



**ETHNOBOTANICAL INVESTIGATION OF TRADITIONAL NATURAL DYES  
(CASE STUDY: MARKAZI PROVINCE OF IRAN)**

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**ABSTRACT**

Ethnobotany is study of human behavior in a particular culture and of the use of local plants. Ethnobotanical studies have drawn increasing attentions in the food and drug industry. Therefore, the present study aimed to investigate ethnobotany of the traditional natural dyes in Markazi Province of Iran. The study included volunteer factories, groceries (medicinal herbs sellers), and lower class people in the province. Data were collected using a questionnaire, and then analyzed using SPSS version 20 software. Results showed that 26.6% of the groceries and 75% of the people obtained dyes of natural sources. Leaves, fruit, stems, flowers, seed, roots, bark and rhizome were the most preferred parts of the plants for production of the dyes, respectively. Boiling of plants were dominant approach among the groceries and soaking was among people and factories for the production of dyes. Plants dyes were mostly used for foods among the people, for hair coloring in the groceries, and for production of antiseptic mouthwashes in the factories. Henna and saffron have been most used to produce color by people and groceries. It seems that use of natural dyes is more prevalent in the groceries in Markazi province of Iran, while the people and factories are less interested in these dyes.

**KEY WORDS:** Ethnobotany, Markazi Province, Natural Dye, Henna, Saffron



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## INTRODUCTION

Artificial dyes are valued for their relatively cheaper prices, bright colors and abundance. However, artificial dyes are also recognized for their toxicity, contribution to environmental pollution and for their carcinogenic properties and can cause allergic reactions in humans<sup>1</sup>. At the same time, Dyes derived from plants have an extensive history of use for enhancing food and clothing in communities worldwide<sup>2</sup>. Natural dyes are recognized for their lower toxicity for both humans and the environment as well as being resilient to washing and fading. Recently, there has been an increasing interest in the herbal dyes as the consumers have become aware of the ecological and the health related problems associated with the synthetic dyes. Throughout history, natural colorants have played a major part in economic and cultural exchanges between nations<sup>3,4</sup>. Natural dyes can be sorted into three categories: natural dyes obtained from plants, animals and minerals<sup>5,6</sup>. In this regard, Ethnobotany is the scientific study of the relationships between humans and plants<sup>7,8</sup>. Ethnobotanical knowledge encompasses both wild and domesticated species, and is rooted in observation, relationship, needs, and traditional ways of knowing. From different parts of plants such as flowers, bark, seeds, roots, etc. can be used in the manufacture of paints. It is interesting to note that over 2000 pigments are synthesized by various parts of plants, of which only about 150 have been commercially exploited<sup>6</sup>.<sup>9</sup> Significant work on ethnobotany has been done during the last few decades in Iran, although much has been published from the various parts of the country, yet Markazi Province lagged behind.

## MATERIALS AND METHODS

This study was performed on groups belong to dying industry, grocery and people in the Markazi Province, Iran. Markazi lies in western of Iran also its capital Arak and its population is estimated at 1.41 million and covering an area of 29,127 km<sup>2</sup>. A questionnaire was used to collected information. Questionnaires were distributed among dying industry, grocery and people in the Markazi Province. General information was collected from pigmented plants which they are using in the manufacture of dyes. After completing the questionnaires, SPSS version 20 was used for analysis of raw data.

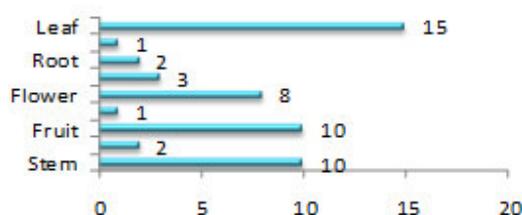
## RESULTS

Consumer's descriptive statistics of natural colors were given in Table 1, as can be seen; the largest consumers of natural dyes are grocery, dying industry, people and factories, respectively. According to results, it was found that Plants, metal elements and insect were most used sources for dyes. Dye plant sources reported in table 2, these information included Latin name (botanical name), local name, habit, family, part used and consumers. Among of metals, titanium dioxide was found in use of dye production in chewing gum. Flowers of eight plant species, roots of two plant species, leaves of fifteen plant species, seeds of three plant species, stem of ten plant species, fruits of ten plant species, bark of one plant species, branch of two plant species and rhizome of one plant species were found in use of the locals for coloring purposes (Figure. No. 1). Gramineous and Shrubs (28.8) dominate the reported plant species followed the trees (20), Herbs (17.1) and 5.7% climber (Figure no.2). Thirty families were reported from the study area, Fabaceae was the most common used families with three elements (Figure no. 3).

