PHARMACOGNOSTIC STUDY OF ANGELICA GLAUCA

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ABSTRACT

The Himalayan endangered species known as Angelia glauca is only found in Tungnath, District of Rudraprayag, Uttarakhand. Around 87 of the 110–115 species of angelica that exist worldwide are native to Asia. Angelica species from India include Angelica glauca edgew, Angelica archangelica L., and Angelica nubigena. In the Charak Samhita and the Susrut Samhita, angelia glauca is referred to as "Chorak" and is also known as "Gandhrayan" and "Choru" regionally. An analysis of Angelica glauca's pharmacognostic properties is presented in this article. It includes information on the plant's profile, morphological characteristics, geographic origin, cultivation collection, chemical components, extraction techniques, identification tests, and biological or therapeutic activities. Antioxidants, bronchoconstrictors, arthritis, and antibacterial properties are all benefits of angelica glauca. Specifically stated in Ayurveda for constipation, infantile atrophy, and bilious symptoms.

KEYWORDS: Angelica Glauca, Essential oil, Antioxidant, Bronchoconstrictor, Antimicrobial.

INTRODUCTION

Since the dawn of human civilization, plant resources have been essential to the growth and maintenance of human life and will continue to be so. In addition to the three basic necessities of human life—food, housing, and fiber—an other crucial part of a person's life—
health—is also heavily dependent on plant resources. Plants are miraculously healing and continue to be a key component of nutraceuticals, Ayurvedic, Unani, homoeopathic, herbal, and allopathic treatments.\[1\] Since ancient times, a number of plants have been extensively employed in traditional medical systems to treat a variety of illnesses. Bioactive metabolites found in plants include polysaccharides, phenolics, alkaloids, steroids, essential oils (EOs), lignins, resins, tannins, and many more. EOs are mostly kept in plants' glands, trichomes, oil ducts, and resin ducts. In particular, monoterpenes, sesquiterpenes, and their oxygenated derivatives, which make up a large portion of their low molecular weight volatile composition, are present. A number of pharmacological properties of Angelica glauca, including antioxidant, antibacterial, antiviral, antimutagenic, anticancer, anti-inflammatory, and immunomodulatory activities, have been clearly demonstrated in earlier scientific investigations.\[2\]

**Plant profile**

<table>
<thead>
<tr>
<th>Family</th>
<th>Apiaceae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayurvedic name</td>
<td>Chorak</td>
</tr>
<tr>
<td>Hindi name</td>
<td>Chora, Choru, Gandrayan</td>
</tr>
<tr>
<td>Trade name</td>
<td>Gandrayan</td>
</tr>
<tr>
<td>English name</td>
<td>Angelica</td>
</tr>
<tr>
<td>Parts used</td>
<td>Roots/Rhizome</td>
</tr>
</tbody>
</table>

**Morphological characteristics**

- It is a 1-2 metre tall, glabrous, scented perennial or biennial herb.
- The stem is hollow, and the rhizomatous, thick root.
- The huge pinna is toothed, ovate or lanceolate, and the leaves are unipinnate, bipinnate, or tripinnate.\[3\]
Geographical source

The family Apiaceae's genus Angelica is well known for its applications in both conventional and contemporary medical practices. There are between 110 and 115 different species of angelica known to exist, 87 of which are found in Asia. There have been reports of Angelica glauca edgew, Angelica archangelica L., and Angelica nubigena Cl. in the Indian Himalaya. One of them, Angelica glauca Edgew, is extensively spread in the Himalayan regions of Uttarakhand, Jammu and Kashmir, and Himachal Pradesh. It is also known locally as Choru, vernacular name Choru, Sanskrit name Gandrayan, and English name Smooth Angelica.1

Cultivation and Collection

Propagation by seed and rootstock spilts

Planting in the field

• Soil preparation and Fertiliser application: The field should be completely tilled and then harrowed to remove weeds and bring the soil to a fine tilth. In April and May, seedlings are transplanted 45X45 cm apart. During the wet season, apical root segments are replanted 45 cm apart. Plants can be harvested using this strategy in just two years.

• Green manuring: It is said that goat and sheep manure is beneficial for its cultivation. At the beginning of agriculture in lower altitudes, one hectare of land needs approximately 15-20 tonnes of manure. Planting occurs prior to manuring. If necessary, manuring should be done in the winter after two or three years of culture, or after the finish of the vegetative growth phase in October. It improves growth as well as survival and yield at higher elevations where there is access to plentiful forest litter.

