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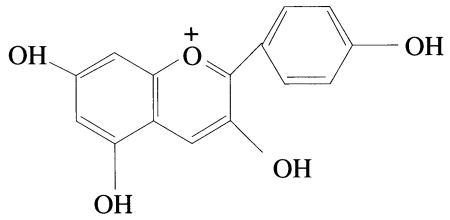
In this study, the total amount of dyeing substances present in onion (Allium cepa L.) was determined by using the extraction method. The extracted substanc were used in the dyeing of woollen strips, feathered- leather and cotton. Dyeing conditions and other characteristics were determined and the repeatable specifics were evaluated for these processes so that ligh fast colours could be obtained.

Introduction

Onion (Allium cepa L.) is a vegetable with is used in the preparation of food. The skin of the onion is inedible (Allium cepa L.). But is contains a dyestuff called Peargonidin (3,5,7,4 tetrahydroxy antocyanidol).[1-2].



Pelargonidin

Pelargonidin has four hydroxy groups all of which are oxochrome groups such as $NH_2, COOH$. Consequently Pelargonidin exhibits good dyeing properties for the dyeing of wool. In this study, 150 dyed woollen strips, 40 dyed- featered-leathers and 40 dyed-cottons were obtained by using various salts of transition elements as mordant agents. Dyeing of wool, feathered- leather and cotton with pelargonidin by mordant agents (various salts, acid and base) was examined in debal. In addition, a new mordant mixture was determined for the dyeing of wool which produced unfading colours.

Experimental

Soxhlet apparatus was used to extract the dyestuff from the onion's skin. The Solvent was evaporated. All of the solvents used during the experiment such as n-hexane and water were redistilled before use. An-analytical balance was used to determine the total dyestuff in the skin of the onion. Light fast analyses were carried out by using a Fadeometer (xenotest; washing fasts were carried out with an Alas Laundero meter LHTP model and Crock fasts were carried and by using a Crockometer 255 model.

Extraction of Dyestuff from the Onion

The dried onion skin (25 g) was left for 24h in distilled n-hexane to separate terpens. After decantation, the residue was extracted with 1000 ml of distilled water by using the Soxhlet apparatus. This solution was used as a dye-bath for the dyeing of the wool, feathered-leather and cotton. For the total content of dyestuff in the onion, 1000 ml of solution (dye-bath) was evaported and then weighed. The amount of pelargonidin was found to be 2.26 % which was known previously [2].

Dyeing of Wool (General Procedure)

The dyeing procedures[3] of wool were carried out using the three methods given below:

1-Pre-mordantation

2-Together mordantation

3-Last mordantation

1-Pre-mordantation: White wollen strips (1.8 g) were heated in 100 ml 0.1M mordant solution at 80° C for 1h. After cooling, it was filtered, dried and put into 180 ml of dye-bath. After heating for 1h at 80° C, it was allowed to cool. The dyed-product was washed with distilled water and dried. This process was carried out at PH: 8,6,4,2 succesively for each mordant.

2-Together mordantation: Mordant (equivalent to a concentration value of 0.1M), 180 ml of dyestuff solution and 1.8 g of woollen strips were placed in 250 ml of erlenmeyer. This mixture was heated at 80° C for 1h. After cooling, it was filtered, washed with distilled water and dried. This process was carried out at pH: 8,6,4,2 successively for each mordant.

3-Last mordantation: Firstly 1.8g of woollen strips were heated in 180 ml of dye-bath at 80° for 1h. After cooling, the woollen strips were filtered and dried. Then it was put into 100 ml 0.1M of mordant solution and heated at 80° C for 1h. Finally, it was filtered, washed with distilled water and dried. This process was also carried out at pH. 8,6,4,2 as in 1 and 2.

The dyed-woollen strips obtained from each of these three methods were kept in a NH_3 solution (3%) to increase the fasts of the colours.

Dyeing of Feathered-Leather (General Procedure):

This is the first time that this process has been carried out the dyeing process of feathered-leather was carried out by pre-mordantation and together mordantation. The third procedure did not give positive result as the temperature of the dye-bath must be between 35° – 40° C during the dyeing. At lower or higher temperatures a good result is not obtained. The dyeing procedure for feathered-leather was carried out using the two methods given as below.

1-Pre-mordantation: The white feathered-leather treated with ptassium bichromate (approx. 15 cm^2) was heated in 100 ml 0.1M of mordant solution at $35-40°$ C for 1h in 300 ml of erlenmeyer. After cooling, it was shaken at frequent intervals for 1h at $35-40°$ C. After completion of the dyeing process, the dyed-feathered-leather was filtered, washed with distilled water and dried.

2-Together Mordantation: The feathered-leather following pre- mordantation was added to 100ml of dyestuff solution and mordant agent and mixed in 250 ml of erlenmeyer. This mixture was shaken at frequent intervals for 1 h at $35-40°$ C and finally, dyed feathered-leather was filtered, washed with distilled water and dried.

