

## Ethnomedicinal plants of Bhaba Nagar Valley of Kinnaur, Himachal Pradesh (India)

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### Abstract

Ethnobotany deals with the study of plants used by aboriginal people and has a great contribution in drug development and management of natural resources. Herbal traditions in developing countries are considered as an important part of the cultural heritage. India is enriched with a broad range of plant diversity and has about 18386 angiosperms, 79 gymnosperms and 1289 pteridophytes. Ethnobotanical studies that help to conserve and investigate traditional knowledge are therefore vital before this classical mythology is vanished forever. The traditional ayurvedic preparations from medicinal plants have been becoming more popular in the present era because of their lesser side effects. Bhaba Nagar is one of the most beautiful valley of Kinnaur with a diversity of vegetation and nutritious food items. The present research article deals with 51 medicinal plant species of valley belonging to 32 families and 46 genera along with quantitative indices such as Use Value (UV), Importance Value (IV) and Total Importance Value (TIV) to have a better idea of effective use of these plants. Herbs are used predominantly followed by trees, shrubs, climbers and one fungus.

**Key words :** Ethnobotany, Traditional, Use Value, Importance Value, Total Importance Value.

**E**thnobotany deals with the study of plants used by aboriginal people and has a great contribution in drug development and management of natural resources. Ethnobotany has emerged as a science which incorporates information from other subjects too. India is enriched with a broad range of plant diversity and has about 18386 angiosperms, 79 gymnosperms and 1289 pteridophytes<sup>4</sup>. At

present, ethnobotanical studies are in great demand in unearthing the traditional knowledge of local communities and tribal societies. Ethnobotanical studies that help to conserve and investigate traditional knowledge are vital before this classical mythology is vanished forever<sup>6</sup>. Considerable efforts have been made to map the ethnobotanical researches in India<sup>5,8,11,15,16</sup>; but the documented data of

ethnobotanical research in different regions of Kinnaur is meagre<sup>10,14</sup>. The traditional ayurvedic preparations from medicinal plants are popular in the present era because of their lesser side effects. Herbal traditions in developing countries are considered an important part of the cultural heritage of the world. Ethnomedicinal plants have been used for health care from ancient times<sup>3</sup>. This undocumented precious knowledge is depleting at a fast rate; so, in order to bridge this gap, the present research has been undertaken.

#### *Study area :*

Kinnaur, once a forbidden land lying on the ancient trade route between India and Tibet is attractive throughout the year because of its climate, vegetation, topography and beauty. From different landscape colors to white snowy peaks, from the blooming of wild flowers to cultivated stone fruits and apple, from the rocky and sandy mountains to the evergreen pine forests, from the windy cold desert to lush green valleys and from the chilling sub-zero winters to the sweaty and shiny summers, Kinnaur is nature's treasure for sure. In winters, the temperature drops well below the freezing point. The geographical extent of Kinnaur is 31°39'N to 78°28' E. Bhaba Nagar is one of the most beautiful valley of Kinnaur with a diversity of vegetation and many nutritious food items. Bhaba river is the main attraction of valley. Though rice, chapati and pulses are the part of daily diet but despite of these, food items including "Chulfanting"; apricot puree/smoothie, "Dhoo"; kind of boiled dough, "Hodho"; chilta/pancake, "Sattu"; roasted cereals flour, "Dau/Pintoo"; laddu made from roasted wheat flour, "Raimokan";

stew of ground apricot kernels, wild vegetables viz, "Lainkut/Lingru" vegetable from circinate fronds of a fern, "Choyakan"; bichhubuti / Stinging nettle are made on special occasions and are considered nutritious.

#### *Field study and data collection :*

Intensive ethnobotanical surveys were conducted during the period of 2021-2022 in the study area. Structured questionnaire is used to document data from the respondents (especially local healers and old people) about the traditional uses of plants. The resultant information gathered for each plant species was recorded in the field notebook and the herbarium methodology is used following Jain and Rao<sup>7</sup>. To get the information on the medicinal uses of the plants, three basic approaches were followed (Phondani *et al.*)<sup>13</sup>.

