



ISSN 2456-3110

Vol 8 · Issue 6

June 2023

Journal of
**Ayurveda and Integrated
Medical Sciences**

www.jaims.in

JAIMS

An International Journal for Researches in Ayurveda and Allied Sciences



Maharshi Charaka
Ayurveda

Indexed

Therapeutic and cultural evaluation of *Brahma Kamal* (*Saussurea obvallata* (Dc.) Edgew: An endangered potential herb

Vidhu Singh¹, Yashika Singh², Rishabha Koirala³, Komal Keshwa⁴, Preeti Tamta⁵, Thakur Rakesh Singh⁶

^{1,3}Post Graduate Scholar, ²Ph.D Scholar, ⁶Assistant Professor, Department of Rasa Shastra & Bhaishajya Kalpana, National Institute of Ayurveda (De Novo), Jaipur, Rajasthan, India.

⁴Post Graduate Scholar, Department of Roga Nidan & Vikriti vigyan, National Institute of Ayurveda (De Novo), Jaipur, Rajasthan, India.

⁵Post Graduate Scholar, Department of Rasa Shastra & Bhaishajya Kalpana, Institute of Medical Science, Banaras Hindu University, Varanasi, Uttar Pradesh, India.

ABSTRACT

Background: The essential components of the traditional medical system are plants. A medicinal plant from Uttarakhand known as *Saussurea obvallata* (DC.) Edgew, is considered to be endangered due to its rich cultural and medical significance. It is found at high altitudes of 3000-4800 meter in the Himalayan region. Many studies have been published on phyto constituents and its traditional uses that shown its therapeutic values. In this article all the published research work and available data on geographical and traditional uses of *Brahma Kamal* are compiled here.

Aim: To increase understanding of *S. obvallata*'s cultural significance, medical uses, and protection against health risks. **Methods:** Review a list of published original articles and review secondary data from a variety of databases, including PubMed, PubMed Central, Shodhganga, DHARA, Ayush Research Portal, Google Scholar, Medline, Embase, etc., as well as a list of published original papers. **Result:** Various plant parts of *S. obvallata* have been used for a variety of ailments, including dysentery, rheumatism, leprosy, bone fractures, nervine debilities, cerebral palsy, paralysis, sexual disorders, lung infections, urinary tract infections, leucoderma, rhinitis, and hyperthermia. **Conclusion:** The information in review confirms the traditional claims and contributes in providing promising baseline information for the pharmacological use of *S. obvallata*. The information presented here maybe beneficial for researchers, healthcare professional and pharmaceutical companies to design and develop effective medicines against microorganisms.

Key words: *Brahma Kamal*, *Saussurea obvallata* (DC.) Edgew, Cerebral palsy, Endangered Species, Anti-cancer.

INTRODUCTION

The flora of India is one of the richest of the world due to the great diversity in climate and geographical conditions. The International Union for Conservation of Nature (IUCN; officially International Union for

Conservation of Nature and Natural Resources)^[1] is an international organization working in the field of nature conservation and sustainable use of natural resources. Continuous changes in the planet's weather, such as global warming, rising CFC emissions, pollution, habitat loss and fragmentation, alien species invasion, overfishing, declining plant production, lowered resistance to environmental changes, and increased variability in some ecosystem processes, like plant productivity, water use, and pest and disease cycle, are to blame for the species' and our planet's health rapidly deteriorating. According to IUCN 41,000 species are under the threatened category, out of them 36% of plants are Red-listed.^[2] The IUCN Red list (2004) documents the extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants) in the last 500 years.^[3] About 15,500 species around the world wide are facing the threat of extinction.

Address for correspondence:

Dr. Vidhu Singh

Post Graduate Scholar, Department of Rasa Shastra & Bhaishajya Kalpana, National Institute of Ayurveda (De Novo), Jaipur, Rajasthan, India.

E-mail: singhvidhu2207@gmail.com

Submission Date: 11/04/2023 Accepted Date: 23/05/2023

Access this article online

Quick Response Code



Website: www.jaims.in

DOI: 10.21760/jaims.8.6.19

Presently 12% birds, 23% mammals, 32% amphibians and 31% gymnosperm species in the world face the threat of extinction.^[4] More than 25% of the drugs currently sold in the worldwide market are derived from plants and approx 25,000 species of plants contribute to the traditional medicines.^[5]

Plants play an integral part in traditional medicinal system. The state flower of Uttarakhand, *Brahma Kamal* (*Saussurea obvallata* DC.), is an endemic herb of the Himalayan region (encompassing the Indian Himalayan Region, northern Burma and Southwest China) with rich cultural and medicinal significance.

