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Colour, Abrasion and Some Colour Fastness Properties of Reactive Dyed Plain Knitted Fabrics Made from Modal Viscose Fibres

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Abstract
This research presents a comparative study of the colour, abrasion and colour fastness properties of plain knitted fabrics made from 100% modal viscose fibres in different fibre finenesses such as microfibre and conventional fibre, their 50/50 blends with cotton fibre and 100% cotton fibre. Abrasion behaviours of the fabrics were assessed by measuring the weight loss and colour values after four different abrasion cycles. All the results were compared with respect to both the fibre fineness and blend proportion of cotton fibre in the fabrics. The L and K/S values of the fabrics after abrasion reveal a similar tendency to that of the fabrics before abrasion. Before and after abrasion cycles, the fabrics with microfibre revealed lower K/S and C* values and higher L* values than those with conventional fibre. With an increase in the cotton amount, the K/S values of the fabrics decrease and the L* values of the fabrics increase.*

Key words: *microfibre, modal, viscose, cotton, plain knitted fabric, colour properties.*

Introduction

Modal viscose fibre is one of the forms of viscose fibre belonging to the regenerated cellulose fibre family. The difference between normal viscose fibre and modal fibre results from the different raw material used and the different production process [1]. Modal fibre is obtained by a process giving a high tenacity and high wet modulus [2]. Compared to viscose fibre, modal fibre has better performance properties such as higher tenacity in dry and wet states, a higher wet elastic modulus, a low water retention capacity, a lower degree of swelling, brighter colour, a silky luster and softer handle [1, 3]. Therefore modal fibre is frequently used as an alternative to viscose fibre. Conventional modal fibre is commonly produced in the fibre fineness range of 1.3 - 5.5 dtex [1]. Since microfibres, as compared to conventional fibres, enhance some performances, such as the comfort and aesthetic properties of fabrics by providing softness, flexibility, smoothness, a fine textile structure, a silky appearance, drapeability, moisture absorption and release [4, 5] etc., microfibre forms of modal fibre with fineness values of 0.8 and 1.0 dtex are also commercially available. Modal fibre or its microfibre form is often used in blends as well as in 100% form to improve other fibre properties. The blend of modal fibre or its microfibre form with cotton fibre commonly enables the production of high quality knitted or woven fabrics without using high quality cotton fibre [3].

A limited number of studies have been reported about knitted fabrics containing modal viscose fibres in microfibre and conventional forms. Srinivasan and Ramakrishnan [6] investigated the wear properties of high performance viscose microfibre knitted fabrics and compared the same with wear properties of knitted fabrics made of normal denier viscose staple fibre and cotton. Gun [7] compared the dimensional, physical and thermal comfort properties of the modal knitted fabrics having microfibre with those of the similar fabrics having conventional fibre. In another study of Gun [8], the similar properties of the knitted fabrics made from 50/50 blend of modal viscose fibre in microfibre form with cotton fibre were investigated in comparison with those of knitted fabrics made from 50/50 blend of conventional modal viscose fibre with cotton fibre and made from 100% cotton fibre.

As can be seen from the literature given above, studies onknitted fabrics with microfibre and conventional forms of modal viscose fibre cover their functional properties such as dimensional stability, and physical and comfort properties. However, the visual aesthetic properties of fabric are also important as well as their functional properties. Colour from the aesthetic properties is often considered as the first factor in the selection of a textile product by consumer. It is also desirable for the colour of dyed fabrics to withstand the effects of a wide variety of conditions such as laundering, light, abrasion etc. as well as to achieve the colour desired by the process of dyeing. Colour fastness tests such as washing, rubbing, light fastness and abrasion tests are important to evaluate the resistance of colour of any dyed fabric.

The abrasion resistance of a fabric is determined by measuring either the weight loss difference before and after a certain number of abrasion cycles or the number of abrasion cycles required to rupture two or more yarns in a fabric in a standard abrasion tester. Since the loss of fibres from a fabric surface during abrasion cycles causes prominent changes in the fabric's colour, in addition to the weight loss and yarn breakage methods, changes in colour that occur after a certain number of abrasion cycles are also measured for evaluation of the abrasion resistance of a fabric. Many studies assessing the effects of an increased number of abrasion cycles on the colour values of dyed knitted and woven fabrics made from different fibres such as cotton, wool, polyester, viscose, bamboo with different yarn and fabric construction parameters are available in the literature [9 - 16]. In these studies, it was reported that the colour values of fabrics after abrasion cycles are closely related with the fibre type and yarn and fabric constructional parameters.