**An interview based approach:** Questions were asked about different aspects of ethnobotany and recorded,

**An inventory based approach:** It involves consecutive interviews

**An interactive discussion approach:** Open discussion through meetings with different participants.

#### *Quantitative Ethnobotany :*

The ethnobotanical statistics were evaluated with the help of three quantitative indices *i.e.* Importance Value (IV), Use Value (UV) and Total Importance Value (TIV).

#### *Importance value (IV) :*

IV was calculated following Bye & Balslev,<sup>2</sup>

$$IV_s = n_s / n$$

$n_s$ : number of informants who consider the plant species very important  
 $n$ : Total number of informants

Where, 'U' is the number of plant uses cited for a given species by the informants and 'N' is the total number of informants quizzed.

*Use Value (UV)* :

Use value (UV) was calculated using the formula given below following Philips *et al.*,<sup>12</sup>.  
 $UV = \Sigma U / N$

*Total Importance value (TIV)*:

TIV is calculated following Belal & Springuel,<sup>1</sup>. Higher the value of TIV in percentage, more useful is the species for community in term of diverse uses.

Table-1. Documented Ethnomedicinal Plants of Bhaba Nagar Valley of Kinnaur (Himachal Pradesh)

S. No.	Botanical name	Vernacular name	Common name	Family	Habit	Part/s used	Medicinal uses
1.	<i>Angelica glauca</i> Edgew.	Chora, Sapal	Angelica	Apiaceae	Herb	Roots	Root poultice and extract as stomachache and diuretic.
2.	<i>Arisaema flavum</i> (Forssk) Schott	Jamusha	Yellow cobralily	Araceae	Herb	Root Tubers	Poultice of root tubers is applied externally for stomachache
3.	<i>Arnebia benthamii</i> (wall .ex G.don) Johns	Khomae	Himalayan Arnebia.	Boraginaceae	Herb	Roots	Poultice of roots is used for hair loss while the extract of the same is used for bronchitis, toothache, eye diseases and as a vegetable colorant.
4.	<i>Articum lappa</i> Wall. ex DC	Nurcha	Greater Burdock	Asteraceae	Herb	Roots, Seeds	Powder of dried roots and seeds is used for asthma, sore throat and neurological disorders.
5.	<i>Allium humile</i> Kunth	Shodh	Small Alpine Onion	Amaryllidaceae	Herb	Leaves, Bulbs	Raw and cooked leaves and bulbs are effective against asthma, stomachache, cold, cough and jaundice
6.	<i>Aesculus indica</i> (Colebr. ex Cambess.) Hook.	Bankhod, khnoor, poo	Indian horse-chestnut	Sapindaceae	Tree	Nuts	Nuts are effective for skin diseases, rheumatism, headaches; also used as astringent.
7.	<i>Berberis aristata</i> Roxb. ex DC.	Chutrum, chatar	Indian barberry	Berberidaceae	Shrub	Roots, leaves	Root paste and leaves extract is recommended for snake bite, lungs

