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Dye Yielding Woody Plants along the National Highway from Parwanoo to Kaurik in Himachal Pradesh

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Abstract: Himachal Pradesh experience diverse climatic condition due to wide variation in altitude ranging from 350 m in the southern tract to over 6500 m in the main Himalaya and in the area lying in it[6]. National highway from Parwanoo to Kaurik is very rich in biodiversity as well as forest cover along side. Along the side of this highway have number of dye yielding woody plants which produce different colours. Locally peoples use these plants for different purposes. Total 51 species belonging to 39 genera and 30 families have been recorded and identified with scientific name, family name, common name, part used and colour. Rosaceae is found to be dominant with 9 species followed by Leguminosae with 6 species, Berberidaceae having 4 spp., Euphorbiaceae having 3 spp., Anacardiaceae and Vitaceae with 2 species each and rest of family having one species each.
Keywords: Dye yielding woody plants, national highway, Himachal Pradesh.

INTRODUCTION

Himachal Pradesh is a state of India located in North India. It is known for its natural environment, hill stations and temples [15]. Himachal Pradesh is one of the states that lie in the Indian Himalayan Region, one of the richest reservoirs of biological diversity in the world. Topographically, Himachal's territory from South to North can be divided into three zones- The Shivaliks or outer Himalayas, inner Himalayas or mid Himalayas and alpine zone or greater Himalayas. Due to extreme variation in elevation, great variation occurs in the climatic conditions of Himachal. The climate varies from hot and sub humid tropical in the southern tracts to, with more elevation, cold, alpine and glacial in the northern and eastern mountain ranges.

Most of the people depend on their surrounding forests. Himachal Pradesh is well known for its rich flora. National Highway from Parwanoo to Kaurik is NH-5 which starts form Punjab to Kinnaur district of Himachal Pradesh [2]. The old name was NH-22 and this road is also known as the old Hindustan-Tibet Road. It covers three districts of Himachal Pradesh named as Solan, Shimla and Kinnaur and their altitude vary from lower to higher. Due to elevation ranges flora along the National Highway from Parwanoo to Kaurik also diverse. Construction and widening of national highway roads often lead to loss of biodiversity due to complete change in natural geology of regions. The present study was taken to congregate data related to botanical name, family, common name, plant part used, color produced of dye yielding woody plants along the national highway from Parwanoo to Kaurik in Himachal Pradesh. Dye is a natural or synthetic substance used to add a color to or change the color of something. The majority of natural dyes are derived from plant sources like roots, berries, bark, leaves and wood.

MATERIALS AND METHODS

Area of Study

From the administrative point of view the state has been divided into twelve districts, namely Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Kullu, Lahaul & Spiti, Mandi, Shimla, Sirmaur, Solan and Una. National highway from Parwanoo to Kaurik covers three districts of Himachal Pradesh named as Solan, Shimla and Kinnaur. Solan is named after the Hindu goddess Shoolini Devi. It is known as the "Mushroom city of India" because of the vast mushroom farming in the area and "City of Red Gold" due to the bulk production of tomatoes in the area [17]. Solan is located at 30.92^0N 77.12^0E. Average elevation of the district is 1502 m and highest point is Mount Karol (2280 m). It is blessed

with diverse and rich source of biodiversity. Shimla is capital and largest city of Himachal Pradesh. It is named after Hindu goddess Shyamala Devi, an incarnation of Kali. Shimla lies in the south-western ranges of the Himalayas at 31.61^0N 77.10^0E. It has an average altitude of 2206 m. The main forests in Shimla are Pine, Deodar, Oak and Rhododendron [1]. Climate is predominantly cool during winters and moderately warm during summer [18]. Kinnaur is located in the northeast corner of Himachal Pradesh bordering Tibet to the east. It has three high mountains ranges, namely, Zanskar and Himalaya that enclose valleys of Sutlej, Spiti, Baspa and their tributaries. The slopes are covered with thick wood, orchards, fields and picturesque hamlets. At the peak of Kinner Kailash mountain is a famous natural rock Shivling. A mountainous area, ranging in altitude from 2,320 to 6,816 m. Most of Kinnaur enjoys a temperate climate due to its high elevation. Vegetation is sparse. Alpine species are juniper, pine, fir, cypress and rhododendron and lower altitude trees are oak, chestnut, maple, birch, alder, magnolia, apple and apricot. Climate is long winters and short summers.