The objective of this study was to investigate in a comparative manner the colour, abrasion and some colour fastness properties of plain knitted fabrics made from 100% modal viscose fibres in different fibre finenesses such as microfibre and conventional fibre together with their 50-50 blends with cotton fibre and 100% cotton fibre . All the results are compared with respect to both fibre fineness and the proportion of cotton fibre in the fabrics.

Experimental

In this study, the same plain knitted fabrics as in the previous studies of the author [7, 8] were used. For the production of the fabrics, five different yarns with

Table 1. *Colour results of the raw and pretreated knitted fabrics.*

Fabric types			L*	a*	b*	C*	h	K/S
Raw knitted	short	micromodal air	93.687	-0.733	5.607	5.655	7.447	0.0759
		modal	93.401	-0.765	5.123	5.180	8.493	0.0765
		micromodal air/cotton	88.288	0.377	11.72	11.73	88.16	0.2675
		modal/cotton	88.750	0.039	11.66	11.66	89.81	0.2648
		cotton	86.164	0.921	13.43	13.46	86.08	0.3695
	long	micromodal air	93.853	-0.791	5.358	5.416	8.393	0.0745
		modal	93.000	-0.571	4.887	4.920	6.686	0.0751
		micromodal air/cotton	88.518	0.310	11.46	11.47	88.45	0.2555
		modal/cotton	88.810	0.046	11.30	11.30	89.77	0.2537
		cotton	86.098	0.865	13.24	13.27	86.26	0.3678
Pretreated knitted	short	micromodal air	94.236	-0.540	3.714	3.753	8.254	0.0630
		modal	93.650	-0.765	4.542	4.606	9.564	0.0789
		micromodal air/cotton	94.185	2.124	-7.576	7.868	285.7	1.1625
		modal/cotton	94.250	2.006	-8.520	8.754	283.2	1.5809
		cotton	94.191	1.091	-8.026	8.100	277.7	5.0876
	long	micromodal air	93.890	-0.472	3.782	3.811	7.124	0.0648
		modal	93.549	-0.736	4.303	4.366	9.694	0.0803
		micromodal air/cotton	94.152	1.954	-6.878	7.150	285.9	0.9166
		modal/cotton	94.232	2.011	-8.578	8.811	283.2	1.4803
		cotton	93.938	1.155	-8.243	8.323	278.0	5.1922

various fibre types of 19.7 tex (Ne 30) were used. Two of these yarns consisted of 100% modal viscose fibres of different fibre fineness values, such as microfibre of 0.8 dtex and conventional fibre of 1.3 dtex, which are referred to as micromodal air and modal fibre, respectively. The micromodal air is the commercial name of the modal fibre of 0.8 dtex fibre fineness. Since modal fibre or its microfibre form is often blended with cotton fibre, as mentioned before, the study was extended to cover fabrics made from 50-50 blends of modal viscose fibres in microfibre and conventional fibre forms with cotton fibre. Therefore the other two yarn types consisted of a blend of micromodal air fibre of 0.8 dtex with cotton fibre at a 50-50 blend ratio and a blend of modal fibre of 1.3 dtex with cotton fibre at a 50-50 blend ratio, which are called micromodal air/cotton and modal/cotton, respectively. In order to investigate the effect of the blend ratio of modal viscose and cotton fibres on the color, the abrasion and colour fastness properties of fabrics produced using 100% cotton yarn were also included in the study. All the fabrics had two different stitch lengths. The short stitch lengths were in the range of 0.258 - 0.267 cm and the long stitch lengths in the range of 0.273 - 0.280 cm.

All the results are discussed by considering both the fibre fineness and proportion of cotton fibre. Therefore, firstly, the colour, abrasion and some color fastness properties of the micromodal air fabrics were compared with those of the modal fabrics. Then similar properties of the micromodal air and modal fabrics were evaluated in comparison with the micromodal air/cotton, modal/cotton and cotton fabrics.

