Pauline Berry.
Resume of a seven-year series of studies on silk and synthetic fabrics. In A. S. T. M. standards on textile materials. Philadelphia. American Society for Testing Materials. 295 p. 1936.

(12) Mease, Ralph T.
A method for analysis of weighted silk. Textile Res. 3: 200. Feb. 1933.

(13) Phillips, Charles R. and Mack, Pauline Berry.
A study of the fastness of dyes on miscellaneous dress fabrics. In Resume of an eight-year series of consumer studies on silk and rayon. Pennsylvania State College Bul. 220 p. 1939.

(14) Schiefer, Herbert F.
Evaluation of crease resistant finishes for fabrics. Amer. Dyestuff Rptr. 27: 22. Jan. 1938.

(15) Schwarz, E. R.
Determination of crimp and take up by microscopic methods. Textile Res. 3: 14-26. Nov. 1932.

(16) Skinkle, J. H.
Textile testing. New York. Howe Publishing Co. 628 p. 1940.

(17) Whitlock, Mary C.
Wearability of silk dresses. In A. S. T. M. standards on textile materials. Philadelphia. American Society for Testing Materials. 295 p. 1936.

(18) Woven dress fabrics, testing and reporting. Commercial Standard CS59-39. Washington D. C. United States Department of Commerce. National Bureau of Standards. 26 p. 1939.