



A Survey of Angiospermic Diversity and Medicinal Plants of Lachhiwala Picnic Spot, Dehradun (Uttarakhand)

¹Poonam Sharma, Associate Professor, Botany Department, S.G.R.R.(P.G.) College, Dehradun, Uttarakhand, India.

²Smriti Sawan, Assistant Professor, Botany Department, D.A.V.(P.G.) College, Dehradun, Uttarakhand,

³Arun Joshi, Assistant Professor, Botany Department, S.G.R.R.(P.G.) College, Dehradun, Uttarakhand.

Abstract :

Biodiversity is the totality of genera, species and ecosystem in a region. It is essential for human survival, economic well-being, for the ecosystem function and stability. The present study has been carried out around Lachhiwala picnic spot, Dehradun which is now known as Nature Park. It is located at Haridwar - Rishikesh road, 22Kms from Dehradun.

A survey was conducted during the winter season (October-December). Over-all 39 plant species of Angiosperms were collected, 37 species belong to dicotyledons and 2 species belong to monocotyledons. Total 19 families of flowering plants were recorded; 37 plant species have medicinal value. The vegetation composition of area was 25 herbs, 12 shrubs and 2 climbers.

The study revealed that several anthropogenic activities are the causes of major threat of these area. Therefore, it is essential to conserve this irreplaceable biodiversity and to minimize its loss through conservation practices.

Key Words: Biodiversity, angiosperms, flora, species, ecosystem.

INTRODUCTION :

Biodiversity is the totality of genera, species and ecosystem in a region. It is essential for human survival and economic well-being and for the ecosystem function and stability (Singh, 2000).

Plant communities along the riverbanks are central elements in the natural landscape, interacting with both the terrestrial and aquatic ecosystems. These communities can be used as indicators of the conditions in both upland and aquatic communities (Lindsey et al., 1961; Nilsson et al., 1997; Naiman and Decamps, 1990). Plant communities have high values for both productivity and biomass. It provides habitats for many animal species as well as corridors for movement of both animal and plant species.

Floristic composition and their life forms give shape to plant community. The structure and rate of change in composition are sensitive indicators of the whole environment.

During the study, 39 plant species of angiosperms were collected. Out of 39 species, 34 genera with 37 species dicotyledons and 2 genera with 2 species were monocotyledons. Total 19 families of flowering plants were recorded; 37 plant species have medicinal value.

The study revealed that several anthropogenic activities like unplanned development works, habitat destruction, over-exploitation, grazing etc. are the of major threat to the important flora. Therefore, it is essential to conserve this irreplaceable biodiversity and to minimize its loss through sustainable management and conservation practices.

OBJECTIVES :

1. To study the floristic status of plants around the Lachhiwala picnic spot.
2. Interaction with local communities to bring out the importance and extent of human dependence on the vegetation around this picnic spot.
3. To enlist and study the medicinal plants of this area which are in the common use of local residents.

METHODOLOGY:

The plant materials were surveyed and collected during education field excursions mainly in winter season (October- December months: 2018-2019) from Lachhiwala picnic spot, Dehradun. A number of plant species were collected, Standard method of the collection, preservation and maintenance of specimen in herbarium were followed (Jain and Rao, 1977). During the field study the plants with flowers and fruits were recorded. The field data or habit, habitat, flower colour and vernacular name of each plant specimen were recorded.

The plant specimens (herbs, shrubs and climbers) collected during field trip were identified with the help of regional floras. The description of plants has been examined with help of available literature (Babu, 1977; Gaur, 1999). The genera and species were arranged alphabetically.

ANALYSIS AND OBSERVATIONS:

Plant community plays a pivotal role in sustainable management by maintaining biodiversity and conserving the environment (Farooque and Saxena, 1996). Vegetation is the most precious gift, nature has provided to us, as it is meeting all kinds of essential requirements of the humans in the form of food, fodder, fuel, medicine, timber, resins, and oil, etc. (Gaur, 1999). The knowledge of the floristic composition of a plant community is a prerequisite to understand the overall structure and function of any ecosystem.