METHODOLOGY

Extensive field survey of entire study area was carried out during 2012-2016. Standard procedures were adopted for collecting, preserving and identifying the dye yielding woody plants. The characteristic features of the plants were noted and their photographs were taken in the field. Herbarium mounts of these plants were also prepared for record and identification. Data were compiled with related literature and then report was documented. Information was composed from different floras namely: Flora Simlensis by Collet[10], Flora of Lahaul & Spiti by Aswal and Mehrotra[5], Flora of Kullu by Dhaliwal and Sharma[11], Flora of Sirmaur by Kaur and Sharma[12], Flora of Bushar Himalayas by Nair[14], Flora of Himachal Pradesh by Chowdhury and Wadhwa[9], and Flora of Chamba district by Singh and Sharma[16]. Information was also collected from: The useful plants of India by Ambasta [4], Directory of Indian economic plants by Agarwal [3], Kaushal, Seth and Swaran Lata[13], Bhardwaj and Seth[7] and Bhardwaj and Seth[8].

RESULTS AND DISCUSSIONS

In the pressent study, 51 species belonging to 39 genera and 30 families were distributed into different life forms, with trees, undershrubs and shrubs. The genera represented by higher number of species were *Berberis* and *Rubus* (4 species), *Prunus* (3 species), *Acacia* (2 species), *Vitaceae* (2 species) and rest of genera with one species. A list of plant species along with their common name, family, part used, colour and habit is given in Table 1.

Table-1: List of dye yielding plants

Sr. No.	Name of Plant	Family	Common name	Part Used	Colour	Habit
1.	*Acacia catechu* (L.f.) Willd.	Leguminosae	Black catechu, Black cutch, Cutch tree	Bark	Brown Balck	Tree
2.	*Acacia nilotica* (L.) Delile	Leguminosae	Arabic tree, Black babool, Gum arabic tree	Seeds	Brown Balck	Tree
3.	*Aesculus indica* (Wall. ex Camb.) Hook.	Sapindaceae	Indian horse-chestnut, Himalayan horse chestnut	Wood	Black	Tree
4.	*Bauhinia purpurea* L.	Leguminosae	Purple bauhinia, Purple butterfly tree, Purple orchid tree	Bark	Purple	Medium-sized tree
5.	*Berberis aristata* DC.	Berberidaceae	Indian barberry, Tree turmeric	Stems and roots	Yellow	Shrub
6.	*Berberis chitria* Buch.-Ham. ex Lindl.	Berberidaceae	Chitra, Nepal barberry	Stems and roots	Yellow	Shrub
7.	*Berberis lycium* Royle	Berberidaceae	Boxthorn barberry, Indian lycium, Indian barberry	Roots	Yellow	Shrub
8.	*Berberis vulgaris* L.	Berberidaceae	European barberry, Jaundice berry	Roots	Yellow	Shrub
9.	*Buddleja davidii* Franch.	Scrophulariaceae	Butterfly bush, Orange eye,	Flower, leaves	Black, green	Shrub