MATERIALS AND METHODS

Elaborative and detailed contemporary review was done from peer reviewed scientific research data bases such as Google Scholar, PubMed Central, Web of Science. Further, evaluated for its *Ayurvedic* property related to the pharmacology, probable mode of action, habitat, spiritual believes along with cultivation from almost all published recent studies. Almost all available data are tried to be compiled.

RESULTS

Taxonomical Classification

Saussurea is a genus of the Asteraceae family found in the Himalayan region. The plants of this genus are generally known as Snow Lotus has around 400 species out of which 62 are found in India.^[6] In taxonomical classification it falls under Kingdom Plantae, Class Magnoliopsida, Family Asteraceae, Genus *Saussurea* DC and Species *S. obvallata* (DC.) Edgew

Kingdom	Plantae
Subkingdom	Viridaeplantae
Infrakingdom	Streptophyta
Division	Tracheophyta
Subdivision	Spermatophytina
Infradivision	Angiospermae
Class	Magnoliopsida

Superorder	Asteranae
Order	Asterales
Family	Asteraceae
Genus	<i>Saussurea</i> DC
Subgenus	Amphilaena

Vernacular Names

Plant is well known by the name '*Brahma Kamal*' means flower of the Lord *Brahma*, all over world also known as 'sacred lotus' due its auspiciousity.

Hindi name	ब्रह्मकमल
English name	<i>Brahma's</i> lotus King of Himalayan flowers Sacred <i>Saussurea</i> Sacred Lotus Glasshouse plants

Geographical Description and Habitat

The transhimalayan zone, (Ladakh in J&K and Lahaul & Spiti in Himachal Pradesh) is the reason of cold desert in India. Few dwarf shrubs are the main species in these areas. One of the biggest protected areas in the Western or Trans Himalaya is Kedarnath Wildlife Sanctuary (KWS). A rich biological diversity with a variety of floral and animal assemblages is produced as a result of the extreme temperature, geology, and topographic variability. Numerous sacred features can be found in this area (Kedar circuit and Pancha Prayag dedicated to Lord Shiva.^[7] These regions are great trove of medicinal plants. The IUCN recognises KWS as a "Habitat/Species Management Area." (IUCN) and is reputed among the world's richest bioreserves. Field Research Laboratory (FRL), and DRDO conducted a thorough ethno-medico-botanical survey of various regions of the Indian cold desert in order to document the traditionally utilised medicinal plants in that region by indigenous herbalists. They gathered over 425 plant species that are used to treat a variety of illnesses.^[8] *Podophyllum hexandrum* (Mayapple), *Aconitum*

heterophyllum (Aconite), *Saussurea obvallata* (Brahma Kamal), *Gentiana aligida*, *Artemisia* sp., *Oxytropis microphylla*, *Cremanthodium ellis*, and other significant medicinal taxa are among the key species.^[9]

The distribution of the plant is between 3000 and 4800 metres above sea level. During the middle of the monsoon (July to August), flowers blossom among the hillside's grasses and boulders. *Brahma Kamal* can be found in Uttarakhand's Kedarnath, Valley of Flowers, Hemkund Sahib, and Tungnath areas. In the area, the plant has great religious significance. Considering herself a spiritual flower.^[10]

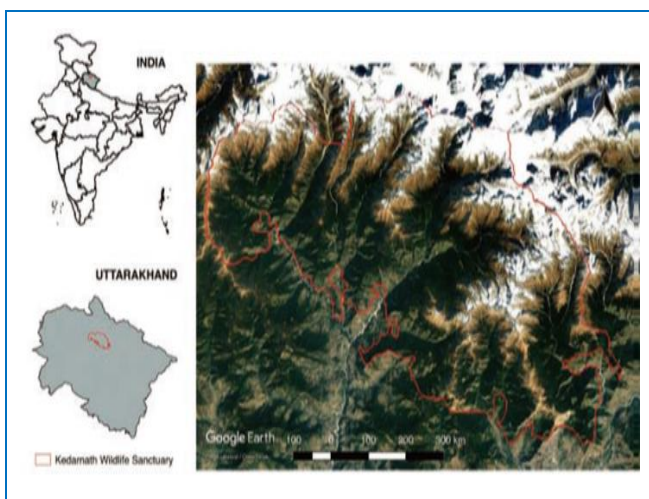


Figure 1: Location of Kedarnath Wildlife Sanctuary in Uttarakhand, India Sanctuary Landscape (Source: Rai et al. 2017).