The length of the feather in the feathered-leather used in this work was approximately 1-1.5 cm. For these two methods, the dyeing pH was selected as 4,5 and 2. These conditions are discussed in the last section.

Dyeing of Cotton (General Procedure)

Cotton has different structure and properties from wool and leather. It is composed of glucoside units. It can exhibit coordinative and intermolecular hydrogen bonding with the mordant agent and dyestuff. In this work, the best dyeing was obtained with pre-mordantation and together mordantation methods.

1-Pre-mordantation: Cotton (1.5 g 50 cm^2) was heated at 90° C for 1h in 100ml 0.1M of mordant solution (Table 1). After cooling, the cotton was taken out; washed with distilled water and dried. Then, it was put into 100ml of dye-bath and heated at 90° C for 1h. It was allowed to cool and then filtered. Finally, the dyed-cotton was washed with distilled water and dried.

2-Together mordantation: 100 ml of dyestuff solution was added to the Cotton and mordant agent (equivalent to the 0.1M value) and heated at 90° C for 1h. After cooling, it was taken out; washed with distilled water and dried.

For each of the two methods, the PH was selected as 7,4 and 2. This choice is explained in the discussion section.

Results and Discussion

The results for fast analyses [4] and colour codes[5] of dyed woollen strips were given in Table 1., the fast analyses of dyed feathered-leather were given in Table 2, and the results of fast analysis for dyed cotton were given in Table 3.

Table 1. Results of fast analyses and colour codes of dyed wollen strips

Dyeing method	Mordant	Flotte ratio	pH	Bath temp. (°C)	Dyeing period (hr)	Colour code	light fast	Crocking Moist	fasts dry	Washing fast	Hypo-chloride fast
Unmordant.-		0.01	4.7	80	1	18-1112 TP	4.5	4	5	4-5	
Together mord	NaOH	"	8	"	"	16-1143 TP	4-5	4	4-5	4-5	-
"	NaOH	"	6	"	"	17-1040 TP	4-5	4-5	4-5	5	-
"	CH_3COOH	"	4	"	"	16-1325 TP	5	4	4-5	5	-
"	CH_3COOH	"	2	"	"	17-1040 TP	5	4-5	4-5	5	-
"	$Fe_2SO_4.7H_2O$	"	8	"	"	18-1112 TP	5(darken)	4	4	4-5	-
"	"	"	6	"	"	17-0808 TP	5(darken)	3-4	4	4	-
"	"	"	4	"	"	17-0613 TP	4-5	4	4	4	-
"	"	"	2	"	"	17-1019 TP	5(darken)	4	4	4-5	-

