



A REVIEW ON SOME SPECIFIC ETHNO – MEDICINAL PLANTS IN UTTARAKHAND REGION

Pandey Preeti^{*1}, Rani Vijeta², Singh D. C.³ and Arya Rishi⁴

^{1,2}P.G. Scholar, P.G. Dept. of Dravyaguna, Rishikul Campus, UAU, Haridwar.

³Professor & H.O.D, P.G. Dept. of Dravyaguna, Rishikul Campus, UAU, Haridwar.

⁴Assistant Professor, P.G. Dept. of Dravyaguna Rishikul Campus, UAU, Haridwar.

***Corresponding Author: Dr. Pandey Preeti**

P.G. Scholar, P.G. Dept. of Dravyaguna, Rishikul Campus, UAU, Haridwar.

Article Received on 21/06/2019

Article Revised on 11/07/2019

Article Accepted on 31/07/2019

ABSTRACT

Uttarakhand state is considered as repository of biodiversity with particular reference to medicinal plants that can be an important option for sustainable livelihood of the hilly people in coming future. About 300 medicinal plant species have been documented from this state, indicating ethno – medicinal richness as an herbal state and for strengthening herbal – based industry in this region. Traditional medicine has been defined as the sum of the knowledge, skill and practices based on the theories, beliefs and experience indigenous to different culture, whether explicable or not, used in the maintenance of health as well in the prevention, diagnosis, improvement or treatment of physical and mental illness. In many developing countries, a large part of the population, especially in rural areas, depend mainly on traditional medicine for their primary health care. The indigenous knowledge of medicinal plants has been well documented in ancient *Hindu* literature. Traditional knowledge on medicine since the time of Great sage *Charak* has led to the discovery of many important drug of modern age. Today about 65% of the Indian population depend on the traditional system of medicine. Present study is an attempt to document the traditional system of medicine; used by the native of Uttarakhand, associated with medicinal plants and herbs used for the treatment of different diseases. In this progress many medicinal plants e.g. Buransh, Neelkanthi, Bicchu ghass etc. are significantly utilized by the local peoples of Uttarakhand region for ethnomedicinal use.

KEYWORDS: Botanical classification, Uses, Morphology, Pharmacological activity.

INTRODUCTION

Uttarakhand Government since its inception has projected itself as a herbal state in recognized for its inherited communities rich biodiversity and ethnic herbal traditions. In view of increasing global popularity of herbal medicinal, cultivation of herbal plants to ensure constant supply can be an important alternate source of economy in the state

The choice of right plant selected for cultivation would be a crucial step. The flora of Garhwal has been already extensively explored by several botanists (Gaur 1999; Naithani 1984-85; Bawa 1993; Bhatt et al 2007).

In present paper a comprehensive list of medicinal plants is presented in view of their medicinal demand and their availability in Uttarakhand.^[1]

Medicinal plants have been the subjects of man's curiosity since time immemorial, almost every civilization has a history of medicinal plant use About 400 plants are used in regular production of ayurvedic, unani, siddha and tribal medicine about 75% are from

tropical and 25% from temperate forests in India. India is also rich in medicinal plant diversity with all the three levels of biodiversity such as species, genetic and habitat diversity. Due to its unique geographical location and different climatic condition, Uttarakhand Himalaya has rich biodiversity and variety of plant species and also has tremendous potential for domestication of medicinal plants that can be an important option for sustainable livelihood of the hilly people in coming future.^[2]

1) Bicchu ghaas [Stinging nettle]

Vernacular name^[4]

Sanskrit – Vrischika

Hindi – Bicchu buti

English – nettle^[35] Tall Bull nettle

Nepali – Sisnu

Uttarakhand – Kandali

Punjabi - Bicchu

Botanical classification^[3]

Kingdom - Plantae

Order - Rosales

Family - Urticaceae

Genus - *Urtica*

Species - *U. dioica*

Bionomial name - *Urtica dioica*

Morphology^[5]