							problem and conjunctivitis.
8.	<i>Betula utilis</i> D. Don	Bhojpatr, shak	Himalayan birch	Betula-ceae	Tree	Bark	Paste of bark is good to treat inflammation, wounds and also used to treat jaundice traditionally.
9.	<i>Bistorta affinis</i> (D. Don) Greene	Jomou, remu	Fleece flower, or knotweed	Polygo-naceae	Herb	Flowers	Extract of flowers is recommended for diarrhoea, dysentery and cholera.
10.	<i>Bunium persicum</i> (Boiss.) B. Fedtsch	Kala zeera	Black cumin	Apiaceae	Herb	Seeds	Seeds are highly effective for stomachache, fever, flatulence and diarrhoea.
11.	<i>Cannabis sativa</i> L.	Bhang	Hemp	Cannabi-naceae	Annual herb	Leaves or female flower	Leaves and female flowers are used as an astringent, spasmodic and appetizer.
12.	<i>Capsella bursa-pastoris</i> (L.) Medik	Chilbotey, shamisho	Shepherd's purse	Brassi-ceae	Herb	Whole plant	Paste good for cuts and wounds.
13.	<i>Cassiope fastigiata</i> (Wall.) D. Don	Motae-shing	Himalayan heather	Ericaceae	Herb	Leaves	Extract of leaves is good for burns and wound.
14.	<i>Carduus nutans</i> L.	Ticho	Musk Thistle	Astera-ceae	Herb	Flowers seeds	Flowers and seeds used as blood purifier.
15.	<i>Celtis australis</i> L.	Kroo	European nettle tree, Mediterranean hackberry	Ulmaceae	Tree	Leaves	Decoction of leaves is good for menstrual bleeding.
16.	<i>Cedrus deodara</i> (Roxb) G. Don	Devdar	Deodar cedar	Pinaceae	Coniferous Tree	Wood	Essential oil of wood used against stomach worms, paralysis and urinary diseases.
17.	<i>Chenopodium album</i> L.	Baroh, Bathu, Takka, Shimbroh	Bacon-weed	Amaran-thaceae	Annual herb	Leaves	Tender leaves are used as vegetables; good for stomach problems.

18.	<i>Coriandrum sativum</i> L.	Dhaniya	Coriander	Apiaceae	Herb	Seeds, leaves	Seeds and leaves are used to flavor dishes and considered good for diabetes and liver disorders.
19.	<i>Crocus sativus</i> L.	Kesar	Saffron crocus	Iridaceae	Herb	Stigma, style	“Kesar” dissolved in milk is good for fever and stomachache; increases immunity.
20.	<i>Datura stramonium</i> L.	Datura	Jimson-weed	Solana-ceae	Annual herb	Flowers, seeds	Infusion of flowers and seeds are good for pain and headache.
21.	<i>Dioscorea deltoidea</i> Wall. ex Griseb.	Singli mingli	Wild yam	Dioscor-eaceae	Climber	Rhizome	Poultice of rhizome is effective for ophthalmic and rheumatic pain.
22.	<i>Fagopyrum esculentum</i> Moench	Olgo	Buck-wheat	Polygon-aceae	Herb	Seeds and leaves	Seeds and leaves as such are effective against abdominal complaints; extract of leaves is used in many ayurvedic formulations against diabetes and renal complaints.
23.	<i>Fagopyrum tataricum</i> (L.) Gaertn	Bras	Wild buck-wheat	Polygo-naceae	Herb	Seeds, leaves	Seeds and leaves used as an astringent; effective against abdominal complaints; extract is used in many ayurvedic formulations against diabetes and renal complaints.
24.	<i>Hippophae rhamnoides</i> L.	Chharma, Surch	Sea buckt-horns	Elaeag-naceae	Shrub	Leaves, Fruits	Leaves used as tea, very effective in liver ailments, male impotency, high cholesterol and excessive menstrual bleeding; also acts as immunity booster.
25.	<i>Hippophae salicifolia</i> D. Don	Chharma, Surch	Sea buckt-horns	Elaeag-naceae	Shrub	Leaves, Fruits	Leaves used as tea, very effective in liver ailment, male impotency, high cholesterol and