Figure 2: *Brahma Kamal* flower blooming in valley. (Source: <https://curlytales.com/chamoli-in-uttarakhand-laced-with-rare-brahma-kamal-flowers/>)

Mythological description of Habitat

Hindu mythology claims that the Goddess *Durga* defeated the demon *Mahishasura*, buried him in the ground, and then sat on him in the *Mandani* meadow as a rock. The goddess is revered as *Mandani* or *Manani Mai*, and there is a modest shrine and rock nearby. According to a different narrative, the *Pandavas* travelled over the valley on their way to heaven from the *Swargarohini* peak. The *Rudranath* temple complex contains a number of sacred water bodies (*Kund*) that draw their water from nearby streams and the sacred "*Vaitarani*," (river of salvation). They carry out rituals for their deceased family members so that their spirit can bridge to the other world in the river while worshippers take a bath in the holy *Kund*. Black-rock, (*Kalishila*), is a holy rock where the goddess *Kali* took the form of a demon to kill *Raktbeej* and purge the gods of other demons. The *Pandavas* were quizzed by a *Yaksha* at a lake called *Deoria Taal*, where Hindu deities are said to have taken baths.^[8]

Religious Aspect

In this area, the boulders, rivers, lakes, and alpine meadows all have significant cultural importance. A few examples include the *Vaitarani* River, *Deoria* Lake, *Kalishila* rock, and the *Mandani* valley and alpine meadow. Several revered plant species, including *Saussurea* spp., *Primula* spp., *Brassica* spp., *Ficus* spp., and *Zanthoxylum armatum*, are used in numerous religious rituals. One such plant, *Saussurea obvallata* or *Brahma Kamal*, is highly revered and has significant cultural importance because it is depicted in several myths about Hindu deities, particularly Lord Shiva. Pastoralists collect it, bring it to towns at lower altitudes, and then present it to worshippers as a gift from the gods. It is also used to festively decorate temples. In celebratory moments like 'Savan-Janmasthanmi'.^[8]

Spiritual belief about harvesting techniques

Harvest demonstrates that in small-scale cultures, positive values and practises that support a safe and community living are commonplace for the village and earth-based, informal ritual rain force. One prominent

instance of the practise in the study area is the “*Nanda Astami*”, which is celebrated in honour of the local goddess *Nanda Devi*, the highest peak in the western Himalaya, and is connected to the gathering of the holy flower the *Brahma Kamal* (*Saussurea obvallata*), at the end of August. Only two people (out of the many Johaaris who congregate in the settlement of Martoli, Johaar Valley) are designated to go collect the *Brahma Kamal* from Salang Gwar, the revered alpine meadow where the species is abundant, on the designated day. After taking a ceremonial bath, these two people enter the meadow barefoot, dressed in white, and holding a cucumber to honour the goddess that is in season. They then make the appropriate prayers to the local deity, at which point the collection process begins. Only mature, fully opened *Brahma Kamals* are chosen for the offering. *Nanda Astami* highlights the inherent message of conservation in a traditional society: (1) It is only observed after the species has flowered and shed its seeds, so gathering the seeds cause the least harm to regeneration; and (2) The restriction on the number of harvesters is an effective way to limit the amount of pool harvested.^[11]

Morphological Features

The generic name, ‘*Saussurea*’ is named after the Swedish plant taxonomist, Horace Benedict de Saussure; specific epithet ‘*obvallata*’ is derived from ‘*obvallatus*’, meaning surrounded by wall referring to involucriform bracts. A small hermaphrodite perennial herb that can reach a height of 60 cm. Usually purple to reddish brown, the stems are upright, ribbed, and hollow. Basal leaves are rosulate, petiolate, elliptic-spathulate or lanceolate, 10 to 25, 1 to 5.5 cm, somewhat expanded and sheathed at base, denticulate cuspidate and scarious at margins, and acute to obtuse or cuspidate at apex. Cauline leaves are elliptic-spathulate or lanceolate. Inflorescences with two to many discoid capitula that are terminal and surrounded by involucriform bracts that are creamy white or pale yellow. Florets have two sexes. Corolla is tubular with bluish purple or violet linear-lanceolate lobes. Oblong or obovoid, with a white pappus, pale creamy, brown, or greyish, are cypsela. The plant

reproduces naturally through the germination of seeds.^[12]

Reproductive Biology

For plants to produce offspring and maintain their population, reproduction is a crucial activity. Plant reproduction contributes to the ecosystem's sustainability and birth rate maintenance. The location of a plant's reproductive organs relies on the method of pollination; it is a crucial factor in the life cycle and evolution of flowering plants and a sign of successful sexual reproduction. Hermaphroditic plants have flowers that can pollinate themselves. In the Uttarakhand Himalaya (India), phenology, pollination biology, and pollinators of *S. obvallata* have been examined. Pollination experiments indicated that *S. obvallata* is naturally self-compatible species and preferred for mixed mating.^[13] Bumble bee was the only insect pollinator observed visiting the flower of this species and other species of this genus.^[14]

Used Plant Parts and Their Clinical Indications

Proper documentation and compilation of indigenous knowledge of a species helps in identifying the potential and conservation value of the species and the document can be used as a tool to transfer the knowledge from generation to generation. Among the various parts, viz., leaves, stem, flowers, seeds, aerial parts, roots, etc. of the plants used for curing diseases, root part is most usable.