Urtica dioica (stinging nettle), is a perennial plant belonging to the genus *Urtica* of the family *Urticaceae*. The stem is erect and green, quadrangular, with lacunar collenchyma at each corner. Fibrovascular bundles could

be 12–20. The leaves are dark-green above and paler beneath, oblong or ovate, opposite, cordate at the base, finely toothed. Stinging trichomes cover both stems and leaves, and contain a fluid enriched in histamine, acetylcholine, and serotonin. The small dioecious flowers are either male or female in separate inflorescences, brown to greenish in color, occurring as racemes in the axils of the upper leaves and flowering from May to September every year.



Figure 1: *urtica dioica*.

Geographical distribution^[9]

It occurs in wastelands, fallow places, margins of cultivated fields, woodlands, shrubberies in Western Himalya.

Chemical constituents^[8]

The major chemical constituents of *Urtica dioica* are flavonoids, tannins, volatile compounds and fatty acids, polysaccharides, isolectins, sterols, terpenes, protein, Vitamins and minerals.

Medicinal uses

- 1) The root of Stinging nettle is used to reduce prostate gland inflammation.^[10]
- 2) Stinging nettle root used to treat urinary difficulties associated with stages I and II of B.P.H.^[10]
- 3) Nettle can help alleviate the symptoms of osteoarthritis and joint pain.^[11]
- 4) Stinging nettle extract supplements have been suggested for reducing nausea and diarrhea, and as with the menstruation and menopausal effects, it can also soothe ulcers and hemorrhoids.^[12]

PHARMACOLOGICAL ACTIVITY

1) Anti-inflammatory & Analgesic properties^[7]

Although a number of steroidal or non-steroidal anti-inflammatory drugs have been developed, researchers are changing their focus to natural products to develop new anti-inflammatory agents due to the side-effects of chemical drugs (Hyun and Kim, 2009; Shokrzadeh and Saeedi Sarvari, 2009). As a result, the search for other alternatives seems necessary and beneficial. *U. dioica* is an open door for new and effective compounds. *U. dioica* sting seems a safe treatment for musculoskeletal pain. It contains serotonin and histamine that are involved in the cascade of stimulation affecting levels of nerve growth factor which in turn increases activation of nociceptive pain neurons (McMahon, 1996).

2) Hepatoprotective properties^[7]

U. dioica has a protective effect on hepatic damage created with ischemia-reperfusion. Since *U. dioica* is known to be a strong antioxidant, breaking up free radicals, it is expected to be protective in hepatic ischemia-reperfusion injury of rats. *U. dioica* exhibited liver protection effect by increasing the activity of paraoxonase, arylesterase, and liver tissue catalase activity. Treatment with *U. dioica* reduced oxidative stress resulting in a decrease in ceruloplasmin levels.

Also, it was found that treatment with *U. dioica* decreased the lipid hydroperoxide activity, indicating that the antioxidant effect of *U. dioica* had prevented the emergence of an oxidant agent such as LOOH with creation of hepatic ischemia-reperfusion (Kandis *et al.*, 2010). (mg/kg po.) and isolated β -sitosterol (10 and 20 mg/kg).

3) Antifungal Activity^[8]

Extract of nettle leaves at different concentrations showed antifungal activity against *R. solani*, *Fusarium oxysporium*, *F. solani*, *Alternaria alternata*. The antifungal activity against is such that the growth of *A. alternata* was completely inhibited at 0.9% concentration. The extract produced great reduction in mycelial growth with this fungus at (0.3, 0.5 and 0.7) % with (30.5, 39.4 and 58.1) % percentage reduction. Seed oil extract of *U. pilulifera* shows anti-fungal activity against *Candida albicans* and *Candida parapsilosis*. The reason of this activity is presence of Ketoconazole and Fluconazole.