							excessive menstrual bleeding; also acts as immunity booster.
26.	<i>Iris planifolia</i> (Mill.) T. Durand & Schinz	Rau	Scorpion Iris	Iridaceae	Herb	Rhizome	Paste of rhizome is good for inflammation and cysts.
27.	<i>Juglans regia</i> L.	Kaa	Walnut	Juglandaceae	Tree	Bark, leaves, fruits	Poultice of bark and leaves is effective against rickets and diarrhoea and bark is used for tooth cleaning; Nuts immunity booster.
28.	<i>Juniperus communis</i> L.	Thekeru	Juniper	Cupressaceae	Shrub	Fruits	Fruits used as diaphoretic, carminative and stimulant.
29.	<i>Juniperus polycarpos</i> K. Koch	Shur	Juniper	Cupressaceae	Tree	Leaves	Leaves are used in ayurvedic formulation for Cardiac and nervous problems.
30.	<i>Lathyrus latifolium</i> L.	Nyar	Grass pea	Fabaceae	climber	Seeds	Seeds consumed as immunity booster.
31.	<i>Malva neglecta</i> Wallr.	Sochil	Dwarf mallow	Malvaceae	Herb	Tender leaves	Leaves are cooked, good for cold, burn, cough, tonsillitis, bronchitis and digestive problems.
32.	<i>Mentha longifolia</i> L. (Huds)	Pudina	Horse mint	Lamiaceae	Herb	Leaves	Extract of leaves used for headache and stomach pain; good for diarrhoea.
33.	<i>Morchella esculanta</i> Fr.	Rang-mooch	Conic morel, Morel	Morchellaceae	Fungi	Fruiting body	Fruiting body is good for fever and constipation; vegetable as immunity booster.
34.	<i>Oxalis corniculata</i> L.	Khatii	Creeping wood-sorrel	Oxalidaceae	Herb	Leaves	Leaves as such are recommended for diarrhoea, haemorrhoids and skin diseases.
35.	<i>Papaver dubium</i> L.	Phimdata	Long-headed poppy	Papaveraceae	Herb	Leaves	Leaves as such are good for cough and digestion.

36.	<i>Pinus gerardiana Wallich</i> ex D. Don.	Neoza, ree	Chilgoza pine	Pinaceae	Tree	Cone, seeds, Needles	Seeds consumed raw or roasted, considered good for respiratory complaints such as coughs, colds, influenza
37.	<i>Pinus roxburghii</i> Sarg.	Chir	Chir pine	Pinaceae	Tree	Seeds	Seeds as stimulant, anthelmintic, digestive and liver tonic.
38.	<i>Polygonum affine</i> D. Don	Rmo	Persicaria-affinis	Polygonaceae	Annual herb	Seeds	Seed used for peptic ulcer, mouth ulcer
39.	<i>Prinsepia utilis</i> Royle	Bekhal	Himalayan Cherry Prinsepia	Rosaceae	Shrub	Seeds	Seeds consumed for rheumatism and muscular pain.
40.	<i>Prunus armeniaca</i> L.	Chuli	Apricot	Rosaceae	Tree	Seed, fruits	Seed oil used for arthritis and fruits relished as immunity booster.
41.	<i>Prunus mira koehne</i> ex Sargent	Rag or bem	Tibetan peach	Rosaceae	Tree	Seeds	Seed oil is used for arthritis.
42.	<i>Rabdosia rugosa</i> (Wall. ex Benth.) H. Hara	Thator	Wrinkled leaf Isodon	Lamiaceae	Shrub	Leaves	Extract of leaves is good for stomachache and gastric problems.
43.	<i>Rhododendron anthopogon</i> D. Don	Sermanung	Dwarf Rhododendron	Ericaceae	Shrub	Leaves	Paste of leaves is good for headache, cold and insect bite.
44.	<i>Robinia pseudoacacia</i> L.	Robinia	Black locust	Fabaceae	Tree	Flowers	Infusion of flowers is good for nausea, indigestion and frontal headache.
45.	<i>Rumex nepalensis</i> Spreng.	Jungle palak	Nepal Dock	Polygonaceae	Herb	leaves	Leaves are cooked, good for colic pain and swollen gums.
46.	<i>Saussurea obvallata</i> (DC.) Sch. Bip	Dongur	Brahma Kamal	Asteraceae	Herb	Root, flowers	Extract from roots and flowers is used in herbal formulations for headache, wounds and cuts.
47.	<i>Thalictrum dioicum</i> Benth. ex Benth	Van ajwain	Early meadow-rue or quicksilver-weed	Ranunculaceae	Herb	Leaves	Extract of leaves good for stomach complaints.

