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Saussurea obvallata (Brahma Kamal): A Unique Medicinal Herb

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ABSTRACT- Saussurea obvallata is well known plant for its considerable medicinal properties. This plant is one of the richest natural sources of health for human beings and animals. The phytochemical estimation of the plant has revealed the presence of many different biologically active substances. Many biological properties associated with this species are contributed by the leaves, flower stems. Most research has been centralized on the biological activities, which include antibacterial, anti-hypoxic, anticancer, antioxidant and antimicrobial activities. sausureaobvallata species are widely distributed in the India,China and Nepal and has various medicinal properties.

KEYWORDS: Saussurea obvallata ,Brahma kamal , Dev Pushp , State flower Uttarakhand.

I. INTRODUCTION –

Any plant that has compounds that can be utilised therapeutically or that serve as building blocks for the production of effective pharmaceuticals is considered to be a medicinal plant. This definition enables the distinction between plants that are considered medicinal but have not yet undergone a full scientific investigation and plants whose therapeutic capabilities and ingredients have been established scientifically.

Due to its low cost, effectiveness, and lack of or little side effects, herbal medicines have been utilised in the traditional Indian medical system as well as other systems of medicine around the world since the dawn of time. These qualities of purportedly "natural" medications are drawing an ever-growing number of individuals from all over the world to them. According to a World Health Organisation (WHO) survey, 85% of traditional medicines are made using plant extracts, and nearly 70% of prescribed human medications are made from plants. This means that 80% of the population in developing countries still relies on these systems of medicine.

The global market for herbal pharmaceuticals is estimated to be around US$ 62 billion, and by 2050, it is expected to expand to US$ 5 trillion in both the Asian and worldwide markets. One billion dollars are spent annually on herbal drugs in India alone, according to estimates, and Uttarakhand is one of the best places to find a wide range of medicinal plants.The global market for herbal pharmaceuticals is estimated to be around US$ 62 billion, and by 2050, it is expected to expand to US$ 5 trillion in both the Asian and worldwide markets. One billion dollars are spent annually on herbal drugs in India alone, according to estimates and INDIA is one of the best places to find a wide range of medicinal plants.

Due to a number of factors, Saussurea is a very significant genus in the family Asteraceae, and the majority of its species have received extensive international research. But little is understood about S. obvallata. It is an indigenous herb to the Himalayan region and grows between 3000 and 4800 metres above sea level. It is commonly referred to as Brahma Kamal and is the Indian state flower of Uttarakhand. Due to its use in traditional, medicinal, ornamental, and religious practises, it is well recognised throughout Uttarakhand. Traditionally is used to cure a variety of illnesses and conditions, including paralysis, cerebral ischemia, wounds, cardiac problems, and mental disorders. Some people also use it as an antibacterial and to help cuts heal, among other things. Sussureaobvallata, often known as Brahma Kamal, is an Asteraceae blooming plant. It is indigenous to the Himalayas and can be found on the Hemkund Sahib trek route at an elevation of about 4500 metres. Purple flower heads are concealed from view under layers of papery, yellowish-green bracts that shelter them from the chilly mountain environment. Insects pollinate the hermaphrodite (contains both male and female organs) flowers. It is used to treat urogenital issues, liver infections, sexually transmitted illnesses, bone pains, colds, and coughs in Tibetan medicine,

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where it is regarded as a medicinal herb. The whole plant is utilised, and it has a harsh taste. This plant is now threatened because of increased human interference and exploitation.

Fig 1 -Saussurea obvallata

[1,2]The state flower of Uttarakhand, Brahma Kamal (Saussurea obvallata), is an endemic herb of the Himalayan region, which includes the Indian Himalayan region, northern Burma, and southwest China. The distribution of the plant is between an altitude of 3000 and 4800 metres. It is a herb that is hermaphrodite and grows to an average height of 5 to 10 cm. In the middle of the monsoon (July to August), flowers blossom among the rocks and grasses of the hillside. Purple flower heads are concealed from view under layers of papery, yellowish-green bracts that shelter them from the chilly mountain environment. The blossoms are visible until mid-October, at which point the plant perishes and only becomes visible once more in April.Brahma Kamal can be found in Uttarakhand's Kedarnath, Valley of Flowers, Hemkund Sahib, and Tungnath areas.

Environment and Ecology -

The Indian Himalayan section, which includes the Himalayas and nearby mountain ranges in Indian Territory's northern section, is a particularly delicate and exposed mountain ecology. Winters and summers are the two main seasons. The summers are brief and chilly, and the winters are lengthy and bitterly cold. Depending on the elevation, the alpine climate varies. As the elevation changes, it becomes colder and dryer, and it becomes wetter. The Indian Himalayan Regions see rapid fluctuations in weather and temperature as a result.Snowfall typically occurs throughout the entire year in the high alpine regions.