2) Buransh [*Rhododendron arboretum*]

Rhododendron is the national flower of Nepal & is known as (Laligurans) & the state tree of Uttarakhand. It is called 'Burans, Bras, Buras or Barah-ke-phool' in local dialect.^[15]

Synonyms - *Rhododendron arboreum* Smith var. *nilagirica* *Rhododendron nilagiricum* Zenk.

Vernacular name^[6]

Sanskrit – *Kurvak*

Hindi – *Burans*

English – Nilgiri Rhododendron

Nepali – *Lali gurans*

Garhwali – *Buransh*

Kumouni - *Eras*

Punjabi - *Adrawal*

Tamil – *Alingi vellimaram*

Bangali - *Baras*

Malyalam - *Kattupoovarasu*

Botanical classification^[12]

Kingdom - Plantae

Class - Angiospermae

Order - Ericales

Family - Ericaceae

Genus - *Rhododendron*

Sub. Genus - *Hymenantes*

Species - *R. arborem*

Classical review^[36]

In Rajanighantu it has been mentioned as a synonym of **Swetamandar**. A reference to medicinal properties & use mentioned for Baka or Buka in Virtarvadi Gana & in the Bhavprakash Nighantu may be made in this connection.

Morphology^[14]

An evergreen, much branched tree, upto 14 cm in height and 2.4 m in girth. Bark is reddish – brown, soft, rough, exfoliates in thin flakes. Leaves are lanceolates or oblong, crowded towards the ends of the branches. Flowers are showy, red, in dense, globose cymes and blooming in the month of March – April.

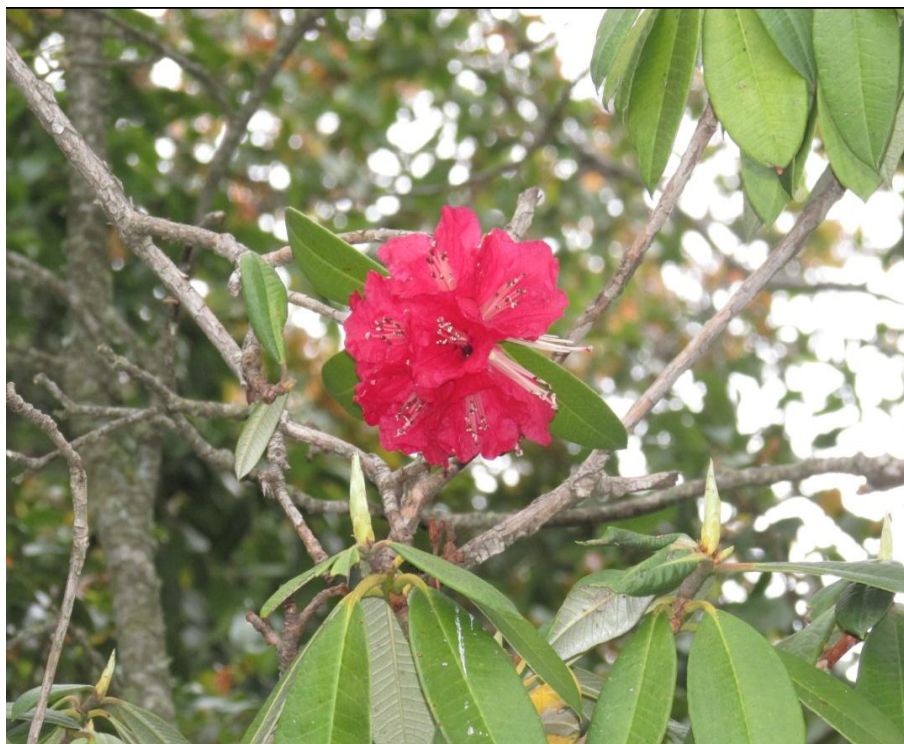


Figure 2: *Rhododendron arboretum*.