48.	<i>Urtica dioica</i> L.	Boksor, chogyra	Common stinging nettle	Urticaceae	Herb	Leaves	Vegetable of leaves used as antirheumatic and tonic.
49.	<i>Viscum album</i> L.	Zgueil	European mistletoe	Santalaceae	Semi-parasitic shrub	Leaves, pea-sized berries	Leaves and berries are considered good for cancer, depression and autoimmune diseases in ayurvedic formulations and Tibetan system of medicine.
50.	<i>Verbascum Thapsus</i> L.	Tamakhu	Great mullein	Scrophulariaceae	Annual herb	Leaves	Infusion used for dry cough, asthma and bronchitis.
51.	<i>Viola biflora</i> L.	Banafsha	Sweet violet	Violaceae	Herb	Leaves	Infusion of flowers and leaves is used for fever and cough.

Table-2. Quantitative ethnobotanical parameters applied in documented plant species

S. No.	Botanical name	Use value (UV)	Importance value (IV)	Total importance value (TIV %)
1.	<i>Angelica glauca</i> Edgew.	0.45	0.50	50
2.	<i>Arisaema flavum</i> (Forssk) Schott	0.10	1.12	25
3.	<i>Arnebia benthamii</i> (wall .ex G.don) Johns	0.43	0.45	50
4.	<i>Articum lappa</i> Wall. ex DC	0.11	0.11	32
5.	<i>Allium humile</i> Kunth	0.19	0.15	35
6.	<i>Aesculus indica</i> (Colebr. ex Cambess.) Hook.	0.17	0.17	35
7.	<i>Berberis aristata</i> Roxb. ex DC.	0.20	0.18	45
8.	<i>Betula utilis</i> D.Don	0.13	0.14	32
9.	<i>Bistorta affinis</i> (D.Don) Greene	0.10	0.07	23
10.	<i>Bunium persicum</i> (Boiss.) B.Fedtsch	0.26	0.31	35
11.	<i>Cannabis sativa</i> L.	0.15	0.21	40
12.	<i>Capsella bursa-pastoris</i> (L.) Medik	0.08	0.09	25
13.	<i>Cassiope fastigiata</i> (Wall.) D. Don	0.09	0.08	20
14.	<i>Carduus nutans</i> L.	0.07	0.09	23
15.	<i>Celtis australis</i> L.	0.08	0.97	17
16.	<i>Cedrus deodara</i> (Roxb.) G.Don	0.14	0.11	23