**Table 1**  
**Consumer's descriptive statistics of natural colors**

Groups	Frequency	Using of natural dyes	percentage
People	40	30	%75
Factory	15	4	%26.6
grocery	40	40	%100
dying industry	11	11	%100

**Figure 1**  
**Dye yielding plant parts representation**

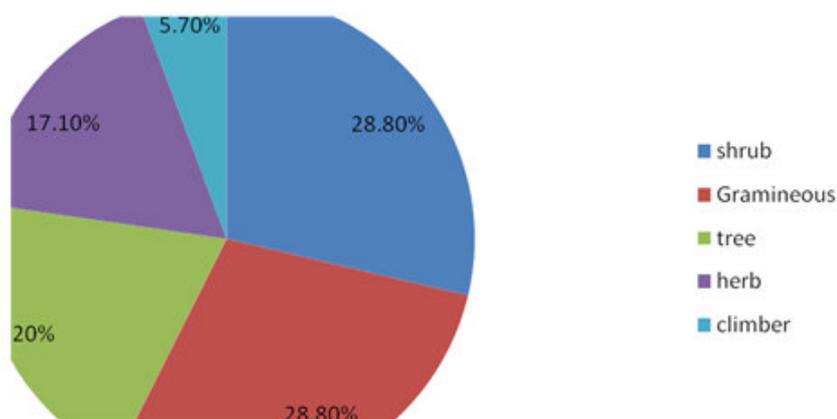


**Table 2**

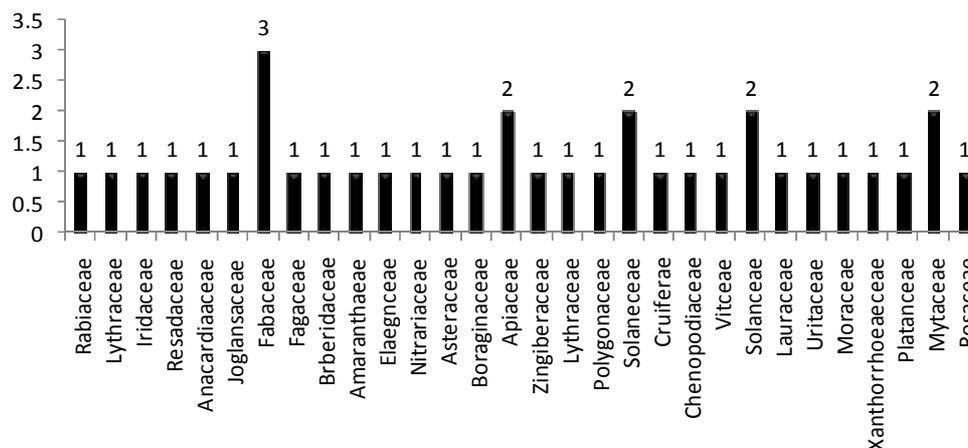
**Enumerations of the dye yielding plant diversity**

S.No	Latin name	Local Name	Habit	Family	Part Used	Consumers
1	<i>Rubia tinctorum</i>	Madder	Herb	Rubiaceae	Root	grocery, dying industry and people
2	<i>Lawsonia inermis</i>	Henna	Shrub	Lythraceae	Leaf	grocery, dying industry and people
3	<i>Crocus sativus</i>	Saffron	Gramineous	Iridaceae	stigma	grocery, dying industry, people and factories
4	<i>Reseda luteola</i>	Reseda	Gramineous	Resedaceae	Stem, Leaf, Flower	dying industry
5	<i>Rhus coriaria</i>	Sumach	Shrub	Anacardiaceae	Fruit,Seed, Leaf	dying industry
6	<i>Juglans regia</i>	Walnut	Tree	Juglandaceae	Exocarp	grocery, dying industry and people
7	<i>Indigofera tinctoria</i>	Woad	shrub	Fabaceae	Leaf	dying industry
8	<i>Quercus infectoria</i>	Oak	Tree	Fagaceae	Fruit,Stem	dying industry
9	<i>Berberis vulgaris</i>	Barberry	shrub	Berberidaceae	Root,Stem	Dying industry and people
10	<i>Spinacia oleracea</i>	Spinach	herb	Amaranthaceae	Leaf	dying industry, people and factories
11	<i>Glycyrrhiza glabra</i>	Licorice	shrub	Fabaceae	Flower	dying industry
12	<i>Elaeagnus angustifolia</i>	Oleaster	tree	Elaeagnaceae	Leaf,Stem	dying industry
13	<i>Peganum harmala</i>	Harmel	herb	Nitrariaceae	Leaf,Stem,Seed	dying industry
14	<i>Onosma crocarnum</i>	Borage	Gramineous	Boraginaceae	Stem,Flower	dying industry and people
15	<i>Carthamus tinctorius</i>	Safflower	Gramineous	Asteraceae	Leaf, Stem,Flower	grocery, dying industry and factories
16	<i>Foeniculum vulgare</i>	Fennel	Gramineous	Apiaceae	Seed	dying industry
17	<i>Myrtus communis</i>	Myrtle	shrub	Myrtaceae	Leaf	dying industry
18	<i>Nerium oleander</i>	Oleander	shrub	Apocynaceae	Leaf,Flower	dying industry
19	<i>Rubus persicus</i>	Raspberry	shrub	Rosaceae	Leaf,Stem	dying industry
20	<i>Curcuma longa</i>	Glosbe	Gramineous	Zingiberaceae	Rhizome	grocery, dying industry, people and factories
21	<i>Punica granatum</i>	Pomegranate	tree	Lythraceae	Bark, Fruit	dying industry, people
22	<i>Rheum ribes</i>	Rheum	Gramineous	Polygonaceae	Flower	dying industry
23	<i>Daucus carota</i>	Carrot	herb	Apiaceae	Fruit	people and factories
24	<i>Lycopersicon esculentum</i>	Tomato	herb	Solanaceae	Fruit	people and factories
25	<i>Brassica oleracea</i>	Cabbage	Gramineous	Crucifera	Leaf	people
26	<i>Beta vulgaris var. esculenta</i>	Sugar beet	Gramineous	Chenopodiaceae	Fruit	people and factories
27	<i>Capsicum annum</i>	Paprika	climber	Solanaceae	Fruit	factories
28	<i>Cercis siliquastrum</i>	Judas	shrub	Fabaceae	Flower	dying industry
29	<i>Platanus orientalis</i>	Plane tree	tree	Platanaceae	Leaf	dying industry
30	<i>Aloe vera</i>	Aloe	herb	Xanthorrhoeaceae	Branch,Stem	dying industry
31	<i>Urtica dioica</i>	Nettle	Gramineous	Urticaceae	Stem	dying industry and factories
32	<i>Morus nigra</i>	Mulberry	tree	Moraceae	Fruit	people
33	<i>Cinnamomum zeylanicum</i>	Cinnamon	shrub	Lauraceae	Bark	people
34	<i>Eucalyptus camaldulensis</i>	Gum tree	tree	Myrtaceae	Leaf	dying industry
35	<i>Vitis vinifera</i>	Grape	climber	Vitaceae	Fruit	factories