The knitted fabrics were subjected to pretreatment and dyeing processes performed on a Haspel dyeing machine at a 20:1 liquor ratio. Depending on the cotton amount, different pretreatments were applied to the fabrics. The micromodal air and modal fabrics without cotton fibre were prewashed in a bath containing 1 g/l of a wetting agent (Defindol 2070 from Pulcra Chemicals, Gernany) and 1 g/l of soda ash at boiling temperature for 15 minutes. The cotton blended and 100% cotton fabrics were prewashed in a bath containing 1 g/l of the wetting agent (Defindol 2070 from Pulcra chemicals), 2 g/l of soda ash and 1 g/l of NaOH at boiling temperature. The cotton blended (micromodal air/cotton and modal/cotton) and 100% cotton fabrics were prewashed for 10 minutes and 20 minutes, respectively. After prewashing, the bleaching process was applied to the cotton blended fabrics for 20 minutes and to the 100% cotton fabrics for 30 minutes. The bleaching bath contained 2% of H_2O_2, 2 g/l of a combined bleaching agent (Chembleach 301 from Genkim, Turkey), 1 g/l of a sequesting agent (Ecorem new from Genkim), 2 g/l of soda ash and 0.5% of an optical brightening agent (BLANCOLUX BVL from Gunerca Chemical, Turkey). The colorimetric coordinates (L*, a*, b*, C* and h) and K/S values of all the raw and pretreated knitted fabrics are given in ***Table 1***.

For the dyeing of the fabrics, reactive dye was used. The reactive dye bath contained 2% owf Evercion Blue HEGN dye (C. I. Reactive Blue 198), 40 g/l of NaCl, 20 g/l of Na_2CO_3 and 1% of a sequesting agent. The dyeing procedure was performed at 80 ºC for 45 min. Then the fabrics were rinsed with hot water 3 times.

The abrasion behaviours of the fabrics were determined by measuring both the weight loss amounts and colour values of the abraded fabrics. Abrasion tests of the fabrics were performed on a Martindale abrasion tester according to the standard of TS EN ISO 12947-3 [17]. Four levels of abrasion cycles (5,000, 10,000, 15,000 and 20,000) were applied to the fabrics inserted into the abrasion tester. Firstly weight loss differences between the weights were determined before and after the four different increasing values of 5,000, 10,000, 15,000 and 20,000 abrasion cycles. Later the color values of the dyed fabrics before and after each level of abrasion cycle were measured. Four abrasion tests were made for each fabric type.

Colour measurements of the dyed fabrics before and after each abrasion cycle were performed on a Minolta 3600d spectrophotometer (Japan) under a D65 illuminant and using a 10º standard observer with the specular component included (SCI) mode. Four colour measurements were performed on each sample by rotating it 90º around and repositioning it between measurements. Four layers of original fabric were placed at the back of each sample to achieve opaqueness. The CIELAB coordinates (L*, a*, b*, C*, h), colour strength (K/S), and colour difference (ΔE^*) values were measured as color values. The color strength (K/S) value of the dyed fabric was recorded at a wavelength of maximum absorption of 640 nm. Unabraded fabrics were taken as standard fabrics and abraded fabrics as samples for the calculation of the colour difference value (ΔE^*). The ΔE^* value was obtained according to the CIELab (1976) equation.

Wash and light fastness measurements were performed in accordance with the standards of TS EN ISO 105 C06 [18] and TS 1008 EN ISO 105 B02 [19], respectively. For wash fastness measurements, staining and changes in shade were assessed with the gray scale. For light fastness measurements, the changes in colour were assessed with the blue scale. Before measurements, the fabrics were conditioned for 24 hours in a standard atmosphere of temperature 20 ± 2 °C and relative humidity 65 ± 2%.

Results and discussions

Colour results of the reactive dyed fabrics

Colour values of the reactive dyed fabrics are given in ***Table 2***. From the colour results of the micromodal air and modal fabrics without cotton fibre, it can be seen that the K/S and C* values of these dyed fabrics in both of the stitch lengths tend to decrease, while the L* values in the short stitch length tend to increase as the fibre fineness decreases. According to these results, the micromodal air fabrics look lighter and duller than the modal fabrics, although the fabrics in this group had the same pretreatment. These colour results for the dyed fabrics are similar to those for the undyed pretreated fabrics. Since the L* values increase, the K/S and C* values decrease with a decrease in fibre fineness after the pretreatment process (***Table 1***); the same tendency is obtained for the L*, C* and K/S values of the fabrics after the dyeing process. As explained in the literature for the dyeing behaviors of microfibre forms of other fibres such as polyester and polyamide [20, 21], the lighter appearance of micromodal air fabrics can also be attributed to their larger surface area. As a fibre gets finer, the number of fibres in the fabric structure increases, whereas airspaces in the fabric structure decrease. Therefore finer microfibres create a larger surface area than conventional fibres. Due to this larger surface area, micromodal air fabrics may reflect incident light in greater proportions, which may lead to higher L* and lower K/S values of micromodal air fabrics than those of modal fabrics. Additionally the high number of fibres as in the case of the fabrics with microfibre may cause the dyestuff applied to be shared by the high numbers of fibres. Moreover the less amount of space in microfibre fabrics may also make the penetration of dye into the fabric difficult, resulting in less deep dyeing.

