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Possibility of Intensive Dyeing of Cotton Fabric with Natural Dyes

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Abstract: *The rapid growth of the population in the country and in the world has a significant negative pressure on the environment of the world. The problem of providing human beings with necessary goods of life gives a rise to global problem which associated with saving natural resources, as well as problems related to the environment and human health.*

Keywords: silk fabrics, sheet and fruits of the elderberry black, intensity of the colour, color tone, toughness of the coloration, natural dye staffs, etched .

Introduction: During the global economic crisis enterprises of real sector put a goal to increase the value of the technologies that increases the production of exportable goods with a sharp reduction in their production costs. In the dynamic of development of textile industry in order to solve such pressing issues the implementation of new resource-saving technologies that meet the economic and environmental needs for the present days is required.

One of such technology is dyeing fabrics with natural dyes obtained from the waste of fruit and leaves of plants. In order to improve the economic performance of the dyeing process, we investigated the possibility of intensifying it by loosening cotton fiber structure, as well as more efficient use of natural dye substances through its additional fixation on the fiber of bi functional substances. Previously, these techniques have been used with positive results in a continuous dyeing silk reactive dyes [1,2].

Analyses: It is known that the rate of diffusion of dye into the micro porous structure of the polymeric substrate depends on the nature of the polymer and its super molecular structure. The density of the fiber structure provides strategic decreasing in moving dye molecules, the presence of active centers of the fiber acts slowing due to sorption to these active centre's.

In the last years of scientific information sources it is indicated that the intensification of the dyeing process as a whole is achieved by loosening the fiber structure by activating its physical, biological, or chemical methods [3]. We have studied the last two options.

Under the influence of the above options an increase in the permeability of the fibers due to swelling or plasticizing by partial break - linking of the polymer macromolecules is happened. These effects should be reversible otherwise the performance properties of the fabric are deteriorated.

Another option is increasing the efficiency of dyeing process which is additional covalent fixation of the dye adsorbed bifunctional substance introduced into the dye bath.

Recommendation: Researches have shown that dyes of different plants are compounds of containing multiple active hydroxyl groups as cellulose cotton fiber. While creating the necessary conditions for dyeing, there is possibly to happen the formation of cross-links between the dye and the cellulose by bi functional agents.

In this research work the possibility of intensification of the dyeing process of the actual textile fabric of our country as a cotton fabric with natural dyes obtained on the basis of broth pomegranate peel, a plant that is widely distributed in various regions of the country has been investigated.

Initially, the influence of nature and concentration of the mordant and electrolytes used in the broth, the intensity of color in dyeing of cotton fabric was investigated. Broth concentration of 10% by weight of the fabric.

Table 1

The impact of nature mordant on the color intensity, in dyeing cotton fabric in a broth of water and electrolyte solutions