S. obvallata species not only used for medicine but also highly regarded for religious purposes. These species are offered for worship at hill shrines and to guard against evil spirits. The former, known as ‘*Brahma Kamal*’ has been designated as State flower for the Uttarakhand. It is offered to the Goddesses ‘*Nanda Devi*’ and other deities on auspicious days. It is being used on cardiac disorders, reproductive disorders, excretory system, seeds being used to treat some mental conditions, and the juice of fresh Roots is applied on wounds and cuts.^[25] Fresh leaf extract is given orally as tonic, for cough and internal injury. Uses of various parts are mentioned in table no 1.

Table 1: Various uses of different parts of Brahma Kamal (*S. Obvallata*)

Whole Plant	Roots	Seeds	Flower buds	Leaves
Paralysis of limbs	Antiseptic	Mental Disorder	Boils	Boils
Cerebral ischemia	Boils		Hydrocele	Wounds
Headache	Leucoderma		Reproductive disorders	Bruises
Body pain	Fever		Bruises	Cuts
Bruises	Cough		Cuts	Fractures
Cuts	Cardiac disorders		Bone-ache	
	Bruises		Intestinal ailments	
	Cuts		Urinary track problems	
			Coughs	
			Urinary infections in cattle	

Uses according to various aspect^[15]

Traditional Uses: The plant is revered as a sacred one. The blooms and inflorescences are dedicated to *Lord Shiva* and Goddess *Ganga*, two local deities. Additionally, it is utilised to adorn temples on festive events like "*Savan-Janmasthanmi*."

Medicinal Uses: There are numerous medical uses for this plant. Cuts and wounds are treated using the ground roots. leukoderma, urinary issues, bone fractures, wounds, bone pain, cough and cold, hydrocele, reproductive disease, and digestive issues are all treated using flower buds and roots. Boils also make use of floral buds. Haematuria is treated with the entire plant in veterinary medicine. The dried powder or paste of the plant is used to cure skin conditions in Tawang.

Ceremonial Uses: During the many formal occasions of Uttarakhand state, dignitaries and celebrities are given lithographed mementos featuring the flower of "*Brahma Kamal*."

High Altitude Sickness

Due to an excessively quick ascent or inability to acclimatise, acute mountain sickness is a high altitude disease. Synthetic medications like acetazolamide, dexamethasone, nifedipine, nitric oxide, salbutamol,

sildenafil, etc. are used therapeutically to treat acute mountain sickness disorders. These medications may have side effects and complications like paresthesias and polyuria, as well as less frequently, nausea, drowsiness, impotence, myopia, acidosis, hyperkalemia, paresthesias, fatigue, and abdominal discomfort. Rare but dangerous hypersensitivity responses include fever, rashes, and bone marrow depression. However, for better acclimatisation and control of normal physiological functioning in hypoxic situations, people and saints who live in high altitude places employ a variety of herbal medications. *Brahma Kamal* commonly being used since generations to treat High altitude sickness and better climate acclimatisation in hills areas by the locals and *Vaidyas* in their local community.^[16]

Anti-hypoxic activity

Anti-hypoxic activity was tested by in-vivo method using the normobaric hypoxia model of mice with 20 selected plateau herbs in which eighteen herbs significantly prolonged the survival time of mice compared to the two positive controls, *Rhodiola algida* and acetazolamide the longest survival time was obtained with *Brahma Kamal*. The LAC (lactic acid concentration) content in blood is an indicator of anaerobic respiration, that is, a higher LAC content represents lower anti-hypoxic activity (Schurr, 2002). Its effective constituents were found in the petroleum ether extract, and have the potential to prevent and treat Acute Mountain Sickness.^[17]

TPC and TFC Compound Value

A study performed on the phytoconstituent TPC and TFC present inside the various parts of the plant. The composition of these compounds varies part by part. Phenolic compounds and hydroxyl groups are important plant constituents prior is responsible for redox properties which is mainly responsible for antioxidant activity^[18] while the later is responsible for facilitating free radical scavenging as well as Flavonoids are secondary metabolites with antioxidant activity, the potency of which depends on the number and position of free OH groups.^[19] In an phytoconstituent study about the total content of phenolics (TPC) and

flavonoids (TFC) in *S. obvallata*, significant variation ($p < 0.05$) was recorded. The maximum and minimum TPC values were found in methanolic leaf and aqueous flower extract of *S. obvallata* respectively. Intermediate values were recorded for aqueous leaf and methanolic flower extract. On other hand the maximum and minimum TFC values were recorded in aqueous flower and methanolic flower extract of *S. obvallata* respectively.^[20] Intermediate values were recorded for aqueous leaf extract and methanolic leaves extract. These types of poly phenolic compounds are known to show different types of biological effects, e.g. antioxidant and antimicrobial activities etc.^[21]