Table 2. *Color results of the reactive dyed knitted fabrics.*

	Fabric types	L*	a*	b*	C*	h	K/S
short	micromodal air	52.501	-9.329	-35.722	36.921	255.363	5.8404
	modal	51.842	-9.296	-36.678	37.838	255.778	6.3680
	micromodal air/cotton	54.024	-9.990	-37.530	38.830	255.130	5.6780
	modal/cotton	55.228	-9.237	-37.928	39.036	256.312	5.0068
	cotton	56.510	-10.469	-36.966	38.421	254.184	4.6210
long	micromodal air	52.490	-9.363	-35.477	36.693	255.216	5.8054
	modal	52.525	-9.179	-36.620	37.754	255.930	5.9471
	micromodal air/cotton	54.106	-9.843	-37.756	39.017	255.488	5.6139
	modal/cotton	54.272	-9.257	-38.343	39.445	256.426	5.5783
	cotton	55.998	-10.445	-37.210	38.649	254.318	4.8415

When the colour values of dyed fabrics are compared in terms of the proportions of cotton fibre in them, it is observed that the K/S values decrease, whereas the L* values increase with an increase in the cotton proportion. These results may arise from the shrinkage properties of the cotton fabrics. The high shrinkage potential of cotton fibre, especially after washing treatment, increases the stitch number i.e. the fabric density. When the fabric density increases, the penetration of dye into the fabric may become difficult and therefore a lighter and less deep colour is obtained. Moreover the increase in fabric density due to shrinkage may lead to an increase in the light reflectivity properties of cotton blended and cotton fabrics. The C* values do not change linearly with the proportion of cotton fibre. However, the C* values of cotton blended and cotton fabrics are higher and, thus, brighter than those of micromodal air and modal fabrics without cotton fibre. The C* values obtained after the dyeing process are consistent with those received after the pretreatment process. Since the cotton blended and cotton fabrics reveal higher C* values than those without cotton fibre after the pretreatment process, the same tendency may be obtained for these fabrics after the dyeing process.

As mentioned before, the fabrics are dyed using blue dye. Thus the b* values of all the fabrics have a negative sign. The hue angles, h, of all the fabrics lying between 254.184º and 256.426º indicate that all of the fabrics are of blue colour. As the fibre gets finer, the b* values (blueness) decrease, which indicates that the micromodal air fabrics are less blue than the modal fabrics. The cotton blended and cotton fabrics have higher b* values than those without cotton fibre.

Abrasion results of the fabrics

Weight loss results of the fabrics after abrasion

The weight loss results of all the fabrics at 5000, 10000, 15000 and 20000 abrasion cycles are given in ***Figure 1***. As can be seen from the figure, the weight loss values increase gradually in equal amounts with an increase in the abrasion cycles. When comparing the micromodal air and modal fabrics according to fibre fineness, it is observed that the weight loss values of the micromodal air fabrics are lower than those of the modal fabrics. The higher abrasion resistance of the mi-