• Transplanting the seedlings to the main Field and Optimal spacing: At the start of the rainy season, transplanting is done to seedlings that have grown for four to six months in a greenhouse or small nursery. For optimum growth, use raised beds. Transplanting can be done in April and May if the location is wet or has good irrigation facilities.

• Maintenance and Intercultural practices: Intercultural tasks like weeding and hoeing are completed as needed on a periodic basis.

• Irrigation procedures: During the dry season, irrigation is necessary twice a week.

• Weed control: It's important to weed once per month, earth once per month during the wet season, and every two to three months during the dry season.
- **Disease and Pest control:** There have been no reported illnesses or pest problems. Harvesting can be completed under cultivation in two to three years. When seeds are halfway developed, in September and October, roots are gathered. Once the cultivation is well-established and produces the most yield, harvesting can be done every two years. An apical piece of the rhizomes is transplanted in a field for future crops after being harvested. Roots are sliced into little pieces and placed in partial shade for drying after the remaining portion has been rinsed with water to remove soil. Roots are preserved and wrapped in cotton bags when they have dried completely.[3]

**Chemical constituents**

The essential oil was a clear, pale yellow liquid with a spicy, warm, and distinct aroma as well as a bittersweet flavour. The average production of Angelica glauca essential oil was determined to be 0.46 percent. The essential oil's refractive index was measured at 1.5456. Transligustilide accounted for the majority of the discovered chemicals (72.377%), followed by Z-3-butylideneaphthalide (6.513%), -phellandrene (3.834%), -phellandrene (2.012%), p-cymene (1.588%), and (-)-spathulenol (1.38 percent). Other components included -pinene, -trans-ocimene, -terpinene, sabinol, -santalene, and -eudesmol, among others. The chemical structures of some important phytoconstituents are shown.

There were comparable substances present in some of the earlier research done on the same species from other places. Examples include the A. glauca species from Himachal Pradesh and Kashmir region, which revealed the presence of (Z)-ligustilide (4,5-dihydrobutylidene phthalide) as the major phthalide and (Z)-butylidene phthalide (1.8-3.6 percent in Kashmir sample and 11.3-20.0 percent in Himachal sample) as the minor constituent of the essential oil. Citronellyl acetate, methyl octane, -pinene, limonene, and -pinene were additional ingredients.

It is important to note that the authors of the same study noted that nearly all the indicated elements differed depending on the location, altitude, or maturity stage.[4] Similar findings from A. glauca gathered from the Garhwal region of the Himalaya were found in a 1995 study. The two main substances found were 3-phellandrene (15.29%) and (Z)-ligustilide (31.55%).[5]

From the roots of Angelica archangelica L., another study from Central Italy found the presence of -pinene (21.3%), -3-carene (16.5%), limonene (16.4%), and -phellandrene
While the solvent extractives contain dimeric lactones, the essential oil obtained from the roots of A. glauca is distinguished by the presence of monomeric lactones (phthalides) Indian A. glauca is similar to the Chinese crude medicine Ligusticum wallichiana,[7,8] Angelica sinensis[9] and the phthalide-patterned oil of Apium graveolens.[10] According to Agnihotri and colleagues,[11] the essential oil of the aerial part of A. glauca was completely different from the root oil.[10] This investigation unequivocally demonstrates that ligustilides and butylidene phthalides, which are distinctive main flavour components of root essential oil, were absent from A. glauca herb essential oil.

Our analysis also showed that a very high concentration of transligustilide (72.377 percent) was detected, which is higher than that previously noted for the essential oil of A. glauca root. This makes the A. glauca species of the Kumaon region's high-altitude area unique as a source of trans-ligustilide, which may be related to the region's unique geographical and altitudinal characteristics. It may have also been shown in the past that this species' essential oil concentration is greatly influenced by a variety of elements, such as the habitat, altitude, and maturity.