Preventive to Ionic Radiation Exposures

The *in-vivo* study about radio-protective effects of *S. obvallata* extract (aqueous) was evaluated in mice models (by radiation exposure of 60Co γ -rays at a dose of 6Gy) by treated with the extract (6Gy). After the treatment observations showed that, the plant extract of *S. obvallata* significantly encouraged the recovery of haematological functions and the number of karyota of femur compared to control group. In the same study the radio-protective effects of aqueous extract of *S. obvallata* (bracts) the aqueous plant extract of bracts promotes the recovery of damage hematopoietic system in radiation-damaged mice compared to control group. Both the studies showed dose dependant radio-protective effects.^[20]

In another *in-vivo* study, radioprotective effects of the aqueous extract of *S. obvallata* on mice models. The experimental models were prepared by the radiation exposure of X-rays at a dose of 4Gy. After irradiation, the mice models were treated with extract (4Gy) up to 14 days. The results of the study demonstrated that, *S. obvallata* have moderate radio-protective effects in mice.^[20]

Antioxidant activity

Antioxidant activity was measured by two methods (DPPH assay and H₂O₂ assay) *in-vitro*, significant variation ($p < 0.05$) while insignificant variation were recorded respectively. The maximum and minimum per cent DPPH free radical scavenging activity were

recorded in the methanolic and aqueous extracts of flowers while aqueous and methanolic extract of leaves shows Intermediate values. Along with it maximum and minimum percent H₂O₂ free radical scavenging activity were recorded in methanolic leaf extract and aqueous leaf extract respectively and Intermediate values of H₂O₂ free radical scavenging activity were recorded for aqueous extract and methanolic extract of flowers.^[20]

Antibacterial activity

An *in-vitro* study performed by the extracts of leaves and flowers of *Saussurea obvallata* were used to measure Antibacterial activity in terms of zone of inhibition (ZOI) against *Pseudomonas aeruginosa* (PA), *Escherichia coli* (EC), *Staphylococcus aureus* (SA), and *Klebsiella pneumoniae* (KP). It performed significant results in ZOI as against bacterial growth. The maximum ZOI for the aqueous extract of leaves was for SA then PA and KP and minimum for EC. The maximum ZOI for methanolic extract of leaves was KP then PA and SA and minimum for EC. The maximum ZOI for the aqueous extract of the flowers was for PA then SA and KP and minimum for EC. The maximum ZOI for methanolic extract of flowers for PA then SA and KP and minimum for EC. Ampicillin (positive control) showed maximum ZOI against PA followed by SA, EC and KP. Five percent DMSO (negative control) did not show any ZOI for individual bacterial strains. On observing all antibacterial study, the extract of *S. obvallata* caused lower values for ZOI against EC compared to other bacteria (SA, PA & KP).

Another *in-vivo* study performed for antibacterial activity of petroleum ether extract of *S. obvallata* by using disk diffusion method against the bacterial strains of *Staphylococcus aureus* (SA), *Salmonella typhi* (ST), *Pseudomonas aeruginosa* (PA), *Escherichia coli* (EC), *Bacillus cereus* (BC), and *Bacillus subtilis* (BS), respectively. The leaves extract exhibited the highest zone of inhibition against the *S. aureus* whereas *P. aeruginosa* was the less sensitive bacterial strain.^[20]

Antifungal activity

During *in-vitro* antifungal activity by using well diffusion method of extracts of leaves and flower of *S.*

obvallata against three fungal species, *Candida albicans* (CA), *Candida glabrata* (CG) and *Candida tropicalis* (CT) in terms of zone of inhibition (ZOI) it found very significant results as an anti-fungal agent. The ZOI observed for the aqueous and methanolic extract of leaves was maximum for CA followed by CG then CT. The ZOI for the aqueous extract of flowers was maximum for CG then CA and CT. The ZOI for methanolic extract of flowers was maximum for CA, CG, CT. Fluconazole (positive drug) showed maximum ZOI against CT, CG, CA. DMSO does not show ZOI against any of the strains (CT, CA, CG).^[20]