17.	<i>Chenopodium album</i> L.	0.17	0.18	32
18.	<i>Coriandrum sativum</i> L.	0.21	0.15	38
19.	<i>Crocus sativus</i> L.	0.25	0.23	45
20.	<i>Datura stramonium</i> L.	0.09	0.07	30
21.	<i>Dioscorea deltoidea</i> Wall. ex Griseb.	0.23	0.22	38
22.	<i>Fagopyrum esculentum</i> Moench	0.21	0.21	38
23.	<i>Fagopyrum tataricum</i> (L.) Gaertn	0.22	0.21	40
24.	<i>Hippophae rhamnoides</i> L.	0.39	0.38	45
25.	<i>Hippophae salicifolia</i> D. Don	0.39	0.38	45
26.	<i>Iris planifolia</i> (Mill.) T.Durand & Schinz	0.11	0.12	25
27.	<i>Juglans regia</i> L.	0.17	0.13	25
28.	<i>Juniperus communis</i> L.	0.16	0.16	27
29.	<i>Juniperus polycarpos</i> K. Koch	0.13	0.18	27
30.	<i>Lathyrus latifolium</i> L.	0.13	0.16	29
31.	<i>Malva neglecta</i> Wallr.	0.21	0.23	24
32.	<i>Mentha longifolia</i> L. ( Huds )	0.29	0.32	34
33.	<i>Morchella esculanta</i> Fr.	0.31	0.33	34
34.	<i>Oxalis corniculata</i> L.	0.14	0.13	25
35.	<i>Papaver dubium</i> L.	0.09	0.07	18
36.	<i>Pinus gerardiana</i> Wallich ex. D. Don.	0.10	0.08	24
37.	<i>Pinus roxburghii</i> Sarg.	0.11	0.11	23
38.	<i>Polygonum affine</i> D. Don	0.14	0.14	26
39.	<i>Prinsepia utilis</i> Royle	0.15	0.17	25
40.	<i>Prunus armeniaca</i> L.	0.17	0.16	35
41.	<i>Prunus mira</i> koehne ex Sargent	0.13	0.15	35
42.	<i>Rabdosia rugosa</i> (Wall. ex Benth.) H.Hara	0.12	0.15	24
43.	<i>Rhododendron anthopogon</i> D. Don	0.12	0.13	23
44.	<i>Robinia pseudoacacia</i> L.	0.10	0.13	20
45.	<i>Rumex nepalensis</i> Spreng .	0.11	0.11	25
46.	<i>Saussurea obvallata</i> (DC.) Sch.Bip	0.15	0.14	20
47.	<i>Thalictrum dioicum</i> Benth .ex Benth	0.13	0.15	20
48.	<i>Urtica dioica</i> L.	0.21	0.24	37
49.	<i>Viscum album</i> L.	0.15	0.15	25
50.	<i>Verbascum Thapsus</i> L.	0.14	0.17	24
51.	<i>Viola biflora</i> L.	0.21	0.27	31

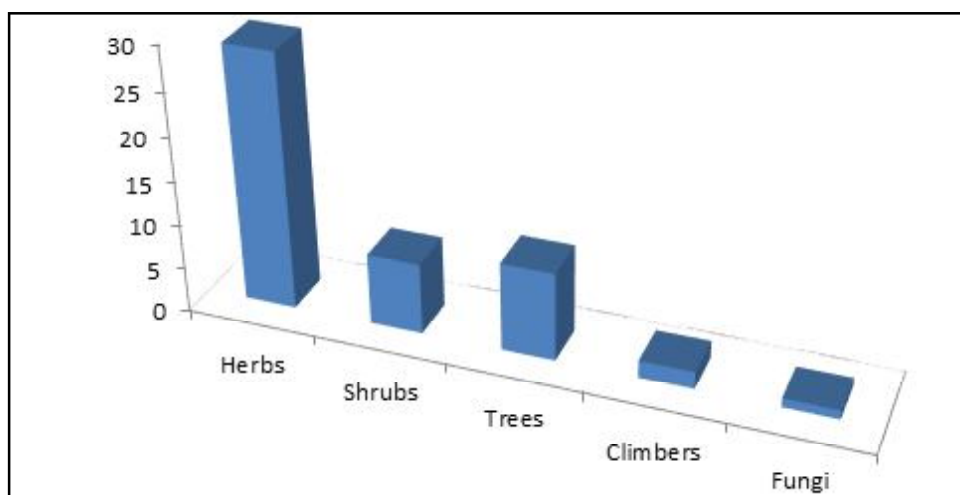


Fig. 1. Habit Wise Distribution of Medicinal Flora of Bhaba Nagar Valley.