"	$Pb(NO_3)_2$	"	8	"	"	16-0950 TP	4-5	4	4	4	-
"	"	"	6	"	"	16-0947 TP	4-5	4	4-5	4	-
"	"	"	4	"	"	15-1142 TP	5	4	4-5	4	-
"	"	"	2	"	"	16-1140 TP	5	4	4-5	4-5	-
"	$Al(NO_3)_3$	"	8	"	"	13-1018 TP	4-5	4	4-5	4	-
"	"	"	6	"	"	14-031 TP	4-5	4	4-5	4	-
"	"	"	4	"	"	14-1041 TP	4	4	4	4	-
"	"	"	2	"	"	15-1050 TP	5	4	4-5	4-5	-
"	$CoCl_2.6H_2O$	"	8	"	"	17-1047 TP	4	3-4	4-5	4	-
"	"	"	6	"	"	17-1129 TP	4	3-4	4	4	-
"	"	"	4	"	"	15-1234 TP	4	4	4	4	-
"	"	"	2	"	"	17-1353 TP	4	4-5	4	4-5	-
"	$(NH_4)_6Mo_7O_{24}.4H_2O$	"	8	"	"	18-0435 TP	5(darken)	4	4	4	-
"	"	"	6	"	"	17-0535 TP	5	4	4	4-5	-
"	"	"	4	"	"	15-0953 TP	5	4	4	4-5	-
"	"	"	2	"	"	16-0840 TP	5	4	4-5	4	-
"	$MnSO_4$	"	8	"	"	18-0935 TP	4	3-4	3-4	4	-
"	"	"	6	"	"	15-0953 TP	4	4	4	4-5	-
"	"	"	4	"	"	18-1248 TP	4	3-4	4	4	-
"	"	"	2	"	"	16-1140 TP	4	4	4-5	4-5	-
"	$CuCl_2$	"	8	"	"	18-0525 TP	4-5	4	3-4	4-5	-
"	"	"	6	"	"	18-0527 TP	4	4	4	4	-
"	"	"	4	"	"	18-0629 TP	4	4	4	4	-
"	"	"	2	"	"	17-1128 TP	4-5	4-5	4-5	4-5	-
"	Na_2CrO_4	"	8	"	"	12-0804 TP	4	4	4	4-5	-
"	"	"	6	"	"	12-0905 TP	4	4-5	4	4	-
"	"	"	4	"	"	16-1320 TP	4	3-4	4	4	-
"	"	"	2	"	"	17-1009 TP	4-5	4-5	4	4-5	-
"	$AgNO_3$	"	8	"	"	18-1033 TP	5(darken)	2-3	3	4	-
"	"	"	6	"	"	19-1020 TP	5	3-4	3	4	-
"	"	"	4	"	"	19-0809 TP	5	4	3-4	4	-
"	"	"	2	"	"	19-0810 TP	5	4	4	4-5	-
"	$ZnSO_4$	"	8	"	"	14-1041 TP	5	4	4	4	-
"	"	"	6	"	"	16-0947 TP	5	4-5	4	4-5	-
"	"	"	4	"	"	15-1234 TP	4-5	4	4	4-5	-
"	"	"	2	"	"	17-1009 TP	5	4-5	4	4-5	-
"	$K_2Cr_2O_7$	"	8	"	"	15-0719 TP	4	4	4	4	-
"	"	"	6	"	"	14-0721 TP	4	4	3-4	3-4	-
"	"	"	4	"	"	17-1022 TP	4	4	4	4	-
"	"	"	2	"	"	17-0929 TP	4-5	5	4	4	-
"	$Cd(NO_3)_2$	"	8	"	"	17-1046 TP	4	4	4	4	-
"	"	"	6	"	"	14-1127 TP	4-5	4	3-4	4-5	-
"	"	"	4	"	"	16-1342 TP	4	4	3-4	4	-
"	"	"	2	"	"	16-1148 TP	4-5	4-5	4	4-5	-
Pre-mord.	$Fe_2SO_47H_2O$	"	8	"	"	17-0935 TP	5(darken)	4-5	4	4-5	-
"	"	"	6	"	"	17-0929 TP	5	4	4	4-5	-
"	"	"	4	"	"	15-0830 TP	5	4	4-5	4	-
"	"	"	2	"	"	19-0622 TP	5	4	4-5	4-5	-
"	$Pb(NO_3)_2$	"	8	"	"	17-0840 TP	4	4	4	4-5	-
"	"	"	6	"	"	17-1129 TP	4	4	4	4	-
"	"	"	4	"	"	15-0921 TP	4	4	4	4-5	-
"	"	"	2	"	"	17-1137 TP	4	4	4-5	4	-
"	$Al(NO_3)_3$	"	8	"	"	14-0941 TP	4-5	4-5	4-5	4-5	-
"	"	"	6	"	"	13-0942 TP	4-5	4-5	4	4-5	-
"	"	"	4	"	"	14-0852 TP	4	4-5	4	4	-
"	"	"	2	"	"	15-0955 TP	5	4-5	4-5	4	-
"	$CoCl_2.6H_2O$	"	8	"	"	16-1139 TP	4	4	4	4	-
"	"	"	6	"	"	17-1129 TP	4	4	4-5	4	-
"	"	"	4	"	"	16-1327 TP	4	4	4-5	4	-
"	"	"	2	"	"	17-1336 TP	4	4	4-5	4	-
"	$(NH)_6Mo_7O_{24}12H_2O$	"	8	"	"	14-4307 TP	5(darken)	4-5	4	4	-
"	"	"	6	"	"	18-0527 TP	5	4-5	4	4-5	-
"	"	"	4	"	"	18-0525 TP	5	4	4	4	-
"	"	"	2	"	"	18-0622 TP	5	4-5	4-5	4-5	-
"	$MnSO_4$	"	8	"	"	16-1143 TP	4	4-5	4	4	-
"	"	"	6	"	"	16-1144 TP	4	4	4	4	-
"	"	"	4	"	"	17-1040 TP	4	4	4	4-5	-
"	"	"	2	"	"	17-1048 TP	4-5	4-5	4	4-5	-