Geographical distribution^[17]

Rhododendrons are native chiefly in the North Temperate Zone, especially in the moist acid soil of the Himalayas and into Southeast Asia to the mountains of New Guinea.

Chemical constituents^{[6][37]}

Leaves of Rododendron has Glucosides, ericoline, ursolic acid, alfa-amayrin, Tr-iterpenoid, quersetin & Hyperoside. It bark contain Leucopelargonidin. Flower of Rhododendron has Ursolic acid, Resins & quersetin.

Formulation^[17] –

Asoka Arishta, Rohitakyadi churna

Part used^[13] – Flower, Petals, Leaves, bark.

Dose^[17]

Powder - 1-3 gm

Decoction - 50-100 mL

PHARMACOLOGICAL ACTIVITY**1) Anti-diabetic activity**^[18]

Anti-diabetic activity was examined in (Rhododendron arboreum Sm) flower and active compounds were isolated from it. Aqueous methanolic extract of the flower of Laligurans was found to show inhibitory activity on the rat intestinal α -glucosidase. Both the water-soluble and ethyl acetate-soluble portions from the aqueous methanolic extract showed inhibitory activities on α -glucosidase, demonstrating higher activity by the ethyl acetate-soluble portion. From the ethyl acetate-soluble portion, α -glucosidase inhibitor quercetin-3-O- β -D-galactopyranoside (hyperin) was isolated through enzyme-assay guided separation. The isolated compound showed a dose dependent α -glucosidase inhibitory activity with IC₅₀ values of 1.66 mM and 0.76 mM for sucrase and maltase, respectively. This study revealed that flower contains antidiabetic potential which property might be helpful to develop medicinal preparations, nutraceutical or functional food for diabetes and its complications (Bhandary & Kuwabata, 2008).

Medicinal uses

- 1) The tincture of dried leaves of rhododendron arboretum has been used in gout and rheumatism.^[15]
- 2) The dried flowers are supposedly highly efficacious in checking diarrhoea and blood dysentery.^[15]
- 3) The young leaves are used as medicinal and applied on the forehead to alleviate headache.^[15]
- 4) Flowers are use in Anti-diabetic and diabetic nephropathy.^[16]

3) Neelkanthi [Ajuga bracteosa]

bracteosa is highly medicinal plant and it is the most valuable species among all the species of genus Ajuga. A. bracteosa is commonly known as kauri booti and it belongs to family Lamiaceae.^[19]

Common name^[22] - Bugle, Lungememen

Vernacular name^[33]

Sanskrit – Neelkanthi

Hindi – Kar

English – Bungle

Kashniri - Jan- i- adam^[19]

Kumouni - Ratpata

Punjabi - Khurbanti

Botanical classification^[20]

Kingdom - Plantae

Class - Magnoliopsida

Order - Lamiales

Family - Lamiaceae (Labiatae)

Genus - Ajuga

Species - A. *Bracteosa*

Morphology^[38]

A perennial herb, softly hairy or glabrate, branches many, 10-30cm long, usually stout, erect or ascending, simple or branching leafy. Leaves 2.5- 10 cm long, ovate, oblanceolate or subsphulcate, obtuse, sinuate – toothed, the lower ones petioled. Whorls axillary, often crowded in spikes. Flowers 6-8 mm long; bracts leaf-like, longer than the whorls, ovate or cuneate – obovate, entire or toothed.



Figure 3: *Ajuga bracteosa*.

Geographical distribution^[19]

It is a perennial herb growing wild in the Punjab plains, upper Gangetic plains and from Kashmir to Nepal in Western Himalaya. It is established on grassland, exposed slopes and open field in temperate and subtropical region of the world at an elevation of 1300 to 2400.

Chemical constituents^[19]

A. bracteosa contains various compounds such as neoclerodane diterpenoids, flavonol glycosides, iridoid glycosides, ergosterol-5,8-endoperoxide and phytoecdysones.

