Preliminary Study On Few Dye Yielding Plants of District Solan, Himachal Pradesh

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Abstract: - Natural dyes are the substances extracted from various parts of the plant like leaves, flowers, stem, bark, wood, roots, fruits/berry etc. to give colour to fiber, paper, cosmetics, wool, hair etc. These natural dyes are preferred over synthetic dyes due to health and environment as they are soft and eco-friendly. Himachal Pradesh which is a huge reserve of plant wealth can serve this purpose very well. Dye yielding plant can be utilized to contribute to the economy of the state. hence increasing the scope in various pharmaceutical, textiles, cosmetics, paper, ink and paint industries.

Key Words:— ***Natural dyes, textiles, herbal, synthetic dye.***

I. INTRODUCTION

History reveals that Chinese have recorded the use of dye stuff even before 2600 B.C. Herbal dyes were used to color clothing by mid 1800B.C. The invention of Indigo, the most important Indian natural dye is as old as textile making itself. The term dye includes natural dyes, synthetic dyes. Those colourants, obtained from animal and vegetables matters without processing is known as natural dye. On the other hand, synthetic dyes manufactured on commercial scale hazardous to human as well to environment. Some synthetic dyes produced carcinogenic substances also. First time Germany banned the use of synthetic dyes in 1996 and after that many of the countries including India works on production of natural dyes. Natural dyes are commonly available and because of their availability at cheaper cost there are within the reach of common man. India is well known for its plant wealth; in simple words we can say India is rich in plant biodiversity. It has a total geographical cover of 3,287,263 sq km. It comprises a large biodiversity covers from tropical to temperate region. Moreover out of 35 biodiversity hotspots of the world four are present in India.

In India approximately 45,000 plant species are present of which 17,500 are angiosperms; there are more than 450 plants that can yield dye (Siva, 2007). Himachal Pradesh has a total geographical area of 55,673 sq Km.

Himachal Pradesh is also very rich in plant wealth. There are several plants species those are used by the indigenous people for a variety of purposes like coloration of textiles, food, drugs and cosmetics. There are various plant species used for preparing dyes by Gaddi tribe of Himachal Pradesh (Singh & Kumar, 2000).

Solan district of Himachal Pradesh is located in the foot hills of lesser Himalayas. Solan town is located at 30.92'N 77.12'E. It has an average elevation of 1502 meter. District Solan is rich in ethno botanical plants including dye yielding plants. The purpose of present investigation is to study to find out the sources of natural dyes used by the local people.

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II. METHODOLOGY

2.1 Study area

The present study on dye yielding plants was carried out mainly in the Solan district of Himachal Pradesh. (Map1) The information regarding the utility, part used and other uses

of the plants in different activities was collected through the field survey those were conducted in Oachghat, Shakti nagar Jaunaji, Shilli, Arki, Darlaghat, Nauni, Chambaghat, Shamti, Dhrampur and people were met in their residential areas. In order to collect the primary data following methods have been followed:

2.2 Discussion method

Discussions were held with different people of the localities in the groups in their local language. All aspects of the plants that are used in dye yielding process were discussed. Data was collected by questionnaire, interviews and discussions (Table1).

2.3 Field survey method

Extensive field surveys were conducted for the collection of

Plant specimens were photographed and sample of some plants were collected from the field. Local names were obtained from the informant and the species were further identified by using secondary sources. The secondary data was collected from libraries or research organizations, institutions, journals (Hooker f., 1872-1897, Singh,G.S.1999), magazines and internet sources.

data. Field surveys were held during the month of February to June 2018. The knowledgeable person was engaged with us to locate the sites where these plants were present.

During the investigation, the villagers and the people of different communities of the area were interviewed.

The collected information is about the particular season for collection of plants and their plant parts used for dye yielding purpose.

Table.1. Profile of the informants of some villagers of Solan district.

Sr.No.	Name	Sex	Age	Profession	Village
1.	Omkar Sharma	Male	46	Employee	Shaktinagar
2.	Premlata	Female	41	Farmer	Shaktiangar
3.	Neena Thakur	Female	39	Farmer	Nauni
4.	Virender Singh	Male	45	Farmer	Jaunaji
5.	Radha	Female	44	Farmer	Shilli
6.	Kadshi devi	Female	67	Farmer	Darlaghat
7.	Achru singh	Male	54	Farmer	Dharampur
8.	Leela Devi	Female	44	Employee	Shamti
9.	Ramkali	female	45	Farmer	Darlaghat
10.	Kirpa Ram	Male	69	Farmer	Dharampur
11.	Geeta	Female	35	Teacher	Arki
12.	Sushma Devi	Female	45	House wife	Oachghat
13.	Savitri Devi	Female	47	Farmer	Chambaghat

Table.2. List of dye yielding plant in Solan district of Himachal Pradesh.