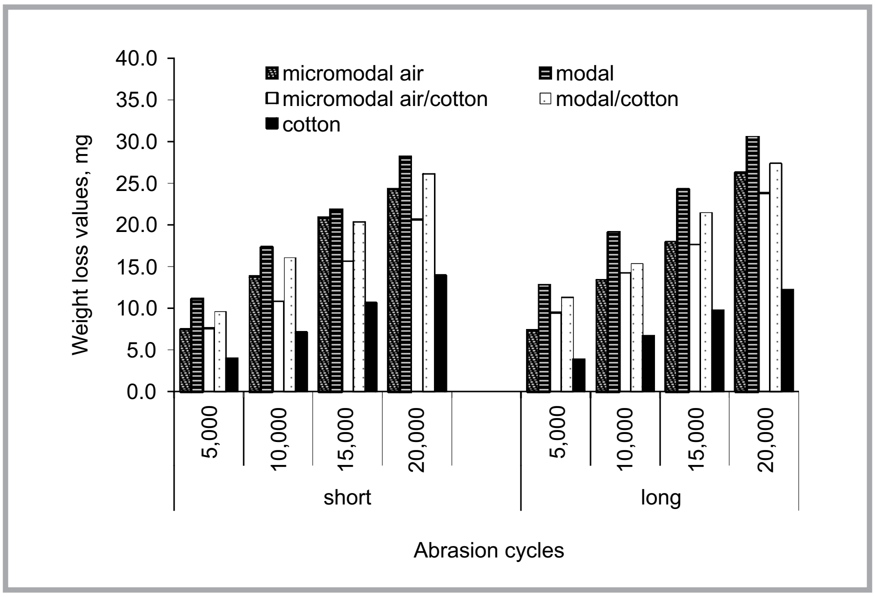

Figure 1. *Weight loss results of the dyed knitted fabrics.*

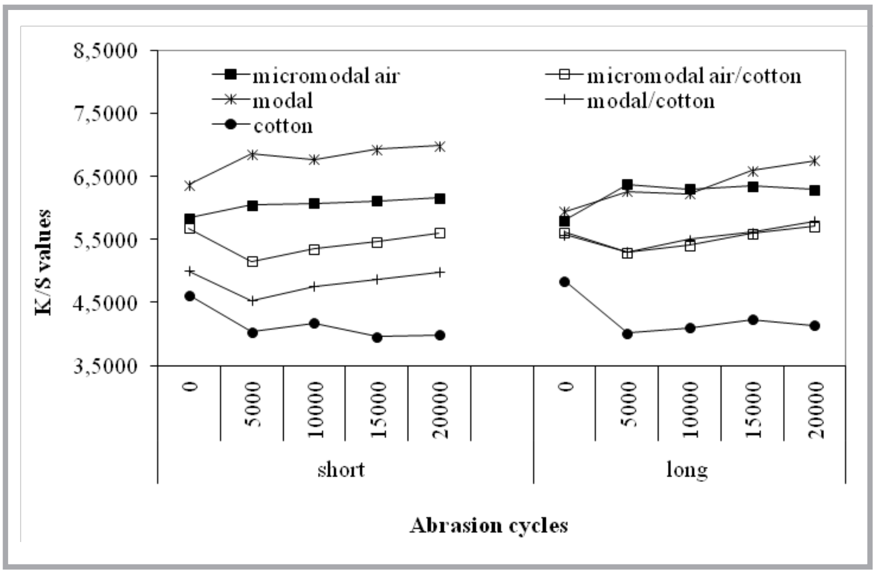

Figure 2. K/S results before and after abrasion cycles.