"	$CuCl_2$)	"	8	"	"	17-1048 TP	4-5	4	4	4	-
"	"	"	6	"	"	17-1022 TP	4	4-5	4	4	-
"	"	"	4	"	"	15-1126 TP	4-5	4	4	4	-
"	"	"	2	"	"	17-1140 TP	4-5	4-5	4-5	4	-
"	Na_2CrO_4	"	8	"	"	14-1118 TP	4	3-4	3-4	4	-
"	"	"	6	"	"	16-1144 TP	4	3-4	4	4	-
"	"	"	4	"	"	17-0942 TP	3-4	4	4	4	-
"	$AgNO_3$)	"	8	"	"	19-1116 TP	5(darken)	3	3-4	3-4	-
"	"	"	6	"	"	19-0810 TP	5	3	3	3	-
"	"	"	4	"	"	19-0812 TP	5	3-4	3	3	-
"	"	"	2	"	"	19-4205 TP	5(darken)	4	3-4	3	-
"	$ZnSO_4$	"	8	"	"	14-1041 TP	5	4-5	4	4-5	-
"	"	"	6	"	"	15-1050 TP	4-5	4-5	4	4-5	-
"	"	"	4	"	"	16-1143 TP	4-5	4	4	4-5	-
"	"	"	2	"	"	16-1148 TP	5	5	4	4-5	-
"	$K_2Cr_2O_7$	"	8	"	"	13-0715 TP	4	4	4-5	4	-
"	"	"	6	"	"	15-1119 TP	4	4	4	4	-
"	"	"	4	"	"	16-1126 TP	4	4	4	4	-
"	"	"	2	"	"	16-1324 TP	4	4	4-5	4	-
"	$Cd(NO_3)_2$	"	8	"	"	16-1144 TP	4	4	4	3-4	-
"	"	"	6	"	"	16-0940 TP	4-5	4	4	4-5	-
"	"	"	4	"	"	17-1353 TP	4	4	4	4-5	-
"	"	"	2	"	"	16-1443 TP	4	4-5	4-5	4	-
"	($urea + NH_{3+}$) ($Na_2C_2O_4$)	"	8	"	"	14-0837	5	5	5	5	5
Last Mord.	$FeSO_4.7H_2O$	"	8	"	"	18-1016 TP	5(darken)	4-5	4	4-5	-
"	"	"	6	"	"	17-1118 TP	5	4	4	4-5	-
"	"	"	4	"	"	18-0920 TP	5	4	4	4	-
"	"	"	2	"	"	18-0928 TP	5	4-5	4-5	4-5	-
"	$Pb(NO_3)_2$	"	8	"	"	17-1340 TP	4	4	4	4-5	-
"	"	"	6	"	"	17-1336 TP	4	4	4	4	-
"	"	"	4	"	"	18-1154 TP	4	4	4	4	-
"	"	"	2	"	"	18-1140 TP	4	4	4-5	4-5	-
"	$Al(NO_3)_3$	"	8	"	"	16-1443 TP	4-5	4-5	4	4	-
"	"	"	6	"	"	14-1122 TP	4-5	4	4-5	4-5	-
"	"	"	4	"	"	14-1036 TP	4	4	4-5	4-5	-
"	"	"	2	"	"	16-1143 TP	5	-5	4	4-5	-
"	$CoCl_2.6H_2O$	"	8	"	"	18-1239 TP	4	4	4	4-5	-
"	"	"	6	"	"	18-1441 TP	4	4	4-5	4	-
"	"	"	4	"	"	18-1230 TP	4	4	4	4	-
"	"	"	2	"	"	19-1333 TP	4	4	4	4-5	-
"	$(NH_4)_6Mo_7O_{24}.4H_2O$	"	8	"	"	13-4405 TP	5(darken)	4-5	4-5	4	-
"											
"	"	"	6	"	"	14-0636 TP	5	4	4	4	-
"	"	"	4	"	"	17-1353 TP	5	4	4	4	-
"	"	"	2	"	"	18-1248 TP	5	5	4-5	4	-
"	$MnSO_4$	"	8	"	"	14-1210 TP	4-5	4	4-5	4-5	-
"	"	"	6	"	"	17-1328 TP	4	4-5	4	4	-
"	"	"	4	"	"	18-1030 TP	4	4	4-5	4-5	-
"	"	"	2	"	"	18-1142 TP	4-5	4	3-4	4	-
"	$CuCl_2$	"	8	"	"	16-1118 TP	4-5	4	4-5	4	-
"	"	"	6	"	"	17-1019 TP	4	4	4	4	-
"	"	"	4	"	"	18-1222 TP	4	4	4	4	-
"	"	"	2	"	"	19-1121 TP	4	4-5	4	4	-
"	Na_2CrO_4	"	8	"	"	11-1122 TP	4	4-5	4	4	-
"	"	"	6	"	"	16-1336 TP	4-5	4	4-5	4	-
"	"	"	4	"	"	18-1230 TP	4	4	4	4	-
"	"	"	2	"	"	18-1242 TP	4	4	5	5	-
"	$AgNO_3$	"	8	"	"	18-1222 TP	5(darken)	3	3-4	3-4	-
"	"	"	6	"	"	19-1121 TP	5(darken)	3	3-4	4	-
"	"	"	4	"	"	19-1118 TP	5(darken)	3	3-4	4	-
"	"	"	2	"	"	19-1118 TP	5(darken)	3-4	4	4	-
"	$ZnSO_4$	"	8	"	"	16-0945 TP	4-5	4-5	4-5	4-5	-
"	"	"	6	"	"	14-1031 TP	5	4-5	4-5	4-5	-
"	"	"	4	"	"	17-1340 TP	4-5	4-5	4-5	4-5	-
"	"	"	2	"	"	18-1142 TP	5	4-5	4	4	-