On the basis of analysis following observation has been made which were summarized in the tables 1 to 6.

Table 1: List of Plants collected from the Lachhiwala Picnic Spot (Dehradun)

S. No.	Name of the Plant	Family	Flower colour	Flowering & Fruiting time	Habit	Vernacular Name
01	<i>Achyranthes aspera</i> (L.) Blume	Amaranthaceae	Creamish	Mar. to Dec.	H	Latjiri
02	<i>Aerva sanguinolenta</i> Jess.	Amaranthaceae	Creamish-White	Sept. to May	H	Kauri jadi or Gorakhbutti
03	<i>Ageratum conyzoides</i> Linn.	Asteraceae	White or purple blue	Jan. to Dec.	H	Gundrya
04	<i>Anisochilus cornosus</i> (L.f.) wall.	Lamiaceae	Pale -purple	Aug. to Dec.	H	Panjri
05	<i>Anisomeles ovata</i> R.Br.	Lamiaceae	Bluish purple	July to Oct.	H	Kalabangra
06	<i>Artemisia vulgaris</i> (C.B. Asteraceae Clarke)	Asteraceae	Brownish yellow	July to Dec.	H	kunjaa
07	<i>Bauhinia vahlii</i> Wight & Arn	Caesalpiniaceae	White	Apr. to Sept.	C	Malu
08	<i>Boehmeria platyphylla</i> D.Don.	Urticaceae	Pale-white	Aug. to Jan.	S	Khagsa
09	<i>Cassia occidentalis</i> Linn.	Caesalpiniaceae	Yellow	May to Nov.	S	Chakunda
10	<i>Cassia tora</i> L.	Caesalpiniaceae	Pale - Yellow	Apr. to Dec.	H	Chakunda
11	<i>Celosia argentea</i> Linn.	Amaranthaceae	White or pinkish	Aug to Dec.	H	Gadrya
12	<i>Chenopodium album</i> L.	Chenopodiaceae	Green	Jan. to Dec	H	Bathua
13	<i>Clematis grata</i> Wallich.	Ranunculaceae	Purple	Aug. to Dec.	C	Dhanwali
14	<i>Colebrookia oppositifolia</i> J.E. Smith.	Lamiaceae	Pale white or white	Jul to Oct.	S	Binda
15	<i>Cynodon dactylon</i> (L) persoon	Poaceae	Green or purplish	Jan. to Dec.	H	Dubla
16	<i>Cynoglossum glochidiatum</i> Wallich. Ex Benth.	Boraginaceae	Dark purple blue	Jul to Nov.	H	Lichkura
17	<i>Dicliptera bupleuroides</i> Nees	Acanthaceae	Pink white or purplish	Jan. to Dec.	H	Kuthhi
18	<i>Eriophoru comoxum</i> Wallichex Nees.	Cyperaceae	Brown	Jul. to Dec.	H	Babula
19	<i>Hemigraphis latebrosa</i> Nees.	Acanthaceae	Blue or purple	Oct. to July	H	Morpankhi
20	<i>Holmskioldia sanguinea</i> Retz.	Verbenaceae	Scarlet red or yellow	Oct. to Jun.	S	Katurikaphool
21	<i>Inula cappa</i> (Buch.-Ham. ex. D.Don) DC.	Asteraceae	Pale Yellow	July to Sep.	S	Athhu, Tamagari
22	<i>Ipomea coccinea</i> sensu. CB. Clarke	Convolvulaceae	Scarlet or red	Jul. to Dec.	H	Morning glory

