

## **COTTON AND WOOL DYEING WITH BIXIN AND NORBIXIN: EXTRACTED BY ATOMIZATION AND DYNAMIC ANNATTO MACERATION.**

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### **EXTENDED ABSTRACT**

**Key Words:** Dyeing; bixin; norbixin; atomization; dynamic maceration; annatto

### **1. INTRODUCTION**

Currently known that synthetic dyes have shown carcinogenic effects and produce allergies and damage to the skin, which seeks to replace them with natural dyes, such as annatto, which is exempt from certification and does not damage to health [1]. The Annatto is a carotenoid which has pigment and dyestuff, hence their differentiation, a pigment is "a colored and finely divided substance that gives color to other materials, this does not dissolve but it is dispersed or suspended in the liquid", in change are the "colored substances that are dissolved in liquids and impart their color materials to be absorbed" [2]. The main seeds of annatto carotenoid pigments are bixin and nor-bixin, its colours varied between yellow and red, are used in "food, drug and cosmetic industry" [3]; bixin which is the part liposoluble and the norbixin is the water-soluble portion, the pigment is insoluble in water and slightly soluble in chloroform, vegetable oils, ethyl acetate and propylene glycol [1]; while the dye is dissolved in water, alcohol, or ether, becoming an orange solution [4]. Most of the 80% of the total pigments in the layer of annatto seeds consists of the carotenoid bixin, 6-methyl hydrogen 9'-cis-6,6'-diapocaroteno-6,6'-dioato [5]; for the FAO CIS-Bixin is: Methyl (9-cis) - hydrogen-6, 6' - diapo - $\Psi$ , $\Psi$ -carotenoid[6]; boiled in a solution of alkali bixin, a methanol molecule is formed and a salt di potassium it produces acid by acidification, di basic Norbixin C<sub>24</sub> H<sub>28</sub> O<sub>4</sub>, water soluble carotenoid pigment [1].

This research proposes establishing dyeing and fastness tests into the fabric of cotton and 100% pure wool, using pigment and dyestuff (bixin and norbixin) extracted from the seeds of Annatto or annatto, dynamic maceration process, and by means of atomization and Rotary evaporator separated by precipitation with (OH) K and (OH) Na 50% 1/1 ratio (Gram stain / mL of alkali).

### **2. MATERIALS AND METHODS**

**2.1 Materials:** Cotton and wool fabric. annatto seeds of two trees with different capsules (green and red) of the province of Los Ríos, Sector Fumisa, Ecuador, and seeds of the province of Tsáchilas. Chemical reagents: (H<sub>2</sub>O<sub>2</sub>) - (NaOH) - (KOH) - (Na<sub>2</sub>CO<sub>3</sub>) - (CH<sub>2</sub>O<sub>2</sub>)

**Equipment:** Atomizer B-290 Mini Spray Dryer of Buchi and Rotavapor.

## 2.2 Extraction Methods

Proceeds to take samples of annatto seeds of two trees with different capsules (green and red) of the province of Los Ríos, Sector Fumisa, Ecuador, and seeds of the province of Tsáchilas. Different extraction methods of bixin and norbixin of annatto (*Bixa orellana* L.) were used according to references [7].

## 2.3 Dyeing Process

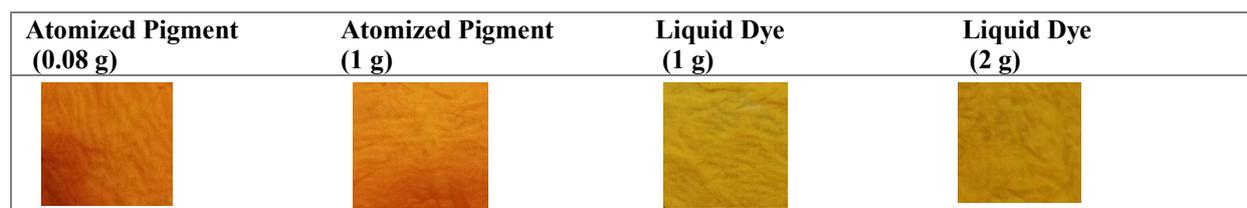
The cotton fabric was placed in a flask containing 300 mL distilled Water, R/B 1/30. The temperature was raised according to the dyeing curve to 70 ° C; The atomized Pigment was used between 0.08 to 1g (plus 3 replicates) and liquid dye between 1 and 2 Gr. (plus 2 repetitions), for 30 min at 90° C, then added 12 g of Salt, 1.50 g of Carbonate, 0.60 g of Sosa Caustic, 0.90 acetic Acid, every 5 min and it was kept at 90° C, then the sample was rinsed.

The wool specimen was placed in a beaker with 300 ml distilled Water, R/B 1/30 The temperature was raised according to the dyeing curve at 50° C; After the atomized Pigment was used in 0.08 g (4 replicates) and liquid dye 1 g. (4 replicates), for 30 min at 90° C, then 0.09 g of Formic Acid was added; And it was kept at 90° C, then the sample was rinsed.

Color fastness tests for cotton and wool are defined by ISO 105 C06. WAsing was carried out at 40° C.

## 3. RESULTS

The results of the liquid Dye and atomized Pigment identified in each piece are shown in the illustration below.



**Figure 1.** Test Results of dyeing in Cotton 100% with Bixin and Norbixina



**Figure 2.** 100% Wool dyeing test Results with Bixin and Norbixina

**Table 1.** Color fastness tests for cotton and wool

<b>MATERIAL</b>	<b>ATOMIZED POWDER 0,08 g</b>	<b>ATOMIZED POWDER 0,16 g</b>	<b>LIQUID 2g</b>	<b>POWDER 0,08 g</b>	<b>ROTAVAPOR LIQUID 2 g</b>	<b>ROTAVAPOR LIQUID 1g</b>	<b>ROTAVAPOR LIQUID 0,5 g</b>
<b>WOOL (Wo)</b>	4/5	4/5	5	5	5	5	4/5
<b>COTTON (Co)</b>	2/3	2	3/4	2/3	4	4/5	4/5
<b>Degradation</b>	3/4	3/4	4	4/5	4	4	5

#### 4. CONCLUSIONS

Staining is observed with the atomized pigment that does not present uniformity in the contour of the tissue more still detects differentiating parts of tone, the rinse did not find an exaggerated variation of pigment as waste. Gender tinted with pigment presents greater whole approaching orange in contrast fabric dyeing with coloring liquid sample a light yellow color, has been coloring in low proportion. Color fastness tests for cotton and wool shows a considerable degradation and that cotton is the fabric which catches easily the dye.

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