"	$K_2Cr_2O_7$	"	8	"	"	16-1432 TP	4	4	4	4	-
"	"	"	6	"	"	18-1030 TP	4-5	3-4	4	4	-
"	"	"	4	"	"	18-1235 TP	4	4	4	4-5	-
"	"	"	2	"	"	18-1142 TP	5	4-5	4-5	5	-
"	$Cd(NO_3)_2$	"	8	"	"	17-1047 TP	4	4	5	5	-
"	"	"	6	"	"	15-0927 TP	4	4	4	4	-
"	"	"	4	"	"	17-1340 TP	4	4-5	4-5	4-5	-
"	"	"	2	"	"	18-1244 TP	4-5	4-5	4-5	4-5	-
"	$NiCl_2$	"	8	"	"	17-1340 TP	4	4	4	3-4	-
"	"	"	6	"	"	16-1443 TP	4-5	4	4	4	-
"	"	"	4	"	"	13-0922 TP	4	4	4	4	-
"	"	"	2	"	"	16-1334 TP	4-5	4	4	4-5	-

Table 2. The results of fast analyses and colour codes of dyed feathered-leathers

Dyeing method	Mordant	Flotte ratio	pH	Bath temp. (°C)	Dyeing period (hr)	Colour code	light fast	Crocking Moist	fasts dry	Washing fast	Hypo-chloride fast
Together mord	$FeSO_4.12H_2O$	0.01	45	35-40°	1	12-1007 TB	4	4-5	5	4-5	-
"	"	"	2	"	"	13-3803 TB	4-5	5	5	5	-
"	$SnCl_2$	"	4.5	"	"	12-0817 TB	5	4-5	5	5	-
"	"	"	2	"	"	12-0722 TB	5	5	5	5	-
"	$AgNO_3$	"	4.5	"	"	19-1230 TB	5(darken)	3-4	4	3-4	-
"	"	"	2	"	"	13-1405 TB	5(darken)	4	4	3-4	-
"	$K_2Cr_2O_7$	"	4.5	"	"	12-1305 TB	5	4-5	5	4	-
"	"	"	2	"	"	12-1304 TB	5	5	5	4	-
"	$KAI(SO_4)_2.12H_2O$	"	4.5	"	"	12-1009 TB	5	4-5	5	4	-
"	"	"	2	"	"	12-913 TB	5	5	5	5	-
"	$MnSO_4$	"	4.5	"	"	14-1509 TB	4	4	5	4	-
"	"	"	2	"	"	12-1107 TB	4-5	4	5	4-5	-
"	$NiCl_2$	"	4.5	"	"	11-251 TB	4	4	5	4	-
"	"	"	2	"	"	12-2905 TB	4-5	4	5	4-5	-
"	$Al(NO_3)_3$	"	4.5	"	"	11-1306 TB	5	5	5		-
"	"	"	2	"	"	12-1304 TB	5	5	5	4-5	-
"	$CoCl_2.6H_2O$	"	4.5	"	"	12-1305 TB	4	4-5	5	4-5	-
"	"	"	2	"	"	13-1408 TB	4-5	4-5	5	4-5	-
"	$(NH_4)_6Mo_7O_{24}.4H_2O$	"	4.5	"	"	12-0915 TB	5(darken)	4	4-5	4-5	-
"	"	"	2	"	"	12-1022 TB	5(darken)	4	4-5	5	-
Pre-mord.	$FeSO_4.7H_2O$	"	4.5	"	"	12-1404 TB	5(darken)	4-5	4		-
"	"	"	2	"	"	13-3803 TB	5(darken)	4-5	4	4	-
"	$SnCl_2$	"	4.5	"	"	12-0911 TB	5	4	5	5	-
"	"	"	2	"	"	13-0941 TB	5	4-5	5	5	-
"	$AgNO_3$	"	4.5	"	"	19-1118 TB	5(darken)	3-4	5	3-4	-
"	"	"	2	"	"	19-1217 TB	5(darken)	4	5	3-4	-
"	$K_2Cr_2O_7$	"	4.5	"	"	11-2309 TB	4	4	4	4	-
"	"	"	2	"	"	11-2409 TB	4-5	4-5	4	4	-
"	$KAISO_4.12H_2$	"	4.5	"	"	12-0915 TB	4-5	5	5	5	-
"	"	"	2	"	"	11-2409 TB	4-5	5	5	5	-
"	$MnSO_4$	"	4.5	"	"	13-2004 TB	4	4	4	4-5	-
"	"	"	2	"	"	12-1304 TB	4-5	4-5	4-5	4-5	-
"	$NiCl_2$	"	4.5	"	"	16-1520 TB	4-5	4	4	4	-
"	"	"	2	"	"	14-1312 TB	4-5	4	4-5	4	-
"	$Al(NO_3)_3$	"	4.5	"	"	12-0917 TB	5	4	5	5	-
"	"	"	2	"	"	14-1219 TB	5	4-5	5	5	-
"	$CoCl_2.6H_2O$	"	4.5	"	"	13-1406 TB	4	4	4-5	4	-
"	"	"	2	"	"	12-0822 TB	4	4-5	4-5	4	-
"	$(NH_4)_6Mo_4O_{27}.4H_2O$	"	4.5	"	"	12-1009 TB	4-5(darken)	4	5	4-5	-
"	"	"	2	"	"	12-0804 TB	4-5(darken)	4-5	5	4-5	-