23	<i>Lantana camara</i> Linn.	Verbenaceae	Red, Orange or yellow	Whole year	S	Kuri-ghas
24	<i>Lepidagathis cuspidata</i> Nees.	Acanthaceae	White with purple dots	Feb. to Sept.	H	Kandya
25	<i>Mazus rugosus</i> Linn.	Scrophulariaceae	Pale or lilac white	Aug. to Nov	H	Mastyar
26	<i>Murraya koenigil</i> (L.)sprenge	Rutaceae	White	Mar to Oct.	S	Gandela
27	<i>Nepeta graciliflora</i> Benth.	Lamiaceae	Pink	Feb. to May	H	Upryaghas
28	<i>Ocimum basilicum</i> Linn.	Lamiaceae	Purplish or whitish pink	Jul. to Dec.	H	Murya
29	<i>Oxalis corniculata</i> Linn.	Oxalidaceae	Dark purple	Whole year	H	Bhilmori
30	<i>Parthenium hysterophorus</i> Linn.	Asteraceae	White or pale	Whole year	H	GajarGhas
31	<i>Pupalia lappacea</i> Juss.	Amaranthaceae	Greenish White	Sept. to Dec.	H	Nagdamince
32	<i>Rungia pectinata</i> (L.) Nees.	Acanthaceae	Bright blue	Nov. to Jan.	H	Pindi
33	<i>Scoparia dulcis</i> Linn.	Scrophulariaceae	White	Whole year	H	Goat weed
34	<i>Sida cardifolia</i> Linn.	Malvaceae	Yellow	Whole year	S	Balu
35	<i>Solanum hispidum</i> Pers.	Solanaceae	White	Whole year	S	Giant Devil's Fig
36	<i>Solanum viarum</i> Dunal	Solanaceae	White	Whole year	S	Chamoli
37	<i>Solanum xanthocarpum</i> Sch. & Wend.	Solanaceae	Purple or yellow	Whole year	S	Berkatali
38	<i>Thevetia neriifolia</i> Juss.	Apocynaceae	Yellow	Whole year	S	Peeli-Kaner
39	<i>Vervascum thapsus</i> L.	Scrophulariaceae	Yellow	Jan. to Aug.	H	Kakri, Tamakhu

H – Herb, S – Shrub, C - Climber

Table 2: Medicinal plants collected from the Lachhiwala Picnic Spot

S. No.	Name of the plant	Vernacular name	Family	Parts used	Uses
01	<i>Achyranthes aspera</i> Linn.	Latjiri	Amaranthaceae	Whole plant	Root infusion - material fever, leaf extract – facilitate delivery. Plant decoction- used in dropsy and bronchitis. Root powder used in making local beverages.
02	<i>Aerva sanguinolenta</i> (L.) Blume	Kapurijadi or Gorakhbuti	Amaranthaceae	Whole plant	The plant is used for food by people and animal and for the treatment of snake bite.
03	<i>Ageratum conyzoides</i> Linn.	Gundrya	Asteraceae	Root	Root paste is used for sores, cuts and various skin ailments.
04	<i>Anisochilus carnosus</i> (L.f.) Wall.	Panjri	Lamiaceae	Whole plant	Plant extract as expectorant, stimulant useful in cough and cold.
05	<i>Anisomeles ovata</i> R. Br.	Kalabangra	Lamiaceae	Whole plant	Plant extract used as carminative and astringent, root powder with milk or extract given to avoid natural nocturnal emission.
06	<i>Artemisia vulgaris</i> C.B. Clarke	Kunjaa	Asteraceae	Leaf	Leaf juice against intestinal worms young twigs made into brooms
07	<i>Bauhinia vahlii</i> Wight & Arn.	Malu	Caesalpiniaceae	Whole plant	Seeds are used as tonic and vermifuge. Whole plant is used in dysentery, stomachache. Fruit is used to treat antifertility of women and as aphrodisiac
08	<i>Boehmeria platyphylla</i> D. Don.	Khagsa	Urticaceae	Root	Root paste control bleeding, root juice help in prevention of stomachic and dysentery.
09	<i>Cassia occidentalis</i> Linn.	Chakunda	Caesalpiniaceae	Leaves, Fruits, and Roots	Leaves used in skin diseases, fruits believed to be an antidote of snake bites, decoction of root given in dropsy, leaf and root paste useful in bites and ring worms.
10	<i>Cassia tora</i> L.	Chakunda	Caesalpiniaceae	Seeds, Leaves and Roots	Seeds and leaves used in skin diseases, cuts, wounds and in bone fracture. Leaves and roots also used as vermicide febrifuge.
11	<i>Celosia argentea</i> Linn.	Gadrya	Amaranthaceae Bhanbithu	Seed	Seeds believed to be as an aphrodisiac.