			Summer lilac	and stems		
10.	*Butea monosperma* (Lam.) Taub.	Leguminosae	Bastard teak, Bengal kino, Flame of the forest, Palas tree	Flowers	Yellow	Tree
11.	*Celtis australis* L.,	Cannabaceae	European nettle tree, Hackberry, Honeyberry, Neetle wood	Bark	Yellow	Tree
12.	*Cotinus coggygria* Scop.	Anacardiaceae	Indian sumach, Smoke bush, Wig tree	Stems	Yellow	Shrub
13.	*Cotoneaster microphyllus* Wall.	Rosaceae	Chinese rockspray, Little-leaf Rockspray cotoneaster	Fruits	Rose-tan	Shrub
14.	*Daphne mucronata* Royle,	Thymelaeaceae	Kashmir daphne	Fruits	-	Shrub
15.	*Erythrina suberosa* Roxb.	Leguminosae	Corky coral tree, Indian coral tree	Wood and bark	-	Tree
16.	*Euonymus tingens* Wall.	Celastraceae	Spindle wood	Inner bark	Yellow	Shrub/small tree
17.	*Ficus bengalensis* L.,	Moraceae	Banyan tree, Bengal fig, Indian fig	Resin	Lac dye	Tree
18.	*Grevillea robusta* A. Cunn. ex R. Br.	Proteaceae	Australian silver oak, Silver oak.	Leaves	Yellow, green	Tree
19.	*Hibiscus rosa-sinensis* L.	Malvaceae	China rose, Hawaiian hibiscus, Shoe-black plant	Flower, leaves	Red	Shrub
20.	*Hymenodictylon orixense* (Roxb.) Mabb.	Rubiaceae	Bridal couch tree, Kuthan	Leaves	-	Tree
21.	*Jasminum humile* L.	Oleaceae	Yellow jasmine, Italian jasmine, Nepal jasmine.	Roots	Yellow	Shrub
22.	*Jatropha curcas* L.	Euphorbiaceae	Barbados nut, Jatropa, Poison nut	Bark	Blue	Shrub
23.	*Juglans regia* L.	Juglandaceae	Common walnut, Persian walnut, Europian walnut	Green hulls, leaves	Yellow, brown	Tree
24.	*Justicia adhatoda* L.	Acanthaceae	Malabar nut, White vasa, Yellow vasa	Leaves	Yellow	Shrub
25.	*Kigelia africana* (Lam.) Benth.	Bignoniaceae	Common sausage tree, Sausage tree	Roots	Yellow	Tree
26.	*Mallotus philippensis* (Lam.) Muell.-Arg.	Euphorbiaceae	Dyer's rottlera, Kumkum tree, Red kamala, Scarlet croton	Fruits	Red	Shrub/small tree
27.	*Osyris lanceolata*	Santalaceae	East african	Roots	Red	Shrub

	Hochst. & Steud.		sandalwood, Rock tannin-bush, Bark bush			
28.	*Pistacia chinensis* subsp. *integerrima* (J.L. Stewart ex Brandis) Rech.f.	Anacardiaceae	Kakkar, Kakarsinghi, Karkatasringi	Galls on leaves	Yellow	Tree
29.	*Platycladus orientalis* (L.) Franco	Cupressaceae	Chinese arborvitae, Oriental thuja, Peacock feathers	Young branches	Yellow	Bush/small tree
30.	*Prosopis juliflora* (Sw.) DC.	Leguminosae	Algaroba, Ironwood, Mesquite	Pods husk	Yellow	Tree
31.	*Prunus avium* (L.) L.	Rosaceae	Gean, sweet cherry, Willd cherry	Leaves and fruits	Grey, Green	Tree
32.	*Prunus cornuta* (Wall. ex Royle) Steud.	Rosaceae	Himalayan bird cherry	Leaves and fruits	Grey, Green	Tree
33.	*Prunus persica* (L.) Batsch	Rosaceae	Common peach, Flowering peach, Ornamental peach	Leaves	Green	Tree
34.	*Pyrus communis* L.	Rosaceae	Bhutan pear, Common pear, European pear	Leaves	Yellow	Tree
35.	*Quercus robur* L.	Fagaceae	English oak, Pedunculate oak, Truffle oak	Bark	Purple	Tree
36.	*Reinwardtia indica* Dumort.	Linaceae	Bush flax, Yellow flax, Golden girl	Flowers	Yellow	Undershrub/shrub
37.	*Ricinus communis*L.	Euphorbiaceae	Castor bean, Castor oil plant, Wonder plant	Seeds oil	-	Shrub/small tree
38.	*Rubus biflorus* Buch.-Ham. ex Sm.	Rosaceae	Raspberry, Silver-stemmed bramble	Fruits	Purple to blue	Shrub
39.	*Rubus macilentus* Jacquem. ex Cambess.	Rosaceae	Lean raspberry	Fruits	Purple to blue	Shrub
40.	*Rubus niveus* Thunb.	Rosaceae	Ceylon raspberry, Hill raspberry, Snow peaks raspberry	Fruits	Purple to blue	Shrub
41.	*Rubus paniculatus* Sm.	Rosaceae	Heart-leaf raspberry	Fruits	Purple to blue	Shrub
42.	*Syzygium cumini* (L.) Skeels,	Myrtaceae	Black plum, Indian blackberry, Jamun, portuguese plum	Bark	Brown	Tree
43.	*Tabernaemontana divaricata* (L.) R. Br. ex Roem. & Schult.	Apocynaceae	Crape jasmine, Rosebay, Pinwheel flower	Seeds	Red	Shrub
44.	*Terminalia bellirica*	Combretaceae	Baheda, beach	Bark and	Black	Tree