Table 3. Results of fast analyses and colour codes of dyed cotton

Dyeing method	Mordant	Flotte ratio	pH	Bath temp. (°C)	Dyeing period (hr)	Colour code	light fast	Crocking Moist	fasts dry	Washing fast	Hypo-chloride fast
Together	$FeSO_4.7H_2O$	0.01	7	90	1	16-0518 TB	5 darken)	4-5	5	4-5	-
"	"	"	4	"	"	15-0318 TB	5(darken)	4-5	5	4-5	-
"	$SnCl_2$	"	7	"	"	13-0941 TB	5	5	5	5	-
"	"	"	4	"	"	14-0850 TB	5	5	5	5	-
"	$AgNO_3$	"	7	"	"	19-1230 TB	5(darken)	3-4	3-4	2-3	-
"	"	"	4	"	"	19-1235 TB	5(darken)	3-4	4	3	-
"	$K_2Cr_2O_7$	"	7	"	"	13-1016 TB	4-5	4	4	4	-
"	"	"	4	"	"	14-1119 TB	4-5	4-5	4	4	-
"	$KAI(SO_4)_2.12H_2O$	"	7	"	"	14-0850 TB	5	4	4-5	4	-
"	"	"	4	"	"	14-0846 TB	5	4	4-5	4	-
"	$MnSO_4$	"	7	"	"	13-1013 TB	4	4	4	4	-
"	"	"	4	"	"	13-1040 TB	4-5	4	4	4	-
"	$NiCl_2$	"	7	"	"	12-0921 TB	4-5	4	4-5	4	-
"	"	"	4	"	"	14-1113 TB	5	4	4-5	4-5	-
"	$Al(NO_3)_3$	"	7	"	"	12-846 TB	5	4	5	4-5	-
"	"	"	4	"	"	13-0947 TB	4-5	4	4	4	-
"	$CoCl_2.6H_2O$	"	7	"	"	14-1118 TB	4-5	4	4	4	-
"	"	"	4	"	"	16-1331 TB	5(darken)	4	4-5	4-5	-
"	$(NH_4)_6MoO_{24}.4H_2O$	"	7	"	"	15-1231 TB	5(darken)				
"	"	"	4	"	"	15-1142 TB	5(darken)	4	4	4	-
Pre-mord.	$FeSO_4.7H_2O$	"	7	"	"	16-0713 TB	5(darken)	4	4	4	-
"	"	"	2	"	"	17-0627 TB	5(darken)	3-4	3-4	3	-
"	$AgNO_3$	"	7	"	"	12-0727 TB	5(darken)	3-4	3-4	3	-
"	"	"	2	"	"	13-0858 TB	4-5	4	4-5	4-5	-
"	$K_2Cr_2O_7$	"	7	"	"	17-1422 TB	4-5	4-5	4	4-5	-
"	"	"	2	"	"	18-1321 TB	5	4-5	5	4-5	-
"	$KAI(SO_4)_2.12H_2O$	"	7	"	"	14-1210 TB	5	4	4	4-5	-
"	"	"	2	"	"	14-1127 TB	5	4	4	4-5	-
"	$MnSO_4$	"	7	"	"	14-1220 TB	5	4	4	4-5	-
"	"	"	2	"	"	13-0941 TB					
"	$NiCl_2$	"	7	"	"	16-0952 TB	5	4	4	4	-
"	"	"	2	"	"	14-1113 TB	5	4	4	4	-
"	$Al(NO_3)_3$	"	7	"	"	15-1237 TB	5	4	5	4	-
"	"	"	2	"	"	14-1113 TB	5	4-5	4-5	5	-
"	$CoCl_26H_2O$	"	7	"	"	18-1248 TB	4	4	4	4	-
"	"	"	2	"	"	15-1050 TB	4	4-5	4-5	4-5	-
"	$(NH_4)_6Mo_7O_{24}.4H_2O$	"	7	"	"	14-1041 TB	5(darken)	4	4	4	-
"	"	"	2	"	"	14-1112 TB	5(darken)	4	4	4	-
Unmordant-	-	"	5	"	"	13-1013 TB	4	4	4	4-5	-