Sr.No.	BOTANICAL NAME	LOCAL NAME	FAMILY	PART USED
1.	*Acacia Catechu* Willd.	Khair	Mimosaceae	Bark
2.	*Adathoda vasica* L.	Adusa	Acanthaceae	Leaves
3.	*Aegle marmelos* (L.) Correa.	Bael	Rutaceae	Fruit Rind
4.	*Bauhinia purpurea*(L.) Benth.	Kachnar	Fabaceae	Flower
5.	*Berberis vulgaris* L.	Kashmal	Berberidaceae	Roots/Stem
6.	*Bombax ceiba* L.	Semal	Bombaceae	Flower
7.	*Curcuma longa* L.	Haldi	Zingiberaceae	Rhizome
8.	*Grevillea robusta* A.Cunn. ex R.Br	Silver oak	Proteaceae	Leaves
9.	*Hibiscus rosa-sinensis* L.	Gudhal	Malvaceae	Flower
10.	*Juglans regia* L.	Akhrot	Juglandaceae	Leaves
11.	*Lawsonia inermis* L.	Mehandi	Lythraceae	Leaves
12.	*Mangifera indica* L.	Aam	Anacardiaceae	Bark/Leaves
13.	*Phyllanthus emblica* L.	Amla	Euphorbiaceae	Fruits/Bark
14.	*Prunus persica*(L.) Batsch	Adoo	Rosaceae	Leaves/Root/Bark
15.	*Punica granatum* L.	Daru	Punicaceae	Fruit rind/Flower
16.	*Syzygium cumini* (L.) Skeels	Jamun	Myrtaceae	Bark
17.	*Tagetes erecta* L.	Genda	Asteraceae	Flower
18.	*Urtica dioica* L.	Bichoo buti	Urticaceae	Leaves
19.	*Woodfordia fruticosa* (L.) Kurz.	Dhawai	Lythraceae	Flowers/Leaves
20	*Ziziphus jujube* Mill.	Ber	Rhamnaceae	Fruit

III. RESULTS

The present study provides detail of 20 plant species, 20 genera from 19 families. The plant species of the present studies are arranged alphabetically with their botanical name, local name, family and plant part used in the table given below (Table 2). Out of the 19 families only 1 family is repeating itself which is Lytharaceae.

3.1 Brief Account of Dye Yielding Plants

3.1.1 Acacia catechu:

Common name: Khair Family: Mimosaceae

The *Acacia catechu* is known as Cutch tree. In hindi it is called as khair and khadira in Sanskrit. The tree is deciduous and has short hooked spines that reach up to the height of 9 to 12 m.

The bark of the tree is grayish brown in color that exfoliates long and narrow strips. The tree of Acacia Catechu is found throughout India. The main is for its habitat in the country are the eastern slopes of Western Ghats and Himalayan region. It found up to an altitude of 1800 m.(Fig.1)

Uses The bark of the plant is used as a natural dye. It is also used to relieve ailments such as anti-fungal activity.

3.1.2 Adhatoda vasica:

Common name: Adusa Family: Acanthaceae

The plant is a small evergreen plant, with broad, lanceolate leaves measuring 10 to 16 cm in length and 5 cm wide. They become greenish brown when dried and have a bitter taste. The flower has large, attractive, white petals, streaked with purple in the lower lip. Shrub grows on the plains of India and in the lower Himalaya. Plant is also cultivated in other tropical regions up to an altitude of 1200 m.(Fig.2)

Uses Leaves of the plant are used as dye. Leaves, roots, flowers and stem of the plant are used for medicinal purposes such as to treat asthma, treating bronchitis, cold and cough and for the purification of blood etc.

3.1.3 Aegle marmelos

Common name: Bael Family: Rutaceae

Bael is also known as Bilva in Sanskrit language. It is slow growing, medium sized tree, up to 12 to 15 m. tall with short trunk. The deciduous, alternate leaves, borne singly or in 2's or 3's are composed of 3 to 5 oval, pointed, shallowly toothed leaflets. It is a species of tree native to Indian subcontinent and southeast Asia. it occurs in dry, open forests on hills and plains at altitudes from sea level to around 1200 m. with mean annual rainfall of 570 to 2000 mm. (Fig.3 a&b).