12	<i>Chenopodium album</i> L.	Bathua	Chenopodiaceae	Whole plant	Decocted for colic, stomach pain, cough asthma and fever as a spring tonic. Poultice for headache used in snake bites. The whole plant is supposed to have wound healing properties.
13	<i>Clematis grata</i> Wallich.	Dhanwali	Ranunculaceae	Leaves and Flowers	Leaves and flowers are used in diarrhoea. Flowers and gut spasm, calcium channels blocking activity insecticidal.
14	<i>Colebrookia oppositifolia</i> J-E. Smith.	Binda	Lamiaceae	Leaf, Flowers	Leaf paste applied on wounds, dried leaves as adulterant to tobacco.
15	<i>Cynodon dactylon</i> (L.) Persoon	Dubla	Poaceae	Roots	Roots infusion taken in malarial fever and in internal injury.
16	<i>Cynoglossum glochidiatum</i> Wallich ex Benth.	Dichkura	Boraginaceae	Root	Root extract used in dyspepsia and digestive disorders.
17	<i>Dicliptera bupleuroides</i> Nees.	Kuthhi	Acanthaceae	Leaf	Leaf paste applied on wounds to check bleeding; leaf useful in cough and gastroenteritis.
18	<i>Hemigraphis latebrosa</i> Nees.	Momankhi	Acanthaceae	Whole plant	Whole plant is used in stopping all external bleeding, used for snake treatment and quick healer of fresh cuts and wounds.
19	<i>Holmskioldia sanguinea</i> Retz.	Katurikaphool \ Kaptolyu	Verbenaceae	Whole plant	Leaf paste applied on body swelling; roots as febrifuge.
20	<i>Inula cappa</i> (Buch - Ham ex. D. Don)	Tamagari	Asteraceae	Root	The juice of the roots is used in the treatment of peptic ulcers, indigestion, gastric disorders and in fever.
21	<i>Ipomea coccinea</i> Sensu C.B. Clarke	Morning glory	Convolvulaceae	Seeds	Seeds used in traditional Chinese medicine as anti-inflammatory, cathartic, diuretic and expectorant, it is used for constipation, edema and parasitosis.
22	<i>Lantana camara</i> Linn.	Kurighas	Verbenaceae	Leaves	Leaves are insecticidal or germicidal and used in skin ailments.
23	<i>Lepidagathis cuspidata</i> Nees.	Kandya	Acanthaceae	Root	Root powder with milk used in fever.
24	<i>Mazus rugosus</i> Linn.	Mastyar	Scrophulariaceae	Whole plant	Leaf poultice applied on burns; infusion of plant with zinger extract given in colic.

25	<i>Murraya koenigii</i> (L.) Sprengel	Gandela	Rutaceae	Bark, seed, fruit	Bark in haemorrhage, resin and seeds in diarrhoea.
26	<i>Nepeta graciliflora</i> Benth.	Upryaghas	Lamiaceae	Leaves, Flowers	Leaves and flowers are nerve relaxant sedative, carminative, diaphoretic, early stage of fever, cold and influenza..
27	<i>Ocimum basilicum</i> Linn.	Muraya	Lamiaceae	Leaves, Seed	Leaves used as as an insecticide, seeds medicinal in fever, cough and cold.
28	<i>Oxalis corniculata</i> Linn.	Bhilmori	Oxalidaceae	Leaves	Leaf juice dropped in cataract and conjunctivitis.
29	<i>Parthenium hysterophorus</i> Linn.	Gajarghas	Asteraceae	Whole plant	Used as tonic, analgesic and febrifuge. Decoction of roots is used in dysentery. Flowers are used for malarial fever, increased flow of milk, disordered vision, ringing in the ears, toothache and hypertrophy.
30	<i>Pupalia lappacea</i> (L.) Juss.	Nagdaminee	Amaranthaceae	Fruits	Fruits taken in cough , fever and paste applied in skin ailments.
31	<i>Rungia pectinata</i> (L.) Nees.	Pindi	Acanthaceae	Leaf, Root	leaf juice is considered cooling and aperients prescribed for children suffering from small pox in doses. Bruised leaves to relieve pain and swelling. Roots are given in fever..
32	<i>Scoparia dulcis</i> Linn.	Goat weed	Scrophulariaceae	Whole plant	It is used to treat diabetes in India.Extracts of the plants have anti hyperglycemic, antimicrobial and antioxidant properties.
33	<i>Sida cardifolia</i> Linn.	Balu	Malvaceae	Seed, Root	Seed powder gives in dyspepsia, roots astringent, diuretic and tonic.
34	<i>Solanum hispidum</i> Persoon	Giant Devil's Fig	Solanaceae	Leaves	Antimycotic, Saponins are derived from Solanumhispidum leaves.
35	<i>Solanum viarum</i> Dunal	Chamoli	Solanaceae	Whole plant	Steroids produced by this plant are used to treat cancer, Addison's disease, rheumatic arthritis, chronic asthma, Leukemia, obesity and skin diseases.
36	<i>Solanum xanthocarpum</i> Sch. & Wend.	Berkatali	Solanaceae	Leaves, Fruits,	Fruits as medicine in fever, cough, asthma and gonorrhoea; floral buds in eye ailments; fruits garlanded round the neck of infants to rid off jaundice.