**Figure 2**  
**Habit wise presentation of dye yielding plant species**



**Figure 3**  
**Family group representation of the reported plant species**



## DISCUSSION

In the human civilization, plants are used not only for the basic needs of life such as food, fiber, fuel, cloths and shelter but also as sources of natural dyes for dyeing clothes, design and painting. Natural dyes have played an important role in the ecological and cultural heritage of human civilizations<sup>10,11,12</sup>. A spectrum of beautiful natural colors ranging from yellow to black exists in the above sources<sup>13,14</sup>. Use of natural dyes have more advantages and less disadvantages over synthetic dyes in dyeing process. Advantages e.g. 1. The natural dyes are free from carcinogenic azo compounds. 2. It is easily available in the nature & used as antioxidant 3. Natural dyes are more ecofriendly than synthetic dyes. The synthetic dyes cause pollution, environmental hazards etc. Disadvantages e.g. 1. The process of natural dyeing is laborious and time consuming. 2. Natural dyes, which obtained from plants were dependent on growing season for actual colors. 3. Fibers such as cotton cannot be colored normally without mordant<sup>8,13,15,16</sup>. Results showed that 26.6% of the groceries and 75% of the people utilize dye from natural sources. Decoction of plants was dominant approach in the groceries and maceration of plants among in people and factories for the production of dyes. Natural dyes were mostly used for foods in the people, for hair coloring among the groceries, and for production of antiseptic mouthwashes

in the factories. Henna and saffron have been most used to produce color by people and groceries. Lawsonia (2-hydroxy-1, 4-naphthaquinone) a natural pigment present in the leaves of Lawsonia inermis has been used as a skin and hair dye since 1400 BC<sup>17,18</sup>. The concentration of lawsone in leaves varies from place to place depending upon many of the environmental factors and the highest quantity reported so far is about 1% of the dry mass<sup>17</sup>. In the last few decades a variety of biological activities related to lawsone have been reported such as macrophage-stimulating activity as a result of the movement of granulocyte macrophage colony stimulating factor<sup>19</sup>, antimicrobial activity<sup>20</sup>, hepatoprotective activity<sup>21</sup>, hypoglycemic activity<sup>22</sup>, anti-inflammatory, antipyretic and analgesic activities<sup>23</sup>. Saffron (*Crocus sativus* L.) belongs to the Iridaceae family. Its valuable dried spice that accumulates in the stigmas is widely used for coloring and flavoring many foods. It has a long medicinal history as part of traditional healing; several modern research studies have hinted that the spice has possible anticarcinogenic (cancer suppressing), anti-mutagenic (mutation preventing), immunomodulating, and antioxidant-like properties<sup>24</sup>. So, natural colors also have valuable effects. Finally it seems that use of natural dyes is more prevalent among the groceries in Markazi province of Iran, while the people and factories are less interested in these dyes.

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