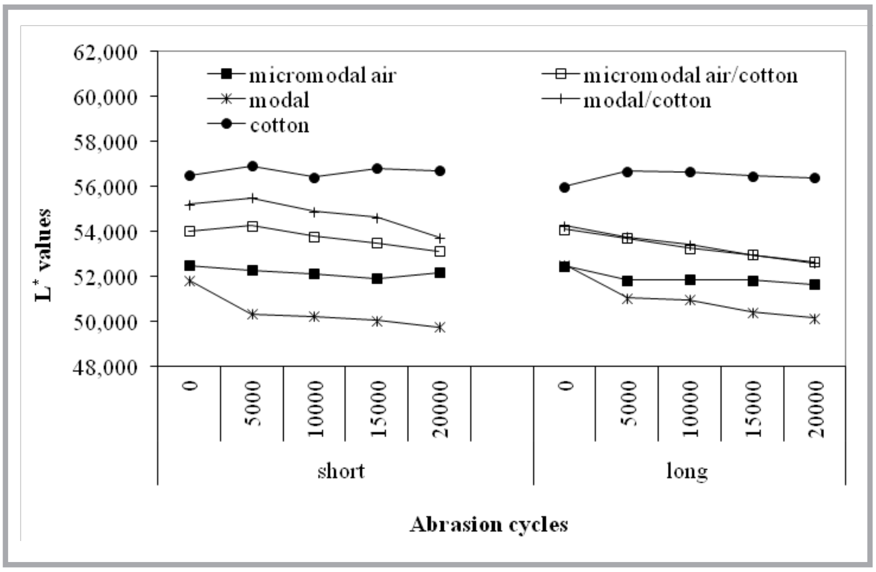

Figure 3. L results before and after abrasion cycles.*

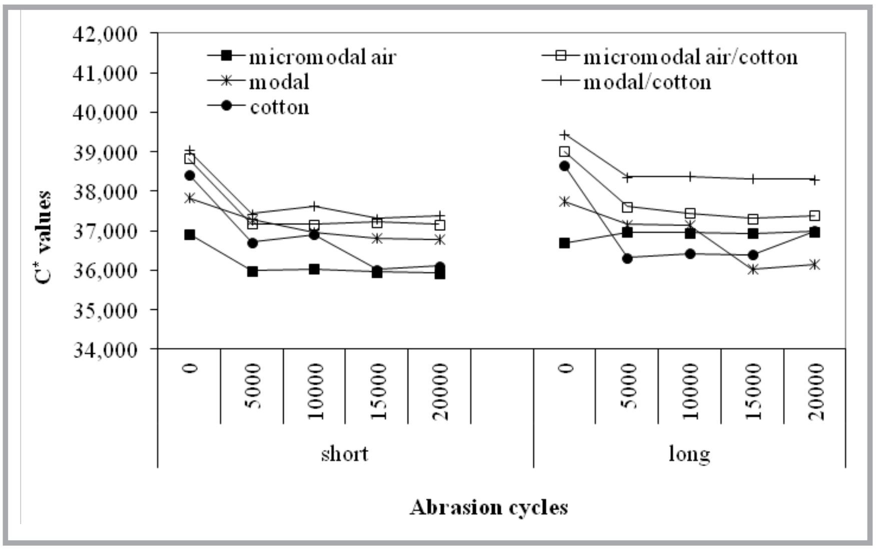

Figure 4. C results before and after abrasion cycles.*

cromodal air fabrics may be explained by the higher number of fibres in these fabrics, which may lead fibres to be held strongly in the fabric structure.

A comparison of the fabrics with regard to the cotton amount shows that as the cotton proportion increases, the weight loss values tend to decrease, meaning that the abrasion resistance increases with an increase in the cotton proportion. According to these weight loss values, the yarn strength does not seem to influence the abrasion behaviour directly. As given in the previous studies of the author [7, 8], the yarn strength decreases with an increase in the cotton fibre amount. Cotton yarn has the lowest yarn strength value. The micromodal air and modal yarns without cotton fibre have the highest yarn strength value.The reason of the result, in which the abrasion resistance increases with an increase in the cotton proportion, can be explained by other fabric properties influencing the fabric compactness. As mentioned in previous papers [7, 8], the stitch density values of the cotton and cotton blended fabrics after the dyeing procedure are higher than those of the fabrics without cotton fibre because of higher shrinkage potential of cotton fibre. The higher stitch density values of cotton and cotton blended fabrics may cause fibres to be held firmly in the yarn or fabric structure and thus may increase resistance towards the abrasion force by increasing the compactness of the fabric structure.

Colour results of the fabrics after abrasion

The K/S, L* and C* results of all the plain knitted fabrics obtained before and after abrasion cycles of 5000, 10000, 15000 and 20000 are given in ***Figures 2, 3*** and ***4***, respectively.

When the effects of the abrasion cycle on the colour results of the fabrics are considered, it is observed that the behaviours of the K/S and L* values change in a different manner for the micromodal air and modal fabrics without cotton fibre and the cotton blended (micromodal air/cotton and modal/cotton) and cotton fabrics. The K/S values of the micromodal air and modal fabrics without cotton fibre tend to increase with an increase in the abrasion cycles, especially at the end of the first 5000 cycles. In parallel with the K/S values, the L* values of these fabrics tend to decrease with the increase in the abrasion cycles. However, the K/S and L* values of the cotton blended and cotton fabrics reveal an opposite tendency to those of the fabrics without cotton fibre. While the K/S values of the micromodal air/cotton, modal/cotton and cotton fabrics with cotton fibre tend to decrease, the L* values of these fabrics tend to increase as the abrasion cycles increase, especially at the end of the first 5000 cycles. The C* values of all the fabrics decrease with an increase in the abrasion cycles. In this case, the abrasion cycles decrease the saturation of all the fabrics and lead to them having a duller colour.