Part used – whole plant

PHARMACOLOGICAL ACTIVITY

1) Hypoglycemic activity^[21]

The herb contains comparatively larger amounts of chromium (leaves 25 mg and roots 20 mg per 100 g) which may be correlated to its use as remedy for diabetes as per Ahmed *et al.* Chromium is another essential mineral that human require in trace amounts. It is an important component of many body building strategies to and in the development of lean muscle mass, as well as in the treatment of diabetes and for weight loss. Chromium increases the metabolism of proteins, fats and carbohydrates. Significantly, it enhances the efficiency of insulin to regulate blood sugar levels.

2) Antihypertensive activity^[21]

The Renin-angiotensin system (RAS) plays an important role in the control of cardiovascular homeostasis, affecting both blood pressure and fluid volume and is one of the most important ethiological candidates in hypertension. 8-O-Acetyl harpagide was isolated and

characterized from *Ajuga bracteosa* Wall, cardiotoxic effects elicited by the compound. Sodium is the common mineral determined in *Ajuga bracteosa* for which Estimated Safe and Adequate Dietary Intake varies from 1100-3300 mg which is 1875-5625 mg for potassium. The ions of these metals are electrolytes which maintain “body water balance” and carry out nerve functions. The requirement of K⁺ for daily intake is obviously quite higher in concentration within body cells, while Na⁺ (along with Cl⁻) ions are found in excess especially in extra cellular fluids such as blood plasma. Larger amounts of potassium (leaves 139 mg, roots 159 mg per 100 g) than sodium (leaves 21 mg, roots 29 mg per 100 g) may have some correlation with the use of the herb in hypertension.

3) Anti-inflammatory activity^[21]

Seventy percent ethanolic extract of *A. bracteosa* possesses promising and significant anti-inflammatory activity. The mechanism of anti-inflammatory is supposed to be facilitated through the inhibition of COX-1 and COX-2. The study also indicates that isolated active ingredients (lupulin A, ajugarin I, deoxyharpagide withaferin A and reptoside) could be accountable for COX inhibitory and anti-inflammatory activity. The study confirms traditional use of *A. bracteosa* for the treatment of rheumatism and some other inflammatory disorders.

4) Antibacterial activity^[21]

Various extracts of *Ajuga bracteosa* leaves, roots and bark have been reported to be active against many bacterial strains. studies the antibacterial activity of withaferin A and its compound reported that this constituent active against gram positive bacteria. Ali *et al*

was reported, the 20-deoxywithanolide-D to possess the highest activity among the compound tested.

Cardiotonic activity

An alkaloidal fraction from *A. bracteosa* showed the cardiostimulant action on frog heart and rat ventricle. The activity was antagonized by dichloroisoprenaline, did not occur in hearts from reserpine-treated animals, and may result from liberation of catecholamine stores in the heart.^[25]

Cardiotonic activity

An alkaloidal fraction from *A. bracteosa* showed the cardiostimulant action on frog heart and rat ventricle. The activity was antagonized by dichloroisoprenaline, did not occur in hearts from reserpine-treated animals, and may result from liberation of catecholamine stores in the heart.^[25]

Anti-inflammatory activity

Seventy percent ethanolic extract of *A. bracteosa* possesses promising and significant anti-inflammatory activity. The mechanism of anti-inflammatory is supposed to be facilitated through the inhibition of COX-1 and COX-2. The study also indicates that isolated active ingredients (lupulin A, ajugarin I, deoxyharpagide withaferin A and reptoside) could be accountable for COX inhibitory and anti-inflammatory activity. The study confirms traditional use of *A. bracteosa* for the treatment of rheumatism and some other inflammatory disorders.^[24]

Anti-inflammatory activity

Seventy percent ethanolic extract of *A. bracteosa* possesses promising and significant anti-inflammatory activity. The mechanism of anti-inflammatory is supposed to be facilitated through the inhibition of COX-1 and COX-2. The study also indicates that isolated active ingredients (lupulin A, ajugarin I, deoxyharpagide withaferin A and reptoside) could be accountable for COX inhibitory and anti-inflammatory activity. The study confirms traditional use of *A. bracteosa* for the treatment of rheumatism and some other inflammatory disorders.^[24]