Uses The fruit of the plant is used as a dye. Which give yellow colour dye. It is a sacred tree, dedicated to Lord Shiva. It is used for the treatment of diarrhea and dysentery; roots are used for the treatment of fever.

3.1.4 Bauhinia purpurea:

Common name: Kachnar Family: Fabaceae

It is small to medium sized tree growing to 10 to 12 m tall, deciduous in the dry season. The leaves are 10 to 20 cm in dry season. The flowers are conspicuous, bright pink or white, 8 to12 cm diameter with five petals. The fruit is a pod 15 to 30 cm long. Plant is native to south Asia and southeast Asia. It grows best in altitude up to 1800 m. with a mean maximum temperature in the range of 30 to 42 °c. and a mean minimum temperature in the range of 7 to 14 °c.(Fig.4).

Uses Flowers of the plant are used for making as natural dye. It is nitrogen fixing tree that helps to enrich the soil fertility. Plant parts are used for the treatment of leprosy, scrofula, ulcers and other skin diseases.

3.1.5 Berberis Vulgaris:

Common name: kashmal Family: Berberidaceae

It is a deciduous shrub growing up to 4 m. high. The leaves are small oval, 2 to 5cm long 1 to 2cm broad with a serrated margin. Flowers are yellow in color. The fruit is an oblong red berry 7 to 10 mm long and 3-5mm broad. The species is native to Asia and Europe. There are over 500 species, growing everywhere except Australia and Antarctica in every kind of habitat from subtropical rainforest to the snowline of the Himalaya. (Fig.5).

Uses Yellow dye is extracted from the roots and stem. Which is used as the good source of natural dye. Berberry is used for the treatment of digestive disorders, skin irritations, and lesions. It has anti-inflammatory properties and has been used in treatment of urinary tract and bladder infection etc.

3.1.6 Bombax ceiba:

Common name: Semal Family: Malvaceae

The Asian tropical tree has a straight tall trunk and its leaves are deciduous in winter. Bear red flower. It grows to an average of 20 m. with old trees up to 60 m. in wet tropical region. The leaves are palmate with about 6 leaflets radiating from a central point, an average of 7 to10 cm. it occurs in subtropical condition of an altitude range of below 1400 m. (Fig.6).

Uses Flowers are used for making dye. It is also used for treating wounds, diarrhea, constipation, urinary disorders, piles and gynecological disorders etc.

3.1.7 Curcuma longa:

Common name: Haldi Family: Zingiberaceae

It is a rhizomatous herbaceous perennial flowering plant that reaches up to 1 m tall. Highly branched, yellow to orange, cylindrical, aromatic rhizomes are found. The leaves are alternate and arranged in two rows. It is native to the Indian subcontinent and Southeast Asia, and requires temperature between 20 and 30°c.turmeric grows up to altitude of 2000m but perform better an altitude of 500 to 1400 m. (Fig.7 a&b).

Uses Rhizomes and leaves are used as coloring agent. which produce yellow colour dye. Turmeric is the key Ingredient of many Asian dishes, imparting a mustard like aroma. Turmeric has been used as an attempted treatment for a variety of internal disorders, such as indigestion, throat infections, common colds, or liver ailments or to treat skin disorders.

3.1.8 Grevillea robusta:

Common name: Silver oak Family: Proteaceae

It is a fast growing evergreen tree, between 18 to 35 m tall, with dark green leaves. Its flowers are golden orange bottle brush like blooms, between 8 to15 cm long, in the spring season. The plant is native to eastern Australia. It adapts to different ecological conditions and is found between 500 and 2000 m altitude where annual rainfall ranges from 800 to 1500 mm.(Fig.8).

Uses: Yellow and green dyes are obtained from the leaves which are used for the preparation of natural dye. Plant is also used for making furniture, cabinetry and fences etc.

3.1.9 Hibiscus rosa-sinensis:

Common Name: Gudhal Family: Malvaceae

Hibiscus rosa–sinensis is a bushy, evergreen shrub or small tree growing 2.5 to 5 m tall and 1.5 to 3 m wide, with glossy leaves and solitary, brilliant red flowers in summer and autumn. The plant is native to East Asia. It is grown as an ornamental plant in tropical and subtropics. Plant has grown up to an altitude of 2000 m above sea level and an average annual rainfall ranges from 1000 to 1600 mm.(Fig.9).

Uses Flowers are used as good source of natural dye. It can also be used as a Ph indicator. Plant is used in the treatment of excessive and painful menstruation, cystitis, venereal diseases, feverish illness, bronchial catarrh cough and to promote hair growth.