	(Gaertner) Roxb.		almond, Beach nut tree	fruits		
45.	*Toona ciliata* Roem.	Meliaceae	Australian redcedar, Indian cedar, Queensland red cedar, Toona	Flower	Yellow	Tree
46.	*Vitex negundo* L.	Lamiaceae	Chaste tree, Five-leaved chaste tree, Horseshoe vitex	Wood	-	Shrub/small tree
47.	*Vitis heyneana* Roem. & Schult.	Vitaceae	Grape	Leaves	Yellow	Climber
48.	*Vitis vinifera* L.	Vitaceae	Common grape vine, European grape	Leaves	Yellow	Climber
49.	*Woodfordia fruticosa* (L.) Kurz	Lythraceae	Fire-flame bush, Red bell bush, Woodfordia	Bark, leaves and flowers	Yellow, Red	Shrub
50.	*Xanthium strumarium* L.	Compositae	Burdock datura, Common cockleburr	Leaves	Yellow	Undershrub
51.	*Ziziphus jujuba* Mill.	Rhamnaceae	Chinese date, Iindian zuzube, Jujube	Bark	Pink, Red	Small tree

A high number of dye yielding plants belonged to Rosaceae family with 9 spp. (*Cotoneaster microphyllus, Prunus avium, Prunu scornuta, Prunus persica, Pyrus communis, Rubus biflorus, Rubus macilentus, Rubus niveus, Rubus paniculatus*), Leguminosae with 6 species (*Acacia catechu, Acacia nilotica, Bauhinia purpurea, Butea monosperma, Erythrina suberosa, Prosopis juliflora),*Berberidaceae (*Berberis aristata, Berberis chitria, Berberis lycium, Berberis vulgaris*) with 4 species, Euphorbiaceae (*Jatropha curcas, Mallotus philippensis, Ricinus communis*) with 3 spp., Anacardiaceae (*Cotinus coggygria, Pistacia chinensis* subsp. *integerrima)*and Vitaceae (*Vitis heyneana, Vitis vinifera*) with 2 species which is followed by rest of family comprising only one species. Frequency of consumption of various plant parts in study area is given in Fig. 1.

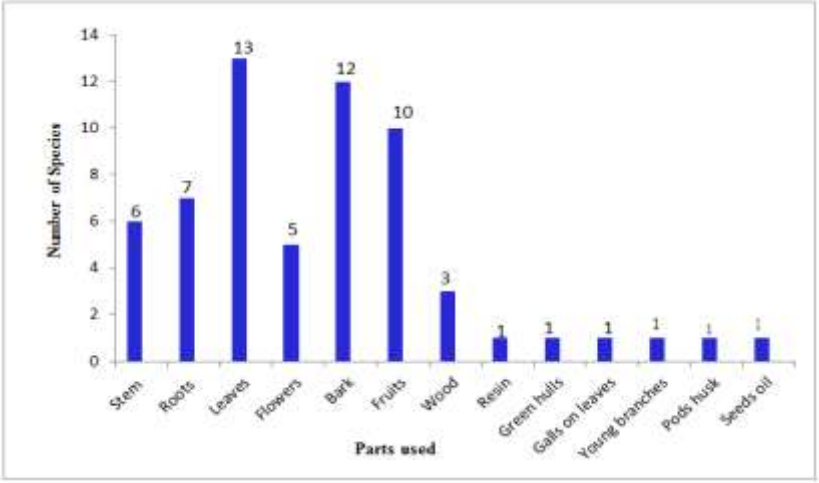

Fig-1: Frequency of dye yielding woody plant parts

CONCLUSION

The present study covers the altitudinal and climatic variation so the diversity of economically important plant particularly dyes yielding plants much. Natural dyes are now-a-days in demand not only in textile industry but in cosmetics, leather, food and pharmaceuticals. The rich biodiversity of plants has provided us a plenty of raw material yet a sustainable linkages must be developed between the cultivation, collection and uses. Due to lack of availability of

precise technical knowledge on the extraction and dyeing technique, habitat destruction of plants, pollution, it has not commercially succeeded like synthetic dyes. So, there is urgent need for proper collection, documentation, assessment and characterization of dye yielding plants and their dyes.

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