GC-MS analysis of methanolic extract of flower and leaf extract

Gas chromatography/mass spectrometry (GC/MS) analysis, is an analytical method that combines the features of gas chromatography and mass spectrometry to identify different substances within a sample component matrix.^[22] GC-MS analyses and component identification of methanolic extracts of flowers and leaves of *Saussurea obvallata* were performed for identification of phytochemicals. Leaves of *S. obvallata* majorly contains Linoleic acid, Dehydrocostus lactone, Palmitic acid, Eltanolone and Doconexent. However, flower majorly contains Methyl palmitate, Linalyl acetate, Palmitic acid, linolenic acid and Methyl stearate, beta-sitosterol Gama-Stearolactone. These extract have already been reported for various biological activities, such as anti-oxidant,^[23] anti-androgenic,^[24] haemolytic,^[28] hepatoprotective,^[25] anti-microbial,^[26] anti-inflammatory,^[27] anti-fungal,^[28] anti-convulsant,^[29] analgesic, cancer preventive,^[30] chemo preventive, anti-tumor, immune-stimulant, thyroid inhibitory,^{[31],[32]} hypoglycemic effects,^[33] sunscreen, perfumery etc.

DPPH and H2O2 Free Radical Scavenging Activity

Antioxidant activity was measured by two in-vitro assays and significant variation was recorded in antioxidant activity of *S. obvallata* extracts using DPPH assay, while significant variation was not recorded in H2O2 assay. The maximum and minimum percent DPPH free radical scavenging activity were recorded in

the methanolic and aqueous extracts of flowers respectively. Intermediate values of DPPH free radical scavenging activity were recorded for aqueous extract of leaves and methanolic extract of leaves. On the other hand, the maximum and minimum percent H2O2 free radical scavenging activity were recorded in methanolic leaf extract and aqueous leaf extract, respectively. Intermediate values of H2O2 free radical scavenging activity were recorded for aqueous extract of flowers and methanolic extract of flowers.^[20]

Ethnoveterinary Uses

In a survey study ethnoveterinary uses of medicinal plants by migratory Shepherds were observed, 51 plant species (Herb 29, Tree 9, Fern 1, Climber 2, Shrub 9, Grass 1) in and their applications were listed from area of Trans-Himalaya Rakchham and Chitkul Wildlife Sanctuary (Himachal Pradesh). The shepherd migrates as there is a deficiency of fodder for their animals; and for this they explore adjoining areas. During seasonal migration of shepherds, they face constraints like fodder, food, veterinary facilities, water, predators, wild animals, and sometimes road accidents of their livestock. These medicinal plants were most used to heal a wide range of ailments.^[34]

The collection of several medicinal plants and plant parts varied from plant to plant, depending upon their availability. During their seasonal migration, the shepherds are much dependent on forest products for their requirements of shelter, fruits, vegetables and medicines etc. Interestingly, the shepherds informed that their preference for ethnoveterinary medicine was *Asparagus filcinus*, *Adhatoda vasica*, *Berginia ciliata*, *Betula utilis*, *Cynodon dactylon*, *Chenopodium album*, *Cannabis sativa*, *Picrorhiza kurroa*, *Trillium govanianum*, *Urtica dioica*, *Urtica palviflora* and *Sasurrea obvalata*.^[35]

Anti-cancer Activity

The anticancer activity of *S. obvallata* leaves and flower extracts was tested against MCF-7 breast cancer cell lines, and the extracts demonstrated significant activity when compared to a positive control (unpublished data).^[20]

Synthesis of gold Nanoparticles using *S. obvallata*

Saussurea obvallata extract was used as a reducing agent during the environmentally friendly microwave irradiation process used to create AuNPs. UV-visible, FT-IR, DLS, SEM/EDAX, XRD analysis, HR-TEM, and TGA analysis were used to characterise the developed AuNPs. The existence of the AuNPs is demonstrated by EDAX and XRD analyses, and the UV-visible spectra of the AuNPs show that spherical Nanoparticles with an average size of 70 nm have formed. The results of the HR-TEM analysis also demonstrate the particles' exceptional distribution and spherical nature. Additionally, when tested using the DPPH assay, AuNPs exhibit excellent antioxidant activity. The developed AuNPs are biocompatible with IMR32 cells. Other in-vitro studies have demonstrated the AuNPs' biocompatibility with T47D breast cancer cells and their cytocompatibility with human MCF-7 and IMR-32 cells.^[36]

DISCUSSION

On discussing the above information, it may be concluded that *S. obvallata* is spiritually and clinically important plant, various plant parts have been used for treating variety of ailments, including dysentery, rheumatism, leprosy, bone fractures, nerve debilities, cerebral palsy, paralysis, sexual disorders, lung infections, urinary tract infections, leukoderma, rhinitis, and hyperthermia, according to a literature review. Hydralcoholic and Methanolic and aqueous extracts of *S. obvallata's* to have strong anti-bacterial and anti-fungal effects in in-vivo. In a cell line study using the breast cancer cell line MCF-7, *S. obvallata* extracts were shown to be quite active. The experimental research of *S. obvallata's* aqueous extract also shown its radio-protective properties and its capacity to treat harmed hemopoetic systems and most effectively to treat high altitude sickness.