The essential oil of A. glauca from Himachal Pradesh and Kashmir showed that monomeric lactones concentration were clearly dependent upon the maturity and locations of the plant, but the qualitative composition of different samples collected from various geographical locations/altitude was almost the same, according to important work done by Thappa et al. on the estimation of essential oil constituents.[11]

The most potent bioactive chemical found in several species of Angelica, ligustilide, has been shown to inhibit the formation of prostaglandin E(2) (PGE(2)), tumour necrosis factor-(TNF-), and nitric oxide (NO). In addition, ligustilide inhibited nuclear factor-B (NF-B) and activator protein-1 (AP-1) activation, producing a strong anti-inflammatory impact. Natural chemicals that target AP-1 have the potential to be used in the treatment of cancer as well. AP-1 is a crucial transcriptor factor that regulates numerous cellular processes necessary for cell survival and differentiation.[12]

Ligustilide from A. sinensis has also been shown to be successful in protecting neurons from subarachnoid haemorrhage by reducing apoptotic damage through decreased p53 expression and caspase-3 cleavage.[13] Additionally, it has been claimed that ligustilide's neuro-
protection aids in functional recovery in a rodent model of spinal cord injury by inhibiting ROS production.\textsuperscript{[14]}

Additionally, Z-ligustilide is said to protect the brain from harm brought on by transient forebrain cerebral ischemia.\textsuperscript{[15]} The value of the volatile oil from the understudied Himalayan herb A. glauca is amply demonstrated by the very high therapeutic potential of ligustilide.
Pharmacological activities\textsuperscript{[16,17]}

1. Broncho relaxation: When the broncho-relaxant effects of A. glauca essential oil were tested in guinea pigs and mice with ovalbumin (OVA)-induced broncho constriction, it was discovered that oral administration of the oil (200 L/kg) significantly lengthened the latency for PCT, indicating bronchodilating activity of A. glauca oil against histamine. The absolute blood eosinophil count, serum IgE level, and the number of eosinophils and neutrophils in BALF were all considerably (P 0.001) lowered after oral administration of A. glauca oil.

2. Antioxidant activity: A. glauca oil's IC50 value of 32.32 g/mL demonstrated significant free radical scavenging activity. The oil has lesser action when DPPH scavenging was measured compared to synthetic antioxidant BHT.

3. Antimicrobial activity: When A. glauca oil was used to evaluate its anti-microbial action, Escherichia coli, Staphylococcus aureus, Pasteurella multocida, and Bacillus subtilis exhibited sensitivity in that order. Overall, the antibacterial activity of A. glauca oil was comparable to that of Amoxycillin, a widely used antibiotic.

4. Antifungal activity: The oil from A. glauca had antifungal properties comparable to those of the medication (flumequinene). Aspergillus flavus, Candida albicans, Fusarium solani, and Microsporum canis are listed in order of increasing sensitivity.

5. Phytotoxic activity: The essential oil of A. glauca shows good in vitro phytotoxic activity against Lemana minor. Six coumarins from A. glauca are reported by Saeed and Sabir that possess potential irritant and cytotoxic activities.

6. Anxiolytic activity: A. glauca methanolic extract was tested at graduated levels to determine its anxiolytic activity. Behavioural observations were made using the elevated plus maze, open field, and hole-board test, and the results were compared to controls and standard controls. The findings indicated that A. glauca had anxiolytic properties.

Preparation of extract

A. glauca extracts were made using four different solvents: petroleum ether (PET), chloroform (CHF), methanol (MeOH), and water. 100g of powdered plant material was soaked in 300 ml of each solvent to create the extracts. Plant material that had been soaked in the solvent was added to the Soxhlet apparatus, and successive extraction methods were used for 72 hours. The recovered plant extracts were concentrated using a rotatory vacuum evaporator from the filtrate after being run through a Whatman No. 1 filter to eliminate
insoluble components. The extracts were diluted in "dimethyl sulfoxide" (DMSO) to a 200 mg/ml concentration for antibacterial tests.\cite{18}

**Identification test**

For a qualitative assessment of the different phytochemicals present in A. glauca root and stem extracts, the primary phytochemical studies were carried out.

**Test for alkaloids**

The solvent-free extract was filtered after being dissolved in an aqueous acidic solution (either hydrochloric acid or acetic acid). The test tube wall was used to slowly add one or two drops of Mayer's reagent to 5 ml of filtrate. The presence of alkaloids in the extract was confirmed by the formation of a white, creamy precipitate.

**Test for flavonoids**

**Alkaline reagent test:** Methanol was used to dissolve the extract, and 1N NaOH solution was then added. The presence of flavonoids in the sample is confirmed by the appearance of an intense yellow colour that vanishes when an acid is added to it.

**Shinoda test:** The plant extract was mixed with a small amount of magnesium and strong hydrochloric acid. After a little while, the extract becomes pink, indicating the presence of flavonoids.