3.1.10 Juglans regia:

Common name: Akhrot Family: juglandaceae

Juglans regia is a large, deciduous tree attaining heights of 25 to 35 m diameter, commonly with a short trunk and broad crown, though taller and narrower in dense forest competition. Leaves are alternately arranged, 25 to 40 cm long, odd pinnate with 5 to 9 leaflets, paired alternately. Plant is native to the mountains ranges of Central Asia. It is cultivated extensively from 25 to 45°c. in northern hemisphere and from 20 to 40°c. in southern hemisphere. (Fig.10 a&b).

Uses Leaves are used for the preparation of natural dye. *Juglans regia* is an Ayurvedic fruit used for the treatment of skin diseases, wounds, herpes, abscess and improving the physical strength.

3.1.11 Lawsonia inermis:

Common name: Mehandi Family: Lythraceae

It is a tall shrub or small tree, standing 1.8 to 7.6 m tall. It is glabrous and multibranched, with spine- tipped branchlets. The leaves grow opposite each other on the stem. It is found at elevation up to 1800 m. It grows best in areas where annual daytime temperature is within the range of 19 to 27°c. It prefers a mean annual rainfall in the range of 500 to 1500 mm.(Fig.11).

Uses Leaves are used for the preparation of natural dye. Plant is used for the treatment of amoebic dysentery, diarrhea various skin disorders, leprosy, wounds, ulcers, and herpes etc.

3.1.12 Mangifera indica:

Common name: Aam Family: Anacardiaceae

Tree is medium to large i.e. 10 to 40 m in height, evergreen with symmetrical, rounded canopy ranging from low and dense upright and open. The leaves are simple, exstipulate, alternately arranged, 15 to 45 cm in length. Plant is native to Indian subcontinent. It is widely grown as fruit tree in tropical and subtropical zones. In tropics mango grows at elevation up to 1200 m. (Fig.12 a&b).

Uses Bark and leaves are used as the source of natural dye. Extracts of the bark, leaves, stems and unripe fruits have demonstrated antibiotic properties and are used in traditional medicine

3.1.13 Phyllanthus emblica:

Common name: Amla Family: Euphorbiaceae

The tree is small to medium in size, reaching 1 to 8 m in height, deciduous. The flowers are greenish yellow. The fruit is nearly spherical, light greenish yellow, quite smooth and hard on appearance, with six vertical stripes or furrows. They are found in subtropical condition and survive in cold winter weather and can stand temperature up to 40°c. Plant can found up to an altitude of 1800 m above sea level. (Fig.13 a&b).

Uses Fruits and bark are used for the preparation of natural dye. Emblica exhibit strong antioxidant activity. It is also used for the immunomodulatory, anti-inflammatory, antiulcer, hepatoprotective, and anticancer actions.

3.1.14. *Prunus persica*

Common name: Adoo Family: Rosaceae

Prunus persica is a deciduous tree grows to 4 to10 m tall and 6 in. in diameter. The leaves are lanceolate, 7 to16 cm long 2 to 3 cm broad, pinnately veined. The flowers are produced in early spring 2.5 to 3 cm diameter, pink with five petals. Tree is native to northwest china between the train Basin and the north slopes of the Kunlun Mountains. Plant generally found in temperate or sub temperate regions where the temperature lies between 1 to 20°c. Plant mostly found in the altitude range of 1500 to 3000 m above sea level (Fig.14 a&b).

Uses A dark grey to green dye are obtained from the leaves, roots and bark which is a good source of natural dye. Plant parts are used for the treatment of gastritis, whooping cough, bronchitis, dropsy and jaundice.

3.1.15. *Punica granatum:*

Common name: Daru Family: punicaceae

It is a fruit bearing deciduous shrub or small tree growing 5 to 10 m high, the pomegranate has multiple spiny branches. The pomegranate originated in the region extending from modern day Iran through Afghanistan and Pakistan to northern India. It is wild in western Himalayas between an altitude range of 900 – 1800 m. (Fig.15 a&b).

Uses Fruit rind and flowers are extensively used for the formation of natural dye. Pomegranate is used for the treatment of cancer, osteoarthritis and other diseases.

3.1.16 Syzigium cumini

Common name: Jamun Family: Myrtaceae

A slow growing evergreen tropical plant species, it can reach heights of up to 30 m. Its dense foliage provides shades and grown just for the ornamental value. It is native to Indian subcontinent, adjoining regions of southeast Asia, china and queens land. it is found in the lower ranges of Himalayan region upto an altitude of 1300 m. (Fig.16).