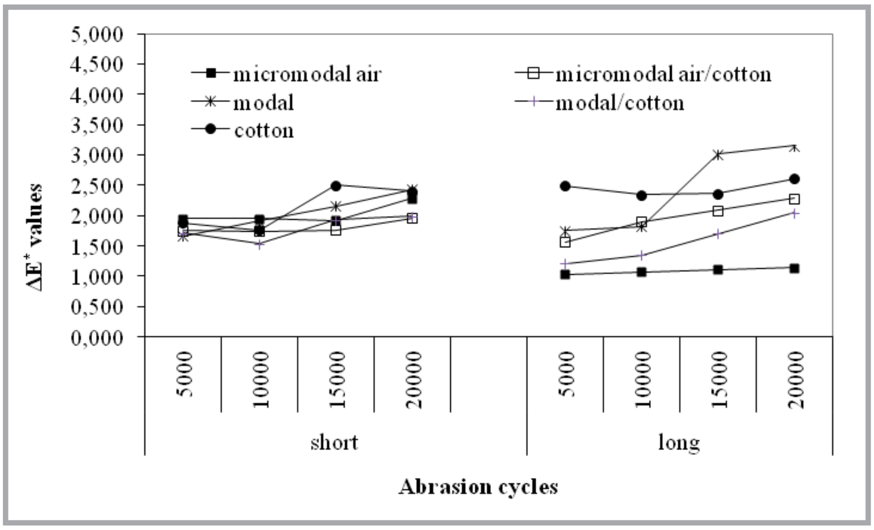

Figure 5. *ΔE* results after abrasion cycles.*

In fact, as shown in most of the previous studies [9, 10, 13 - 16], it can be expected that the abrasion cycles may cause dye loss on the fabric surface due to abrasive forces, and as a result the colours of fabrics may get lighter as the abrasion cycles increase. The decrease in K/S and C* values and increase in L* values obtained for the cotton blended and cotton fabrics during abrasion implies that these fabrics lose their colour with an increase in the abrasion cycles, as can be expected. However, the increase in K/S values and decrease in L* and C* values obtained for the micromodal air and modal fabrics without cotton fibre during the abrasion cycles indicate that the appearance of the fabrics becomes darker and less saturated as the abrasion cycle increases, and thus implies that no dye loss on the fabric surface occurs. However, the results obtained for the K/S and L* values of these fabrics are consistent with those in some of the previous studies [11, 22, 23], which were about the colour properties of polyester fabrics after abrasion. The reason for the darker fabric appearance obtained after the abrasion cycles was explained in a previous study [23] that a very small amount of dye might have been lost from the fabric surface and the new fibre alignment and fibre mixing in the fabric structure may have hindered the effects of the very small dye loss from the fabric. As is known, polyester fibre, used in these previous studies [11, 22, 23], has relatively high fibre strength. Thus since the breaking of fibres in fabric made from this kind of fibre, with a high fibre strength property, will be rather difficult, very little dye loss from the fibre surface may occur. Additionally abrasive forces applied during the abrasion cycles may pull out some amounts of fibres from the fabric structure. Fibres pulled out from the fabric due to the abrasive force may lead to a decrease in the surface area of the fabric, and therefore less light will be reflected from the fabric surface. As a result, a darker fabric appearance may be obtained. Similar to polyester fibre, since the modal fibre used in this study has relatively high fibre strength, the color values in this study may show a similar tendency to those in previous studies [11, 22, 23].

According to the effects of fibre fineness on the color values of the fabrics after abrasion, especially after 15,000 and 20,000 abrasion cycles, in both of the stitch lengths, the micromodal air fabrics with microfibre reveal lower K/S values, but higher L* values than the modal fabrics with conventional fibre. All the L* and K/S results obtained after the abrasion cycles are similar to those obtained before abrasion. The C* values after abrasion do not appear to change with the fibre fineness.

When the colour results after the abrasion cycles are examined with respect to the cotton blend, it can be observed that as in the case of the K/S and L* values before abrasion, the K/S values decrease and L* values increase with an increase in the cotton amount after the abrasion cycles. The C* values after abrasion cycles do not change linearly in relation to the cotton amount. The cotton blended fabrics (the micromodal air/cotton and modal/cotton), which have the highest C* values before abrasion, reveal the highest C* values after abrasion.

From the colour results, it may be concluded that, especially the K/S and L* values, after the abrasion cycles they appear to reflect the dyeing behaviour of the fabrics before abrasion rather than weight loss values that occur after the abrasion cycles.

The colour difference values, ΔE*, between the standard (unabraded) fabrics and those abraded after 5,000, 10,000, 15,000 and 20,000 abrasion cycles are presented in ***Figure 5***. After 10,000, 15,000 and 20,000 abrasion cycles, the micromodal air fabrics display lower ΔE* values than the modal fabrics, which indicates that these fabrics are less affected by the abrasion cycles than the modal fabrics. Since the micromodal air fabrics have a higher number of fibres than the modal fabrics, the weight losses due to the abrasion cycles may affect the colour difference values of these fabrics to a lesser extent.