Anti-inflammatory activity

Seventy percent ethanolic extract of *A. bracteosa* possesses promising and significant anti-inflammatory activity. The mechanism of anti-inflammatory is supposed to be facilitated through the inhibition of COX-1 and COX-2. The study also indicates that isolated active ingredients (lupulin A, ajugarin I, deoxyharpagide withaferin A and reptoside) could be accountable for COX inhibitory and anti-inflammatory activity. The

study confirms traditional use of *A. bracteosa* for the treatment of rheumatism and some other inflammatory disorders.^[24]

Medicinal uses

- 1) The juice of the root is used in the treatment of diarrhoea and dysentery.^[23]
- 2) The leaves are used in the treatment of fevers as a substitute for quinine.
- 3) The juice of the leaves is used as a blood purifier and also for fevers, and the powdered leaves for burns and boils.^[24]
- 4) Decoction of its bark is used to cure jaundice and sore throat.^[25]
- 5) An aromatic tonic, specially useful in ague.^[31]

4) Brahma- kamal [*Saussurea obvallata*]

(Local names of this flower is Brahma Kamal)

It is the state flower of Uttarakhand

Brahmkamal, the mysterious herb of Himalya. In Hindu mythology Brahmkamal is believed to have divine powers. Brahmkamal is highly valuable plant, beside its religious value, the plant is extensively harvested by local people for preparation of traditional Ayurvedic medicine.^[29]

Vernacular name^[33]

Kumouni - *Brahma- kamal*

Punjabi - *Kanwal*

Botanical classification^[26]

Kingdom - Plantae

Class - Magnoliopsida

Order - Asterales

Family - Asteraceae

Genus - *Saussurea*

Species - *S. obvallata*

Binomial name^[26] - *Saussurea obvallata* (DC.) Edgew.

Synonyms - *Aplotaxis obvallata* DC. *Theodorea obvallata* (DC.) Kuntze

Morphology^[27]

Saussurea obvallata is a perennial herb with stout stem, 15-45 cm long. Leaves are oblong to blunt lanceolate in shape, and leaf margins are toothed. The lower part of the leaf is stalked, and the upper part is half-clasping with the blade. Continuing in a wing down stem. Several purple flower heads occur in a dense umbel-like cluster, each 1.5-2.5 cm long, and is supplemented with involucrel-bracts with black margins and tips. Flowers bloom usually in July-August, and flower can be seen till mid- October.



Figure 4: Saussurea obvallata.

Geographical distribution^[27]

The Brahma Kamal, native to Himalayas, at the upper limit of high mountains (4000m approx). The flowers bloom at the height of the monsoons and abundant in high-altitude places like The Valley of Flowers. The bract-cover provides the warm space needed to bloom in the cold mountains. The flowers are used as offering in the hill temples, like the shrines of Badrinath. Brahma Kamal is the state flower of Uttarakhand.

Outside India, Brahma Kamal also grows in Myanmar, Bhutan, Nepal, East Tibet, and Pakistan.

Chemical constituents^[30]

Alkaloids; Calcium; Chromium; Copper; Glycosides; Iron; Lead; Magnesium; Manganese; Minerals; Nickel; Phenol; Proteins; Saponins; Steroids; Strontium; Tannins; Terpenoids; Zinc phenolics, flavonoids, lignans, sesquiterpenes and lactones.

Part used – Flower.