37	<i>Vervascum thapsus</i> L.	Kakri Tamaku	Scrophulariaceae	Whole plant	Plant extract taken in bronchitis and asthma, seeds used as narcotic.
----	-----------------------------	--------------	------------------	-------------	---

(Bhardwaj, R. et al. 2011, Bhatt, V.P. and Negi, G.C.S. 2006, Bisht, A. S. and Bhatt, A. B. 2012, Dobhal, P. et al. 2007)

Table 3: General phenological character of various plant species from Lachhiwala

S.No.	Family	Plant Species	Life Form
01	Acanthaceae	<i>Dicliptera bupleroides</i> Nees.	Th.
02		<i>Hemigraphis latebrosa</i> Nees.	Th.
03		<i>Lepidagraphis cuspidata</i> Nees.	Ph.
04		<i>Rungia pectinata</i> (L.) Nees.	Th.
05	Amaranthaceae	<i>Achyranthes aspera</i> L.	Th.
06		<i>Aerva lanata</i> Juss.	Ph.
07		<i>Celosia argentea</i> Linn.	Th.
08		<i>Pupalia lappacea</i> Juss.	Ph.
09	Apocynaceae	<i>Thevetia nerifolia</i> Juss.	Ph.
10	Asteraceae	<i>Ageratum conyzoides</i> Linn.	Th.
11		<i>Artemisia vulgaris</i> (C.B. Clarke)	Th.
12		<i>Inula cappa</i> (Buch.Ham. ex D.Don) DC.	Ph.
13		<i>Parthenium hysterophorus</i> L.	Th.
14	Boraginaceae	<i>Cynoglossum glochidiatum</i> Wallich. G.Don	Th.
15	Caesalpiniaceae	<i>Bauhinia vahlii</i> W & A	Ph.
16		<i>Cassia occidentalis</i> L.	Th.
17		<i>Cassia tora</i> L.	Th.
18	Chenopodiaceae	<i>Chenopodium ambrosioides</i> L.	Th.
19	Convolvulaceae	<i>Ipomea coccinea</i> C.B. Clarke	Th.
20	Cyperaceae	<i>Eriophorum comosum</i> (Wallich) ex Nees.	Th.
21	Lamiaceae	<i>Anisochilus carnosus</i> (L.f.) Wall.	Th.
22		<i>Anisomeles ovata</i> R.Br.	Th.
23		<i>Colebrookia oppositifolia</i> J.E. Smith.	Ph.
24		<i>Nepeta graciliflora</i> Benth.	Th.
25		<i>Ocimum basilicum</i> Linn.	Th.
26	Malvaceae	<i>Sida cordifolia</i> Linn.	Th.
27	Oxalidaceae	<i>Oxalis corniculata</i> Linn.	Th.
28	Poaceae	<i>Cynodon dactylon</i> L. Pers.	He.
29	Ranunculaceae	<i>Clematis grata</i> Wallich.	Ph.
30	Rutaceae	<i>Murraya koenigii</i> (L.) Spreng.	Ph.
31	Scrophulariaceae	<i>Mazus rugosus</i> Linn.	Th.
32		<i>Scoparia dulcis</i> Linn.	Th.
33		<i>Vervascum thapsus</i> L.	Th.
34	Solanaceae	<i>Solanum hispidum</i> Pers.	Th.
35		<i>Solanum viarum</i> Dunal	Ph.
36		<i>Solanum xanthocarpum</i> Sch. & Wend.	Th.
37	Urticaceae	<i>Boehmeria platyphylla</i> D. Don.	Th.
38	Verbenaceae	<i>Holmskiodia sanguinea</i> Hertz.	Ph.
39		<i>Lantana camara</i> Linn.	Ph.