CONCLUSION

The information in review confirms the traditional claims contribute in providing promising baseline information for the pharmacological uses of *S. obvallata*. The information presented here maybe

beneficial for researchers, healthcare professional and pharmaceutical companies to design and develop effective medicines against microorganisms, help in promoting and popularizing this rich herb having promising potentials to prevent and treat various ailments. Additionally, highly developed research is essential for isolation and identification of specific active components which are responsible for pharmacological properties of the plant.

REFERENCES

1. IUCN. 3 December 2014. The organisation changed its name to the International Union for Conservation of Nature and Natural Resources in 1956 with the acronym IUCN (or UICN in French and Spanish). This remains our full legal name to this day.
2. IUCN, The IUCN Red List of Threatened Species. Version 2016- 3; <http://www.iucnredlist.org> (downloaded on 23 august 2022)
3. NCERT textbook of Biology class 12, chapter 15, biodiversity and conservation, pg 263
4. NCERT textbook of Biology class 12, chapter 15, biodiversity and conservation, pg 264
5. NCERT textbook of Biology class 12, chapter 15, biodiversity and conservation, pg 265
6. Budha-Magar, Shanta, et al. "Saussurea albescens (DC.) Sch. Saussurea lappa (Decne.) Sch. Bip Saussurea obvallata (DC.) Sch. Bip. A steraceae." *Ethnobotany of the Himalayas* (2020): 1-9.
7. Chauhan, Astha, et al. "Medicinal plants of the Trans-Himalayan Cold Desert of Ladakh-a review." *International Journal of Science, Environment* 9.2 (2020): 239-253.
8. Singh, D. K., and Gangte, B. K. 2009. Management Plan of Kedarnath Wildlife Sanctuary (From 2010-2011 to 2019-2020) Part I, II & Appendices. Wildlife Preservation Organization, Forest Department, Uttarakhand. India.
9. Singh, G., and Rai, I. D. 2008. Threatened plant of Kedarnath Wildlife Sanctuary, Western Himalaya, In Rawat, G. S. (ed.): Special Habitats and Threatened plants of India. ENVIS, Wildlife and Protected Area, 11(1). pp. 51-54. Wildlife Institute of India, Dehradun, India.