Uses Bark is used for the formation of natural dye. plant is used for the treatment of sore throat, bronchitis, asthma, thirst, biliousness, dysentery and ulcers. Also used as blood purifier.

3.1.17. *Tagetes erecta:*

Common name: Genda Family: Asteraceae

It is a genus of annual or perennial mostly herbaceous plants. *Tagetes* species vary in size from 0.1 to 2.2 m tall. Most species have pinnate green leaves. Blooms naturally occur in golden, orange, yellow, and white colors, often with maroon highlights. The genus is native to North and South America. Plant is found in an altitude range of 800 to 2000 m.

Uses: Flowers are used for the preparation of natural dye. *Tagetes* is used for digestive tract problems including poor appetite, gas, stomach pain, colic intestinal worms, and dysentery. (Fig.17).

3.1.18 Urtica dioica:

Common name: Bichoo buti Family : Urticaceae

It is a herbaceous perennial flowering plant. It is 1 to 2 m tall in the summer and dying down to the ground in winter. The soft green leaves are 3 to 15 cm. long and borne oppositely on an erect weary green stem. It is native to Europe, Asia, Northern Africa and Northern America. The species is found at an altitude of 3200 m.(Fig.18).

Uses: Leaves are used for the preparation of natural dyes. *Urtica dioica* are used for the treatment of allergies, bleeding, gout, urinary tract infections, diabetes, joint pain, cancers etc.

3.1.19. Woodfordia fruticose:

Common name: Dhawai Family: Lytheraceae

Woodfordia fruticosa is an evergreen branched shrub growing up to 5 to 7 m in height with a reddish brown bark that peels off in strips. Leaves are simple, covered with white hairs and opposite or in rings of three. The plant is native to Asia and Africa. It is a shrub found up to an altitude range of 1500 m**.** (Fig.19).

Uses: Flowers and leaves are used for the preparation of natural dyes. It is used to cure diarrhea, piles and dysentery and many other diseases.

3.1.20 *Ziziphus jujube*:

Common name: Ber Family: Rhamnaceae

It is a small deciduous tree or shrub reaching a height of 5 to 12 m, usually thorny branches. The leaves are shiny green, ovate acute, 2 to 7 cm long and 1 to 3 cm. wide. Plant is native to Southern China to Afghanistan, Malaysia and Queensland, Australia. Plant is found an altitude range of up to 1700 m. (Fig.20 a&b).

Uses Fruit is used for the preparation of natural dye and as edible fruit. The seeds, fruit, and bark of jujube have been used in traditional medicine for anxiety and insomnia

Fig.1 Acacia catechu

Fig.2Adhatodavasica

Fig.3(a) *Aegle marmelos*

Fig.3(b) *Aegle marmelos*

Fig.4 *Bauhinia purpurea*

Fig.5 *Berberis vulgaris*

Fig.6 *Bombax ceiba*

Fig.7(b) *Curcuma longa*

Fig.7(b) *Curcuma longa*

Fig.8 Grevillea robusta

Fig.9 *Hibiscus rosa-sinensis*

Fig.10(a) *Juglans regia*

Fig.10(b) *Juglans regia*

Fig.11 *Lawsonia inermis*

Fig.12(a) *Mangifera indica*

Fig.12(b) *Mangifera indica*

Fig.13(a) *Phyllanthus emblica*

Fig.13(b) *Phyllanthus emblica*

Fig.14(a)*Prunuspersica*

Fig.14(b) Prunus persica

Fig.15(a) *Punica granatum*

Fig.15(b) Punica granatum

Fig.16 *Syzygium cumini*

Fig.17 *Tagetes erecta*

Fig.18 *Urtica dioica*

Fig.19 *Woodfordia fruticose*

Fig. 20(a) *Ziziphus jujube*

Fig.20(b) Ziziphus jujube

IV. CONCLUSIONS

The study of dye yielding plants of Solan district of Himachal Pradesh makes us to understand how plants are important to the people of the state. These plants have become important due to their different uses in different disciplines such as coloration of paints, varnishes, inks, food, fabrics, medicines etc. These dye yielding plants have a lot of potential not only to give employment to the locals but can simultaneously increase the economy of the country. During the survey of 20 plant species, 20 plant genera, 19 plant family were identified as dye yielding plants. The various plant parts are used in the household activities or commercial purposes as a source of natural dyes. The different portions of plant parts such as leaf 30.43%, flower 26.08%, fruits 17.39% roots 8.69% and rhizome 4.34%. The leaves among all the plants part are used widely.

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