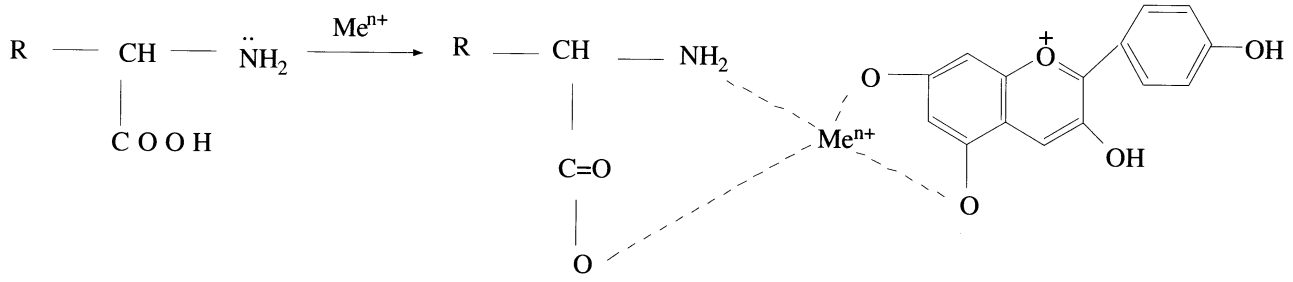
Molecules of wool consist of amino acid units. Proteins are formed from amino acids which contain free amino and carboxyl groups. Therefore, wool can be considered as an amphoteric compound. During the dyeing of the wool, a hydrogen bond occurs between the dyestuff and the amino groups of the wool[6] Diagram 1.

$$+ - - - - - - - - - - \quad \text{Y: Wool molecule}$$
$$Y - NH_3 \qquad OO - Bo \quad \text{BoOO: Dyestuff}$$

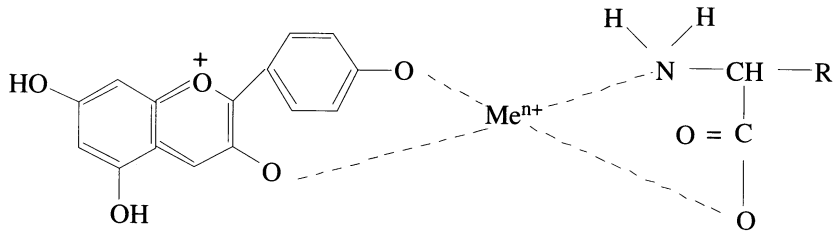
Diagram 1.

Mechanism of pre-mordantation (1), together mordantation (2) and last mordantation (3) can be considered as given in diagram 2.

(1) Wool – – – – – Mordant – – – – – Dyestuff
(Me^{n+})



(2) Dyestuff – – – – – Mordant – – – – – Wool



(3) Wool – – – – – Dyestuff – – – – – Mordant

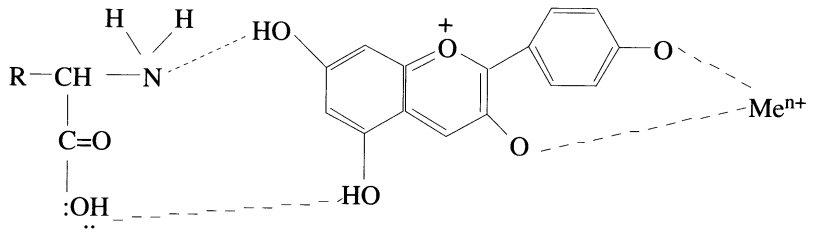


Diagram 2.

Vegetative dyestuff must have oxochrome groups in order to obtain good results in dyeing: Pelargonidin has four oxochrome groups. These groups cause stable complex compounds to from the woollen strips and cotton. These are inner complex. Also a new mordant mixture (urea+NH_3 + $Na_2C_2O_4$) was found for wool dyeing. In this study the dyeing specificity for wool, feathered-leather and cotton were investigated for a wide pH range using transition element's salts for the first time.

In the dyeing of woollen strips, feathered-leather and cotton, the best results were obtained from the pre-mordantation method at acidic value ($pH < 5$). The woollen strips were kept in mordant solution (50 ml 3% NH_3 +0.2 g of urea+ 0.3 g of $Na_2C_2O_4$) for 24 h. After dyeing, the colour obtained did not fade with the strong fadings techniques such as NaOCI and sunbeam. Some samples dyed with $AgNO_3$, $FeSO_4$, $(NH_4)_6Mo_7O_{24}.4H_2O$ darkened during the sunbeam analyses.