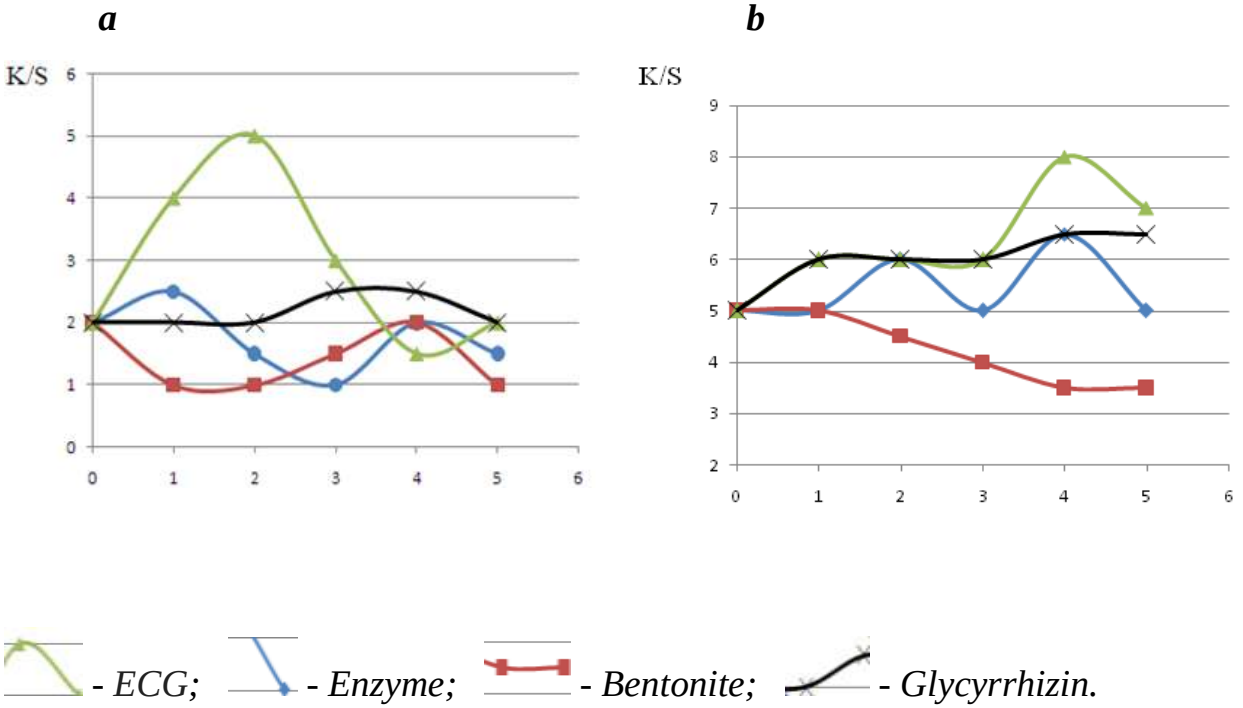
(Mordant concentration 2.5 % by weight of fabric)

Broth in a solution / Prograsses	Na_3PO_4 5g/l	NaCl 5g/l	Na_2SiO_3 5g/l	H_2O
Without a prograss	5	11	6	2
$CuSO_4$	9	8	11	12
$K_2Cr_2O_7$	17	19	16	14
$Al_2(SO_4)_3$	5	9	7	7
$Fe_2(SO_4)_3$	7	7	6,5	5

The table shows that in dyeing cotton fabric without etched color intensity (K / S) for all investigated electrolytes used for the extraction of the coloring material is higher than for the water decoction, to Na_3PO_4 and Na_2SiO_3 color intensity above 1,8 - 2 times, and for NaCl 3,7 times. This indicates the effect of intensifying the salts in the allocation of plant dyes. When dyeing stained samples of broth the change of color intensity is approximately at the same level, but for all infusions mordant color deepens and this depends on the nature of the metal.

Later, a comparative studying of the influence of stain concentration in % by weight of fabric of from 0 to 5 for dyeing in an aqueous broth and in broth obtained 5 g/l Na_3PO_4 broth concentration of 10% by weight of the fabric was carried out. According to studies for the concentration of mordant $CuSO_4$, $K_2Cr_2O_7$, $Al_2(SO_4)_3$ can be recommended 1-2% of the fabric weight, and for $Fe_2(SO_4)_3$ can be increased to 5% by weight if required black color.

During the research the study of the influence of various textile substances (TIA) which were added into the dye bath in an amount of from 1 to 5 g/l in the aqueous broth *(a)*, as well as in broth with added Na3PO4 electrolyte at a concentration of 5 g/l *(b)* (Figure-1).



(a) *TIA concentration of 1 to 5 g/l*

(b) *TIA concentration of 5 g/l*

Fig.1. Influence of concentration on TIA intensity of color during dyeing in an aqueous broth and in broth with Na_3PO_4 5 g/l

As it is seen from the picture in the case of an aqueous decoction and decoction with Na_3PO_4 some intensifying effect is chloroethanol (ECG), glycerol and the enzyme. For ethylene concentration can be offered 4.2 g/l for glycerol 2.3 g/l for the enzyme 1 and 4 g/l. Among all tested researches TIA is stated as chloroethanol, we suggest that the systematic study of the use of it can renounce the use of mordents. This gives the possibility of recommending environmentally friendly technology of dyeing of cotton fabric without etched [4].

Conclusion: Comparative physical and mechanical characteristics of white cotton fabric treated with a solution with a concentration of TIA 3 g/l, colored samples showed that the breaking load and elongation at break for all the treated samples is higher than the original white cloth. Air permeability is somewhat reduced for white and processed ethylene, enzyme and bentonite samples in dyeing, others retain the value of the original tissue.

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