[1]Monsoons,floods, heavy winds, snowstorms, and other types of precipitation can arrive suddenly, which makes the climate here quiet.unstable and unpredictable. Furthermore, the air is extremely dry, thin, and precipitation levels are relatively low at high altitudes.The Eastern Himalayas and the Western Himalayas, two subgroups of the region, have been recognised as different phytogeographic zones. More over 50% of the Indian flora, or about 10,000 species of vascular plants, are found in the Indian Himalayan region.

Fig: 2 Flowers of Sussureaobvallata

But the majority of the high-alpine ecosystems in the Indian Himalayan region are essentially rocky deserts with year-round snow and harsh conditions. As a result, only a few types of vascular plants can live here. They must adjust to the harsh conditions, strong winds, and a brief growing season. All of the high-altitude species of the genus Saussurea that are discussed here are dwarf, grow low to the ground, and are between 5 and 10 cm tall. A thick basal rosette produces the leaves, and The Eastern Himalayas and the Western Himalayas, two subgroups of the region, have been recognised as different phytogeographic zones. The flowering stem is roughly spiral. The blooms grow in a dense head of tiny capitula that are frequently entirely encircled by papery bracts or by dense white to purple foliage. fuzzy hairs. The abundant woolly hairs protect the flowers from UV rays from the harsh high-altitude sunlight and aid in thermoregulation by minimising frost damage at night.

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Description –

[3,9]A little 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 involucre form 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 cypselae.

Distribution –

It grows in the Himalayan region at an altitude of 3000–4800 m in India, Pakistan, China, Tibet, Nepal, Myanmar, and Bhutan, where it is endemic. It can be found in the Himalayan alpine meadows that stretch from Jammu and Kashmir to Arunachal Pradesh. At elevations between 3700 and 4600, it is also found in Pakistan, China, Nepal, and Bhutan.

Other names –

Local names include Hindi, Sanskrit and Nepal. Khas Chhetri, from the far west of Nepal, English.
English: Sacred Saussurea, King of Himalayan Flowers, Brahma's Lotus**.**
Hindi: Brahma Kamal, Dev Pushp, Bhramha Phool
Marathi: Brahma kamad
Nepal: Khas Chhetri.

Morphology –

Fig: 3Saussurea obvallata

[8]Perennial Saussurea obvallata. The stem is solitary, erect, 15–60 cm long, 2–8.33 mm in diameter, ribbed, and hollow; the indumentum is 0.5-2 mm long and has flagellate, uniseriate, and glandular hairs. Leaf blades are basal and lower petiolate, oblong to blunt lanceolate, surface pilose, glandular hairy, glabrescent, base attenuate, margins toothed, and have a distinct midrib; purple and upper leaves are called bracts, and they are 9–12 in number**.**Boat-shaped, semi-transparent, milky white or pale yellow, spirally grouped in pseudo whorl, completely surrounding inflorescence. corymbiform florescence measuring 3.5-9.0cm in diameter, pedunculate or subsessile, with capitulae 7-16 per head, hermaphrodite florets, with a foul odor; inflorescence measuring 15-21 cm in length and 69-84 mm in diameter; corolla (11-13 mm): actinomorphic, tubular with linear-lanceolate lobes, bluish purple or violet; stamen (6-7 mm), filaments (2-3 mm), anther tube (4-6 mm), appendages (1-2 mm); achenes: dark brown to black, cylindric or obovoid, obtuse, smooth, size 4-4.8×1.6, distinctly ribbed, 5-7 rounded ribs in cross-section, isodiametric Flowering and fruiting: July–September and August–October .

Religious Belief-

The plant is extremely sacred in the area. It is presented to Lord Vishnu at the Badrinath temple and to Lord Shiva at the Kedarnath shrine since it is thought of as a spiritual flower. Brahma Kamal is offered at temples and given out as 'prasada' during the festival of Nanda Ashtami in September or October..Brahma Kamal was allegedly created by Lord Brahma to assist Lord Shiva in placing the elephant's head on the body of Lord Ganesha, according to Hindu mythology. 'Amruta' was dropped by the flower.It is also said that in celebration of Lakshmana's survival through the use of Sanjeevani, the Gods blessed Brahma Kamal with rain from heaven. Thus, BrahmaKamal dropped to the ground and established himself in the Valley of Flowers. Locals pick the plant extensively for traditional ayurveda medication preparation in addition to its religious significance. The rhizomes, leaves, and petals are used to cure urinary tract issues, digestive disorders, coughs and colds, and bone pain.Particularly the rhizomes are used as an antibacterial and to treat cuts and bruises.