When the colour difference values (ΔE*) are considered in relation to the cotton amount, it is observed that the ΔE* values do not seem to change in relation to the cotton amount. However, higher colour difference values are obtained for the cotton and modal fabrics.

Colour fastness results of the fabrics

The light and wash fastness results are given in ***Table 3*** (see page 112). The light fastness results in ***Table 3*** indicate that all the micromodal air and modal fabrics have acceptable light fastness results (ratings above 4). The micromodal air fabrics exhibit slightly worse light fastness results than the modal fabrics. The lighter and less deep colour of the micromodal air fabrics due to higher L* and lower K/S values may be the reason for the lower light fastness results. When the results are examined in relation to

Table 3. *Light and wash fastness results of the dyed knitted fabrics.*

Fabric types		**Light fastness**		**Wash fastness (staining on cotton)**		
		Sample number		**Sample number**		
		1	**2**	**1**	**2**	**3**
short	micromodal air	6	6	4	3-4	3-4
	modal	6	7	4-5	4-5	4
	micromodal air/cotton	4	4	3-4	3-4	3-4
	modal/cotton	4	5	3-4	4	3-4
long	micromodal air	6	7	3-4	3-4	3-4
	modal	7	7	4	4	4
	micromodal air/cotton	5	4	4	4	4
	modal/cotton	5	6	4	3-4	3-4
	cotton	2	2	3-4	3-4	3-4

the cotton amount, it can be seen that the light fastness results of the cotton blended and 100% cotton fabrics are not as satisfactory as those of the fabrics without cotton fibre, which may also arise from their lighter and less deep colour.

When the wash fastness results in ***Table 3*** are considered, it can be seen that the changes in shade for all of the fabrics are observed at a rate of 4-5. The staining of the adjacent wool has a rate of 4-5. The wash fastness results in ***Table 3*** reveal the staining of the adjacent cotton. In terms of the staining on adjacent cotton, the micromodal air fabrics reveal slightly worse wash fastness results than the modal fabrics. The wash fastness results of all the fabrics without cotton fibre are slightly better than those of the cotton blended and cotton fabrics.

Conclusion

This study comparatively discusses the colour and colour fastness properties of plain knitted fabrics made from modal viscose fibres in different fibre finenesses such as microfibre and conventional fibre, their 50/50 blends with cotton fibre and 100% cotton fibre, together with the colour and weight loss values that occur after four levels of abrasion cycles (5,000, 10,000, 15,000 and 20,000). All results obtained are compared by considering both the fibre fineness and blend proportion of cotton fibres in the fabrics.

When the colour results of the fabrics made from modal viscose fibres in the form of microfibre and conventional fibre before abrasion are considered with respect to fibre fineness, the fabrics with microfibre display lower K/S and C^* values, but higher L^* values than those fabrics with conventional fibre before abrasion. These results all together highlight that the colours of the fabrics with microfibre are lighter and duller than those of the fabrics with conventional fibre; and these fabrics have a lower dye uptake than those with conventional fibre. With an increase in the cotton amount, the K/S values of the fabrics decrease, and the L^* values increase. The C^* values of the cotton blended and cotton fabrics are found to be higher than those of the fabrics without cotton fibre.

When the effect of fibre fineness on the weight loss values is considered, it is observed that the weight loss values of the fabrics with microfibre is found to be lower than those of the fabrics with conventional fibre. A comparison of the weight loss values of the fabrics in relation to the cotton amount shows that during 15,000 and 20,000 abrasion cycles, as the cotton proportion increases, the weight loss values decrease, which means that the abrasion resistance increases with an increase in the cotton proportion.

Regarding the colour properties after abrasion, the fabrics with microfibre show lower K/S values but higher L^* values than those with conventional fibre after the abrasion cycles, as in the case of those of fabrics obtained before abrasion. The colour difference values (ΔE^*) of the fabrics with microfibres are lower than those with conventional fibre at the end of 15,000 and 20,000 abrasion cycles. Similar to the colour values before abrasion, the K/S values decrease and L^* values increase with an increase in the cotton amount after the abrasion cycles. The effects of the cotton amount on the C^* values and colour difference values (ΔE^*) were not observed.

Finally the light and wash fastness properties of the fabrics with microfibres are slightly worse than those with conventional fibre. The fabrics without cotton fibre exhibit better light and wash fastness properties than the cotton blended and cotton fabrics.

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