10. Manral, Upma. "Kedarnath Wildlife Sanctuary: Nature-culture linkages in a sacred landscape in Indian Himalayan Region." *世界遺產学研究* (2018): 26-33.
11. Semwal, Prabhakar, and Sakshi Painuli. "Antioxidant, antimicrobial, and GC-MS profiling of *Saussurea obvallata* (*Brahma Kamal*) from Uttarakhand Himalaya." *Clinical Phytoscience* 5.1 (2019): 1-11.
12. Debta, Manas Ranjan; Dutta, Debasmitra (March 2011). "Uttarakhand" (PDF). *Botanical Survey of India*
13. Car, Lorraine Tudor, et al. "Digital problem-based learning in health professions: systematic review and meta-analysis by the digital health education collaboration." *Journal of medical Internet research* 21.2 (2019): e12945.
14. Law et al. 2010, Saini et al. 2012, Spackman et al. 2001, Tsukaya et al. 2002
15. Joshi, Pooja, and Nilanjana Rao. "Role of indigenous people in conservation of biodiversity of medicinal plants: An Indian case study." *Survival and Sustainability: Environmental concerns in the 21st Century* (2011): 91-101.
16. Sharma, Kuldeep, Kamal Jeet, and Ashish Baldi. "Management Of Acute Mountain Sickness: An Exploratory Review On Herbal Drugs." *Indian J. Nat. Prod* 29.1 (2015): 5.
17. Ma, Hui-Ping, et al. "Anti-hypoxic activity at simulated high altitude was isolated in petroleum ether extract of *Saussurea involucreta*." *Journal of ethnopharmacology* 137.3 (2011): 1510-1515.
18. Soobrattee M.A., Neergheen V.S., Luximon-Ramma A., Aruoma O.I., Bahorun T. Phenolics as potential antioxidant therapeutic agents: Mechanism and actions. *Mutat. Res.-Fund. Mol. Mutagen.* 2005;579:200–213. doi: 10.1016/j.mrfmmm.2005.03.023.
19. Panche A.N., Diwan A.D., Chandra S.R. Flavonoids: An overview. *J. Nutr. Sci.* 2016;5:e47. doi: 10.1017/jns.2016.41.
20. Semwal, Prabhakar, and Sakshi Painuli. "Antioxidant, antimicrobial, and GC-MS profiling of *Saussurea obvallata* (*Brahma Kamal*) from Uttarakhand Himalaya." *Clinical Phytoscience* 5.1 (2019): 1-11.
21. Vinson JA, Dabbagh YA, Serry MM, Jang J. Plant flavonoids, especially tea flavonols, are powerful antioxidants using an in vitro oxidation model for heart disease. *J Agri Food Chem.* 1995;43(11):2800–2.
22. <https://www.element.com/materials-testing-services/chemical-analysis-labs/gcms-analysis-laboratories>, viewed on 02/10/2022
23. El-Tahir KEH, Abdel-Kader MS. Chemical and pharmacological study of *Cymbopogon proximus* volatile oil. *Res J Med Plant.* 2008;2(2):53–60.
24. Yin Y, Bi Y, Chen S, Yoncai L, Yi W, Yonghong G, et al. Chemical composition and antifungal activity of Cuticular wax isolated from Asian pear fruit (cv. Pingguoli). *Sci Hort.* 2011;129(4):577–82.
25. Rahman MM, Ahmad SH, Mohamed MTM, Rahman MZ. Antimicrobial compounds from leaf extracts of *Jatropha curcas*, *Psidium guajava*, and *Andrographis paniculata*. *Scientific World J.* 2014;2014;1–8 (Article ID 635240)
26. Rodilla JM, Tinoco MT, Morais JC, Gimenez C, Cabrera R, Martín-Benito D, et al. *Laurus novocanariensis* essential oil: seasonal variation and valorization. *Biochem Syst Ecol.* 2008;36(3):167–76.
27. Wei LS, Wee W, Siong JY, Syamsumir DF. Characterization of anticancer, antimicrobial, antioxidant properties and chemical compositions of *Peperomia pellucida* leaf extract. *Acta Med Iran.* 2011;49(10):670–4.
28. Agoramorthy G, Chandrasekaran M, Venkatesalu V, Hsu MJ. Antibacterial and antifungal activities of fatty acid methyl esters of the blind - your – eye mangrove from India. *Brazil J Microbiol.* 2007;38:739–42.
29. Soares MCMS, Damiani CEN, Moreira CM, Stefanon I, Vassallo DV. Eucalyptol, an essential oil, reduces contractile activity in rat cardiac muscle. *Braz J Med Biol Res.* 2005;38(3):453–61.
30. Vishnuvardhanaraj G, Tamilvendan D, Amaladasan M. Synthesis, characterization and biological activities of cinnamaldehyde's mannich bases. *Int Pharm Pharma Sci.* 2013;5(3):821–5.
31. Panda S, Jafri M, Kar A, Meheta BK. Thyroid inhibitory, antiperoxidative and hypoglycemic effects of stigmaterol isolated from *Butea monosperma*. *Fitoterapia.* 2009;80(2):123–6.
32. Sayeed MSB, Karim SMR, Sharmin T, Morshed MM. Critical analysis on characterization, systemic effect, and

therapeutic potential of beta-sitosterol: a plant-derived orphan phytosterol. *Medicines*. 2016; 3(4):2–25.

33. Sayeed MSB, Karim SMR, Sharmin T, Morshed MM. Critical analysis on characterization, systemic effect, and therapeutic potential of beta-sitosterol: a plant-derived orphan phytosterol. *Medicines*. 2016; 3(4):2–25.

34. Puri, Sunil, and Somidh Saha. "Documenting Traditional Wisdom before They Are Forgotten: A Study on the Ethnoveterinary Uses of Mountain Plants among the Trans-Himalayan Migratory Shepherds in the Kinnaur District of Himachal Pradesh, India." (2020).

35. Puri, Sunil, and Somidh Saha. "Documenting Traditional Wisdom before They Are Forgotten: A Study on the Ethnoveterinary Uses of Mountain Plants among the Trans-Himalayan Migratory Shepherds in the Kinnaur District of Himachal Pradesh, India." (2020).

36. Dalavi, Pandurang Appana, et al. "Microwave-Assisted Biosynthesized Gold Nanoparticles Using Saussurea obvallata: Biocompatibility and Antioxidant Activity Assessment." *BioNanoScience* (2022): 1-11.

How to cite this article: Vidhu Singh, Yashika Singh, Rishabha Koirala, Komal Keshwa, Preeti Tamta, Thakur Rakesh Singh. Therapeutic and cultural evaluation of Brahma Kamal (Saussurea obvallata (Dc.) Edgew: An endangered potential herb. *J Ayurveda Integr Med Sci* 2023;06:109-118.
<http://dx.doi.org/10.21760/jaims.8.6.19>

Source of Support: Nil, **Conflict of Interest:** None declared.