In the dyeing of the feathered-leather at a higher acidic values (PH=6,7,8.) didn't result in chemical bonding because of the low temperature ($35° - 40°$ C). Thus, the most effective pH values were determined as 4.5 and less.

In the dyeing of cotton, the most effective pH values were determined as 7, 4 and 2. Dyeing did not give desired results of PH=8 or higher. This result showed that the chemical bond or bonds do not occur between dyestuff and glucoside units in this range.

Desirable results were obtained from the dyeing of feathered-leather. The result of this work has economic potential in the leather industry. In addition the surface of the leather was dyed almost the opposite colour of the feathered surface.

For example:

pale brown	leather surface	dark brown	feathered surface

Cotton contains 90% Cellulose. The cellulose molecule is a linear polimer of 1,4- β-D glucose (diagram 3)[6].

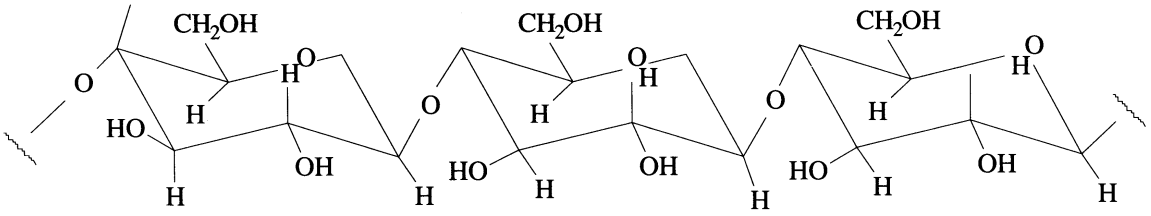


Diagram 3.

Cotton is dyed without using any mordant. When mordant was used a lot of of colour tones except for red were obtained. The mechanism of dyeing can be considered as below (diagram 4).

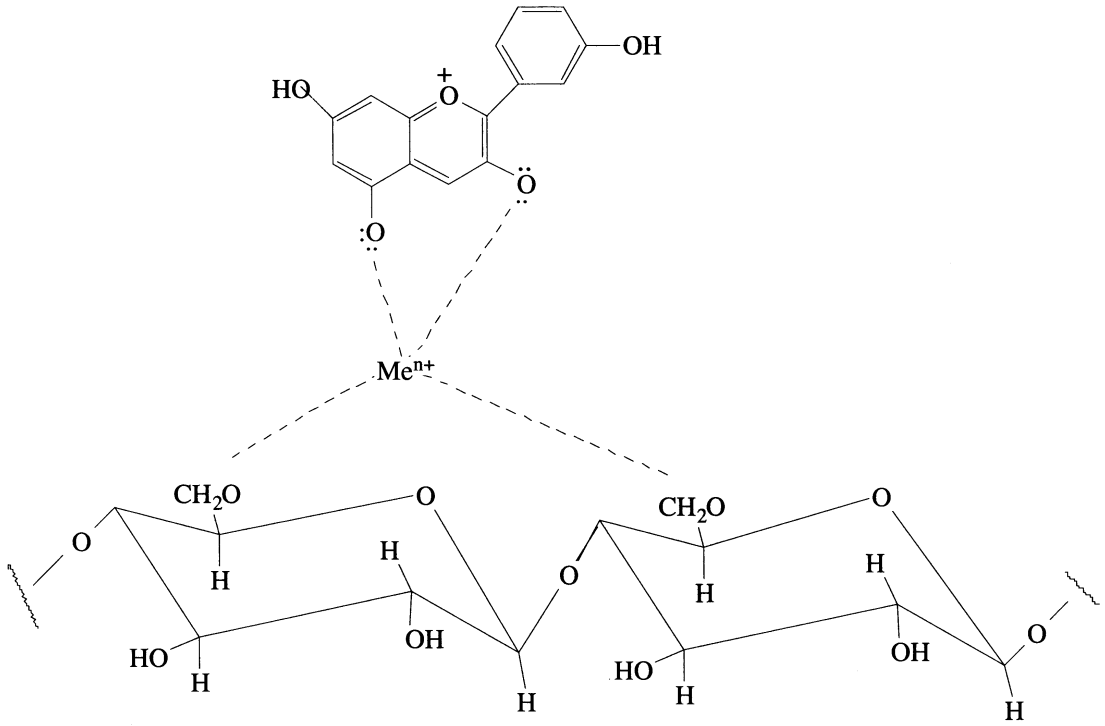


Diagram 4.

From the dyeing of wollen strips 150 different colours or colour- tones were obtained. These methods can be applied in the textile industry. In particular these dyed samples can be used in the weaving of carpets and kilims. Their durability, after seeing the museum pieces, could be decided to be about 400 years.

Commercial Approach

Onion is a nutrient which is consumed daily. Its skin is not used for any purpose. If it were used to obtain dyestuff, it would probably be an important raw material in terms of commerical use.

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