Medicinal uses

- 1) Due to its bitter nature, it is an excellent liver tonic and a great appetiser.^[28]
- 2) Soup made from this plant helps soothe liver inflammations and also increases blood volume in the body.^[28]
- 3) Plant juice is useful to treat urinary tract disorders. It clears recurrent urinary tract infections.^[28]
- 4) The flowers, rhizomes, and leaves are used for the treatment of ache, intestinal ailments, cough, and cold.^[28]
- 5) Roots are often applied as a paste in cuts and bruises.^[35]

- 6) The bracts are boiled in water and used as hot fomentation to cure hydrosele.^[35]

REFERENCES

1. Rakhi rawat, D.P Vashishtha, Internatinal journal of Pharmacognosy & Phytochemical Research, 2011; 3(3): 64-73. ISSN: 09754873, dept. of botany, H.N.B university, u.k, India.
2. Mukesh Topwal & Shailendra uniyal, Review of Important Ethno medicinal plants in U.K., 2018; 6(2): 455-464. ISSN: 2320 – 7051. Available on www.ijpab.com
3. Wikipedia [https:// en.m.wikipedia. org/](https://en.m.wikipedia.org/) Urtica dioica accessed on 30/06/2019.
4. Acharya Balkrishna, Ayurvedic Jadi buti rahasya, Vol 3, Divya Prakashan, Patanjali Yogpeeth Maharshi Dayanand Gram, Haridwar (U.K). 20117 ISBN NO. 978-81-89235-44-4. p. 1383.
5. Gionata De Vico, Vincenzo Guida, urtica dioica (Stinging Nettle); A Neglected plant with emerging Growth Promoter/ Immunostimulant Properties for farmed fish. 26 March 2018 | <https://doi.org/10.3389/fphys.2018.-00285>, 26 March 2018 |
6. Acharya Balkrishna, Ayurvedic Jadi buti rahasya, Vol 2, Divya Prakashan, Patanjali Yogpeeth Maharshi Dayanand Gram, Haridwar (U.K). 20117 ISBN NO. 978-81-89235-44-4 p. 1066.
7. Jinous Asgarpanah, Phytochemistry & pharmacological properties of Urtica dioica. Journal of Medicinal plants research, ISSN; 1996-0875, DOI;10.587/JMPR, 2012.
8. Priyanka Rajput, Maitry Chaudhary and R. A. Sharma, International journal of Pharmaceutical sciences and research, PHYTOCHEMICAL AND