[9]Ethnobotany use –

To treat cuts and wounds, a treatment including roots is utilize.In hydrocele, the floral bracts that have been boiled in water are utilzeas a fomentation. Flowers are stored between layers of clothing to keep insects away.

Traditional use –

[8,11,13] The species continues to play a significant role in the treatment of numerous ailments, both old and new, and is widely employed

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in traditional medicine. Numerous Saussurea species are utilised in various traditional and folk medical practises in China, India, Tibet, Nepal, Pakistan, Bangladesh, Uyghur, Mongolia, and other Asian nation..In the past, the Himalayan populations of Tibet, China, Nepal, and the Indian Himalaya have used S. obvallata to treat or cure a number of illnesses and conditions, including paralysis, cerebral ischemia, wounds, cardiac, and mental disorders; some people also use it as an antiseptic and to heal cuts, etc.

Conservation-

[2] Numerous plants, including S. obvallata, are in danger of going extinct because of overuse. Therefore, it is crucial to protect all therapeutic plants. The main reason for the fall in its population is the over usage of the plant's parts for medical and religious purposes.Actions can be performed in a variety of ways to support the preservation and sustainable usage of medicinal plants. Others are less direct, such as those linked to commercial systems, ex situ conservation, and in situ conservation, while some of these are carried out directly at the locations where the plants are found.

Pharmacological study –

[11] Antibacterial study -

The antimicrobial activity of S. obvallataextracts (20 µl of 5mg/mL) against four bacterial (Pseudomonas aeruginosa, Escherichia coli, Staphylococcus aureus, & Klebsiella pneumoniae) and three fungal (Candida albicans, Candida glabrata, & Candida tropicalis) strains, respectively. utilising the well diffusion method, the antimicrobial assay was carried out. According to the study's zone of inhibition measurements, which ranged from 8.87 to 20.50 mm and 8.30 to 15.90 mm, respectively, methanolic and aqueous extracts showed moderate antibacterial and antifungal activity against all of the pathogens. By using two in-vitro tests, the DPPH and H2O2 techniques, to measure the antioxidant activity of S. obvallata extracts (20 l of 1 mg/mL), significant antioxidant activity was found in both extracts, ranging from 29.25 to 82.88%.

[11]Free radical scavenging activity of DPPH and H2O2

Two in-vitro tests were used to assess antioxidant activity. Significant variance (p 0.05) was seen in the antioxidant activity of S. obvallata extracts using the DPPH assay, but not the H2O2 assay. The methanolic and aqueous extracts of flowers showed the highest and lowest levels of DPPH free radical scavenging activity (82.88 0.48% and 29.25 0.86%, respectively).

[15]Anticancer activity -

S. obvallata leaves and flower extracts were tested for their anticancer effects against MCF-7 breast cancer cell lines, and when compared to a positive control, the extracts showed a significant amount of activity. According to Mishra et al. (2018), the antibacterial activity of S. obvallata petroleum ether extract (1-3 mg/disk) was assessed against the bacterial strains Staphylococcus aureus, Salmonella typhi, Pseudomonas aeruginosa, Escherichia coli, Bacillus cereus, and Bacillus subtilis, respectively. In order to test for germs, the disc diffusion method was used. In this study, P. aeruginosa was the less susceptible bacterial strain, and the leaves extract showed the maximum zone of inhibition against S. aureus (15.2 mm) at 3.0 mg/disk. S. obvallata extract was tested against several microorganisms to determine its MIC value.

[14,15]Plant tissue culture -

In the plant biotechnology, plant tissue culture has grown in significance. Using plant tissue culture techniques, a number of studies reported on the large-scale creation of plant material and the production of biologically active elements. Only two studies on micro-propagation of S. obvallatafrom the Indian Himalayan Region have been published. The initial procedure for the micro-propagation of S.obvallatawas disclosed by Joshi & Dhar in 2003. Young aseptic seedlings' epicotyle segments were utilized. for the because mature explants aren't readily available, for purposes of multiplication. Epicotyle explants were used to create the many shoots (five shoots per explant) on Murashige and Skoog (MS) media. The findings showed that the plantlets should be in-vitro rooted for 15 days and ex-vitro acclimated for 12 days before field transplantation.