A total of 80 rural informants were interviewed and out of total, 37 were males and 43 were females. From the study area, a total of 51 plant species belonging to 32 families and 46 genera were collected for their traditional uses. All the documented plant species are indicated in Table 1 along with their ethnomedicinal uses and the calculated quantitative indices *i.e.* Use Value, Importance Value and Total Importance Value are mentioned in Table-2. The predominant families of the study area are Polygonaceae (5 spp), Asteraceae, Apiaceae and Rosaceae with 3 spp each. The remaining families contributed for single plant species. Herbs (29spp) were used predominantly followed by trees (10spp), shrubs (9spp), climbers (2spp) and one fungus (Figure 1). The most exploited plant parts were leaves (25spp), followed by seeds (14 spp), flowers and roots (7 spp each). The most commonly used methods of usage of medicinal plants were mentioned in table-2.

On the basis of use-value (UV), the

most important medicinal plant species of the area were *Angelica glauca* (0.45), *Arnebia benthamii* (UV=0.43), *Hippophae rhamnoides* and *Hippophae salicifolia* (UV=0.49 each). On the basis of Importance value (IV), the most important medicinal plant species of the area were *Angelica glauca* (0.50), *Arnebia benthamii* (0.45), *Hippophae rhamnoides* and *Hippophae salicifolia* (0.38 each). The highest values of same plant species in both categories indicate the co-relation between Use value and Importance value.

Similarly, Total Importance Value (TIV) was highest for the same plant species as *Angelica glauca* and *Arnebia benthamii* (50% each), *Hippophae rhamnoides* and *Hippophae salicifolia* (45% each); however two more plant species *i.e.* *Berberis aristata* and *Crocus sativus* were reported with high TIV values (45% each). It means that all the above mentioned plant species are most commonly and frequently used by the local rural populace of the region.

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References :

1. Belal, A.E. and I. Springuel (1996). *Nature & Resources*, 32(1): 33-39.
2. Bye, A. and H. Balsav (2001). *Biodiversity & Conservation*, 10: 951-970.
3. Chauhan, K. (2020). *Journal of Arts, Culture, Philosophy, Religion, Language and Literature*, 4(2): 109-111.
4. Dash, S.S., D.D. Pramanik, S. Kumar, P. Songh, and A.A. Mao (2019). *Phytotaxonomy*, 18: 1-12.
5. Dikshit, S. S., S. Rai, and M.M. Sharma (2016). *J. Med. Plant*, 4: 108-116.
6. Jain, S.K. (2004). *A Manual of Ethnobotany*. 2<sup>nd</sup> ed. Scientific Publishers, Jodhpur.
7. Jain, S.K. and R.R. Rao (1976). *A Handbook of Field and Herbarium Methods*. New Delhi: Today & Tomorrow's Printers and Publishers.
8. Kaur, R. (2015). *International journal of current research and academic review*, 3(5): 262-271.
9. Khajuria, A.K., R.K. Manhas, H. Kumar and N.S. Bisht (2021). *J. Ethnopharmacology*, 276: 114204.
10. Negi, K., H.P. Singh, D. R. Batish, A. Sharma. and S. Kumari (2017). *International Journal of Advanced research*, 5(7): 743-750.
11. Pathak, M. and K.A. Bharti (2020). *Ethnobotany Res. & Appl.* 20(49): 1-42.
12. Phillips, O.L., A.H. Gentry, C. Reynel, P. Wilkin and C. Galvez-Durand (1994). *Conservation Biology*, 8: 225-248.
13. Phondani, P. C., R.K. Maiknuri, L.S. Rawat, N.A. Farooquee, C.P. Kala, S.C.R. Vishwakarma, K.S. Rao and K.G. Saxena (2010). *Ethnobot. Res. & Applications*, 8 : 233-244.
14. Singh, G.S. (2004). *Studies of Tribes and Tribals* 2(1): 29-35.
15. Verma, R. K. (2014). *Asian Pacific Journal of Tropical Biomedicine*, 4 : 460-467.
16. Xavier, T. F., M. Kannan, L. Lija, A. Auxillia and A.K.F. Rose (2014). *J. Ethnopharmacology*, 152(1): 78-90.