- PHARMACOLOGICAL IMPORTANCE OF GENUS *URTICA* - A REVIEW, ISSN:2320-5148, 2017
9. Ravindra Sharma, Medicinal Plants of India; An Encyclopaedia, Daya Publishing House, 2003; ISBN 81-7035-304-1, p.252.
 10. By Hannah Baauman, Jenny perez, Food as Medicine: Stinging Nettle (*Urtica dioica*), American Botanical Council, Herbal E Gram: Volume 15, Issue 7, July 2018
 11. By Dorota Kregiel, Ewelina Pawlikowska, *Urtica* spp.: Ordinary plants with Extraordinary properties, A journal of Systemic Chemistry and Natural product Chemistry. Molocules, 2018 jul; 23(7): 1664, published on 9 July 2018.
 12. https://en.wikipedia.org/wiki/Rhododendron_arboreum accessed on 30/06/2019.
 13. Shalini Varshney, Puneet kumar lohiya, An ethnobotanical study of undocumented medicinal plants of uttrakhand, International journal of recent scientific research, April, 2018; 9, 4(B): 25655.
 14. Ravindra Sharma, Medicinal Plants of India; An Encyclopaedia, Daya Publishing House, 2003; ISBN 81-7035-304-1, p.213.
 15. Pallavi Srivastava, Journal of Applied Pharmaceutical Science, 2012; 02(01): 158-162, ISSN: 2231-3354, accessed on 30/06/2019. Also available on www.japsonline.com
 16. By Vikas kumar, Sheenam suri, Bioactive compounds, health benefits and utilization of *Rhododendron*: a comprehensive review, ISSN2048-7010, accessed on 30-06-2019.
 17. Pallavi Srivastava, Journal of Applied Pharmaceutical Science, 2012; 02(01): 158- ISSN: 2231-3354, accessed on 18-01-2012. Also available on www.japsonline.com
 18. Laydong Lepcha, B.C. Basistha, International Journal of Engineering Science and Innovative Technology (IJESIT), Volume 3, ISSN: 2319-5967.
 19. life medicine, 2016; 4(11): 918, October 2016. Mubashir Hussain, A review of therapeutic potential of *Ajuga bracteosa*: A critically endangered plant from Himalaya. Journal of coastal.
 20. Akriti Pala, Mayank Jadona, *Ajuga bracteosa* wall: A review on its ethnopharmacological and phytochemical studies. Pelagia research library, Der Pharmacia Sinica, 2011; 2(2): 1-10, ISSN:0976-8688.
 21. <https://pfaf.org/user/Plant.aspx?LatinName=Ajuga+bracteosa>, accessed on 30/06/2019.
 22. https://practicalplants.org/wiki/Ajuga_bracteosa accessed on 30/06/2019.
 23. Ashwani Kumar, *Ajuga bracteosa* Wall ex. Benth. has medicinal value. Accessed on 30/06/2019.
 24. <https://bmccomplementalrmed.biomedcentral.com/articles/10.1186/s12906-016-1363-y>.
 25. https://en.wikipedia.org/wiki/Saussurea_obvallata accessed on 30/06/2019.
 26. Yadav chavi, Pharmacognocny of different parts of *Brahmkamal*: The state flower of uttrakhand, Int. J. Res. Ayurveda pharm, 2018; 9(4): 170-175 <http://dx.doi.org/10.7897/2277-4343.094137>.
 27. Dipanjan Ghosh, Brahma Kamal The Himalayan Beauty, 22(4): 377-387. Accesd on April 2017.
 28. By Sripriya Satish, Medicinal uses of Brahma Kamal. Accessed on June 28, 2017.
 29. Yadav chavi, 'physiochemical, phytochemical & chromatography study of different parts of brahmkamal', European journal of biomedical science, ISSN 2349-8870, 2018; 5(6): 694-700.
 30. Kavya Sakthivel, Harish Rameshkumar, Brahma Kamal – A Specific Exploration, Int. J. Pharm. Sci. Rev. Res, January- Febuary 2019; 54(2). ISSN 0976 – 044X.
 31. K.R. Kritikar & B .D. Basu, Indian Medicinal Plants, Vol.3 International Book Disributors Dehradun, 2005; ISBN 81-7089-279-1, p 2027.
 32. Narayan Das Prajapati & Dr. U. Kumar, Agro's Dictionary of Medicinal plant, Agrobios (India) Jodhpur, Reprinted 2005. ISBN:81-7754-173-0, p.15.
 33. Narayan Das Prajapati & Dr. U. Kumar, Agro's Dictionary of Medicinal plant, Agrobios (India) Jodhpur, Reprinted 2005. ISBN:81-7754-173-0, p.306.
 34. Narayan Das Prajapati & Dr. U. Kumar, Agro's Dictionary of Medicinal plant, Agrobios (India) Jodhpur, Reprinted 2005. ISBN:81-7754-173-0, p.361.
 35. Ravindra Sharma, Medicinal Plants of India; An Encyclopaedia, Daya Publishing House, 2003; ISBN 81-7035-304-1. p.225.
 36. Pandit Narahari, Raj Nighantu, Chowkhambha Krishnadas Academy, Varanasi. 4th Edition, 2006, ISBN 81- 218- 0012-9, p.303.
 37. Ravindra Sharma, Medicinal Plants of India; An Encyclopaedia, Daya Publishing House, 2003; ISBN 81-7035-304-1. p.214.
 38. K.R. Kritikar & B .D. Basu, Indian Medicinal Plants, Vol.3 International Book Disributors Dehradun, 2005; ISBN 81-7089-279-1 p 2026.