[15]In-vivo radio-protective properties

Liang-wen et al. (2009a) tested the in-vivo radio-protective properties of S. obvallata extract (aqueous) in mouse models. The mice models for the experiments were exposed to 60Co-rays at a dose of 6Gy to prepare them, and then the extract was administered (6Gy) to the mice models. Following therapy, it was found that S. obvallata plant extract significantly (P 0.05) promoted the

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recovery of haematological functions and the number of femurkaryota compared to control group. The same team also reported on the radio-protective properties of S. obvallata (bracts) aqueous extract (Liang-wen et al. 2009b). When compared to the control group in this study, the aqueous plant extract of bracts encourages the recovery of the injured hematopoietic system in the radiation-damaged mice ($P<0.05$). The radio-protective effects were dosage dependent in both investigations. The radio-protective properties of the aqueous extract of S. obvallataand Crataegus on mouse models were reported by Ying et al. (2015). X-ray treatment at a dose of 4Gy was used to prepare the experimental models. The mouse models were given extract (4Gy) for up to 14 days following irradiation. The study's findings showed that S. obvallata had moderate radioprotective effects in mice, although Crataegus performed better (P 0.01).

[15]Anti-hypoxic efficacy-

In hypoxia mouse models, S. obvallata's anti-hypoxic efficacy was investigated. Adenosine triphosphate (ATP) and adenosine triphosphatase (ATPase) activity, lactic acid (LAC) and lactate dehydrogenase (LDH), blood sugar, and glycogen content in the liver and skeletal muscles, were also studied in these models (Ma H-P et al. 2011, 2011). While Saussurea involcucrata (Kar. et Kir.) Sch.-Bip showed the highest anti-hypoxic activity in this study (survival time=40.78 min, prolongation rate=33.13%) at the dose of 1000 mg/kg, Saussurea obvallata showed the most significant results in terms of survival time (36.34 min) and prolongation rate (20.52%). Additionally, LAC concentration in mice plasma was measured at 1.93 mmol/L for S. involucrata and 2.84 mmol/L for S. obvallata at the time of testing.The treatment of acute mountain sickness may be successful when using the dose of 1000 mg/kg. The anti-hypoxic effect of S. obvallata(crude extract) on EA.hy926 cells was also examined by Hai-li LI et al. (2016). Utilising sodium dithionite, a hypoxia injury experimental model was created. In the model of hypoxia injury, the results showed that the plant extract enhanced EA.hy926 cell survival rate (from a dose of 1.25 mg/mL) as compared with control.

[14]GC-MS (gas chromatography-mass spectrometry) -

Component analysis and identification using GC-MS of Saussurea obvallata flowers and foliage were extracted using methanol. Each sample, weigh in (1 mg/mL), was injected into the column in split mode (split ratio 10), with helium (99.99% pure) serving as the carrier gas and flowing at a rate of 1.21 mL/min. An MS detector in full scan mode found that several metabolites and phytocomponents had distinct peak fragmentation patterns. Retention time (RT) and mass measurements made under identical GC-MS conditions were used to identify the components. utilizing the peak locations, quantitative analyses of the various samples were done. The phytocomponents in Saussurea obvallata extracts were identified.The total running time of the GC-MS was 50.74 min, and peak area normalization was used to express the relative percentage of each ingredient. Majorly Linoleic acid (22.50%), Dehydrocostus lactone (21.98%), Palmitic acid (11.84%), Eltanolone (11.43%), and Doconexent (9%) were the main ingredients in the methanolic extract of S.obvallata leaves. However, the known libraries were unable to identify the principal components in the methanolic flower extract of S.obvallata (Rt: 19.40; 38.85%), which was followed by methyl palmitate (12.18%), linalool acetate (4.94%), palmitic acid (4.65%), and methyl stearate (3067%). Few components in the leaves and flowers extracts of S. obvallata have already been reported for diverse biological properties, such as anti-oxidant, antibacterial, hemolytic, cancer preventive, chemo preventative, anti-tumor, immuno-stimulant, etc. after GC-MS studies of both extracts.

II. CONCLUSION –

In the current paper, Saussurea obvallata is discussed in terms of its traditional usage, pharmacognosy, phytochemistry, pharmacology, reproductive biology, micro-propagation, and plant studies. S. obvallata is one of the most significant species in the Himalayan regions and is utilised in several traditional systems, according to a review of the literature. However, bioassay-guided isolation is still needed to elucidate and validate the active chemicals of this species. It is important to use genomes, proteomics, and molecular approaches to further examine the chemical characterization of the substances and their mechanism of action. Additionally, there are a very few research accessible for this species, both in terms of chemical characterization and pharmacological evaluation.

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