Th. -Therophytes, Ph.- Phanerophytes, He. -Hemicryptophytes

Table 4: Taxonomic Ranks in Lachhiwala

S.No.	Plant Groups	Family		Genera		Species	
		No.	%	No.	%	No.	%
01	Angiosperms	No.	%	No.	%	No.	%
a.	Dicotyledons	17	89.5	34	94.4	37	94.9
b.	Monocotyledons	02	10.5	02	5.6	02	5.1
	Total	19		36		39	

Table 5: Vegetative Structure of Angiosperms from Lachhiwala

S.No.	Life Form	Dicotyledons		Monocotyledons		Total
		No.	%	No.	%	
01	Herbs	23	92	02	08	25
02	Shrubs	12	100	-	-	12
03	Climbers	02	100	-	-	02
04	Trees	-	-	-	-	-
	Total	37		02		39

Table 6: Families of study site with number of genera and species

S.No.	Family	Genera	Species
01	Acanthaceae	04	04
02	Amaranthaceae	04	04
03	Apocynaceae	01	01
04	Asteraceae	04	04
05	Boraginaceae	01	01
06	Caesalpiniaceae	02	03
07	Chenopodiaceae	01	01
08	Convolvulaceae	01	01
09	Cyperaceae	01	01
10	Lamiaceae	05	05
11	Malvaceae	01	01
12	Oxalidaceae	01	01
13	Poaceae	01	01
14	Ranunculaceae	01	01
15	Rutaceae	01	01
16	Scrophulariaceae	03	03
17	Solanaceae	01	03
18	Urticaceae	01	01
19	Verbenaceae	02	02
	Total	36	39

RESULT AND DISCUSSION:

During the study, 39 plant species of angiosperms were collected. Out of 39 species, 34 genera with 37 species dicotyledons and 02 genera with 02 species were monocotyledons. Total 19 families of flowering plants were recorded with 36 genera and 39 species of angiospermic plants. The general information such as family, flower colour, flowering and fruiting time, habit, vernacular name is given in Table 1. Among the plant life forms the biggest group was of herb (25 species) which is followed by shrub (12 species) and climbers with 2 species.

The study revealed a total of 37 medicinal plant species distributed into 34 genera belonging to 17 families. Lamiaceae is the dominant family with 5 species followed by Acanthaceae, Amaranthaceae and Asteraceae (4 species each). The enumeration of Medicinal plants with their medicinal value are described in Table 2.

The general phenological character of various angiosperm species is given in Table 3. The life form reported were therophytes (66.7%), phanerophytes (30.8%) and Hemicryptophytes (2.5%).

The taxonomic rank of Lachhiwala is given in Table 4. The 17 families represented dicot with 34 genera and 37 species. 2 families belonged to monocot with 2 genera and 2 species. In all dicot contributed 94.9%, monocot 5.1% of the total plant species.

The vegetation composition of area is 25 herbs, 12 shrubs and 2 climbers (Table 5). Total herbaceous species includes 92% of dicot and 8.0% of monocot. In all dicot contributes 100% of the shrubs and climber species.

The forests provide an excellent opportunity to examine successional process in the tropical environment. The availability of water, seasonal flooding and sedimentation influences the vegetation and its development (Dutt et al., 2011; Jean and Bouchard 1993).