**Test for glycosides**

Water was dissolved with plant extract, then it was boiled and filtered. When 0.2 ml of Fehling solutions were added to 5.0 ml of filtrate, the filtrate turned brick red, indicating the presence of glycosides. The emergence of a thicker precipitate than the previous one, when the process is repeated with diluted H2SO4 supplied in place of water, further supports the glycosides' presence.

**Test for steroids**

Chloroform was used to dissolve the extract. The sample will turn green when you add a few drops of concentrated H2SO4 and acetic anhydride to it, which is a sign that there are steroids present.
Test for reducing sugars
After the extract was dissolved in water, Fehling solutions A and B were added in a 1:1 ratio. Aldolase (reducing) sugars were present in the sample as evidenced by the appearance of a brick red coloured precipitate after heating.

Test for saponins
In a test tube, 20 mg of the extract was heated and then cooled with 10 ml of water for two minutes. After a quick shake, the mixture was left for three minutes. The presence of saponins in the sample is indicated by the formation of a 1 cm thick foam layer.

Test for tannins
Water was used to dissolve the plant extract, and 10% ferric chloride was added. The presence of blue green colour in the sample suggests the presence of tannins. [1]

Therapeutic activity
A. glauca is renowned for its fragrant and medicinal properties. It has been classified by Shodala nighantu as "Chandanadi varg," which also denotes the presence of flavonoids and volatile oils in it. A. glauca is categorised as a "Sanjasthapan varg" in the Charak Samhita, which is Sanskrit for "for restoring consciousness to the fainted." [1]

A. sinensis has been used in China to cure a variety of illnesses, including haemorrhoids, malaria, apoplexia, constipation, and gynaecological conditions. Additionally, the herb has been used as a hematinic to replenish blood, control menstruation, and soothe the bowels.[2,19-21] The primary uses of A. gigas in traditional Korean medicine have been the treatment of anaemia, gynaecological disorders, circulatory disorders, and arthritis. Additionally, it has been employed as a sedative, analgesic, and tonic.[2,22-23]

A. acutiloba has historically been used to treat anaemia and gynaecological conditions. [2,24] Angelica archangelica is frequently used in conventional medicine to treat anxiety, sleeplessness, stomach and intestinal troubles, skin conditions, respiratory issues, and arthritis.[2,25-26] The herb angelica glauca has been used to cure constipation, infantile atrophy, and bilious symptoms. [2,27]

A. glauca had notable antimicrobial efficacy against a few species of bacteria including Staphylococcus aureus, Bacillus subtilis, Escherichia coli, Pasteurella multocida and fungi including Candida albicans, Microsporum canis, Aspergillus flavus, and Fusarium solani.
With minimum inhibitory concentration (MIC) values of 141.3 and 159.3 _g/mL, respectively, Escherichia coli and Staphylococcus aureus were the two bacterial strains that were the most sensitive. Microsporum canis, which had a MIC value of 178.1 _g/mL, was the most sensitive fungal strain.[2,29]

By lowering the absolute blood eosinophil count, serum levels of immunoglobulin E, and the quantity of eosinophils and neutrophils in bronchoalveolar lavage fluid, A. glauca demonstrated broncho-relaxant efficacy against histamine and ovalbumin-induced bronchoconstriction in guinea pigs.[2,22]

**Biological activities of angelica essential oils**

**Antioxidant activity**

Reactive oxygen species (ROS), such as the superoxide anion, the hydroxyl radical, and hydrogen peroxide, are crucial in the onset of many diseases, including Parkinson's disease, rheumatoid arthritis, asthma, and bronchitis.

Because plants contain natural antioxidant chemicals that protect cells from the damaging effects of ROS and reactive nitrogen species (RNS), they offer a good chance for the treatment of diseases caused by ROS.[1]

1,1-Diphenyl-2-picrylhydrazil (DPPH) and 2,2-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid (ABTS) The effectiveness of plant extracts or compounds as antioxidants is frequently assessed using radical scavenging activities. A. glauca showed strong antioxidant activity.[2,28-30]

**CONCLUSION**

Angelica glauca is local Himalayan drug, specifically cultivate in the Tungnath district rudraprayag, uttarakhand. the study summarized that Angelica glauca has antimicrobial, antioxidant, bronchoconstrictor, and many more activities due to presence of bioactive phytochemicals such as alkaloid, flavonoids, terpenes, tannins, saponin and glycosides. Angelica glauca either in pure form or in a combination can be used for above mentioned therapeutic activity in ayurvedic herbal formulation. Angelica glauca further studies on isolation, purification and other biological activities of this plant are awaited.
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