CONCLUSION:

The vegetation of this area is rich, linking terrestrial and aquatic habitat under the influence of a waterway, such as riverbanks, represented by a particular type of vegetation that grows along the sides of rivers. The survey indicated that study area has a number of medicinal plants to treat a wide spectrum of human ailments. The study also points out that certain species of medicinal plants are being exploited by the locals, they are being unaware of the importance of medicinal plants in the ecosystem. Therefore, greater efforts are required to preserve their traditional systems of medicine. Unfortunately, our riverbanks have suffered a high level of disturbance.

The study concluded that there is a need of so many ecological study of this area, because this is one of the important areas of Doon valley to its unique biodiversity. To satisfy the needs and greed of the people, many important plants are threatened and becoming rare, even some are on the verge of extinction. Therefore it is urgent to stop exploitation and develop an appropriate strategy for conservation and utilization of plant resources. A sound understanding of the richness of species is necessary for appropriate conservation and restoration of the biological diversity.

ACKNOWLEDGEMENT:

Authors are grateful to the Principal of S.G.R.R. (P.G.) College Dehradun for his kind support and consistent motivation during the study.

REFERENCES

1. Babu, C.R. 1977. Herbaceous Flora of Dehradun, C. S. I. R. New Delhi.
2. Bhardwaj, R., Dutta, S. and Sharma, K. C. 2011. Conserving biodiversity of medicinal plants from central Aravallis of Rajasthan, India, *J. Res. Develop*, 6(1): 69-75.
3. Bhatt, V. P. and Negi, G. C. S. 2006. Ethnomedicinal Plant resources of Jounsari tribe of Garhwal Himalaya, Uttranchal. *Ind. J. Trad. Knowl.* 5 (3): 26-31.
4. Bisht, A. S. and Bhatt, A. B. 2012. A contribution to the Medicinal plants of Shastradhara, District Dehradun, Uttarakhand (with Ethnobotanical Notes). *Journal of Drug delivery and Therapeutics*, 2:114-120.
5. Dobhal, P., Sawan, S. and Sharma, N. 2007. Studies on medicinal plants of two villages of Chakrata Forest Division (Uttarakhand). *Ann.For.*, 15 (2): 351-357.
6. Dutt, R., Baurah, D. and Sharma, S. K. 2011. Influence of Riverine flora on the River Bank health of a Himalayan River before being regulated by a large Dam in North West India. *Annals of Biological Research*, 2(4): 268-280.
7. Farooquee, N. A. and Saxena, K.G. 1996. Conservation and Utilization of medicinal plants in high hills of Central Himalayas. *Environ. Conserv.*, 23: 75-80.
8. Gaur, R. D. 1999. Flora of the district Garhwal northwest Himalaya (with ethnobotanical notes). Transmedia Publication, Srinagar (Garhwal) India.
9. Jean, M. and Bouchard, A. 1993. Riverine vegetation: Importance of small-scale and large-scale environmental variation. *Journal of Vegetation Science*, 4: 609-620.
10. Lindsey, A. A., Petty, R. O., Sterling, D. K. and Asdall, W. V. 1961. Vegetation and environment along the Wabash and Tippecanoc, Rivers. *Ecological Monograph*, 31:105-156
11. Naiman, R. J. and Decamps, H. 1990. The Ecology and Management of Aquatic-Terrestrial Ecotones. United Nations Educational, scientific and Cultural Organization Paris.
12. Nilsson, C. R. and Zinko, U. 1997. Long-term response of river-margin vegetation to water-level regulation. *Science*, 276: 798-800.
13. Sharma, P. and Joshi, A. 2018. Some important Medicinal plants of Dehradun Zoo, Uttarakhand. *Wjpps* 7 (10): 1099-1103.
14. Sharma, P., Joshi, A. and Sawan, S. 2019. Data analysis of angiosperms from Renuka Wetland, Himachal Pradesh *Phytotaxonomy* 18:118-124.
15. Singh, J. S. 2000. The biodiversity Crisis: a multifaceted review. *Current Science*, 82: 638-647.