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An overview of *Angelica* species market potential in herbal and medicinal industry

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Medicinal and aromatic plants are now gaining popularity with growing demand for natural products in the herbal, cosmetic, pharmaceutical and health care industries. The genus *Angelica* is reputed for its medicinal and aromatic species, which have been used in folklore remedies for treating various ailments. *A. glauca* is an important member of the Apiaceae family. It is found in the western Himalayas and is popular as a spice or flavoured agent. People of many indigenous communities and local people have been using this plant for edible purposes and the cure of a variety of ailments such as indigestion, constipation, vomiting, cold, fever, headaches, low appetite, postpartum fatigue, etc. Many phytochemicals are present in *A. glauca*, which shows different pharmacological activities. The roots of this herb are important commercially because of their rich essential oil content and medicinal properties. Indigenous people use these plants traditionally to prepare different decoctions and oils to treat various ailments. Some of their products can nowadays also be found in the markets. Accordingly, the major purpose of this study is to investigate the commercial market products of *Angelica* species and their therapeutic effects.

Keywords: *Angelica, traditional uses, market products, spice, essential oil*

Introduction

Spices come from dried parts of plants, like seeds, fruits, roots, bark, or flowers, and are used in different ways to add flavour, colour, or even to boost appetite (Sachan et al., 2018). For ages, they've been valued not only for making food taste better but also for their health benefits. According to "World Health Organization" about 80% people depends on medicinal plants for their traditional medicinal uses (Chaudhary et al., 2023; Thakur et al., 2023). These medicinal properties come from bioactive compounds in them, including terpenes, flavonoids, anthocyanins, and phenylpropanoids (Jessica Elizabeth et al., 2017; Shahidi & Hossain, 2018; Khanal et al., 2021). The Himalayan regions are rich in medicinal and aromatic plants (MAP) and various indigenous communities use these plants as medicine or a food source. The genus *Angelica* includes various plant species distributed across Asia, Europe, and North American region (Batiha et al., 2022; Kumar et al., 2022). For centuries, many plants of this genus, such as *A. archangelica*, *A. sinensis*, *A. dahurica*, *A. glauca*, *A. japonica*, *A. gigas*, *A. atropupurea*, and many more have traditionally been utilised to treat many diseases (Sarker & Nahar, 2004). *A. glauca* is important Himalayan herb that is used for the treatment of various diseases and is also used as a spice. It is found in the North-Western Himalayan region at an altitude of 2,000 to 4,000 meters (Purohit et al., 2015; Butola & Vashistha, 2010). Numerous studies have proved its antioxidant and antibacterial activities by using various assays and also have shown anticancer activity against breast and stomach cancer (Devi et al., 2018; Nengroo & Rauf, 2021; Stanković et al., 2020; Qasim & Abid, 2023). *A. glauca* also showed neuroprotective effects (Puri et al., 2014) and broncho-relaxant activity against albino mice (Sharma et al., 2017) (Figure 1). The roots of *A. glauca* are used to enhance the flavour of food (dal or curry) in the Kumaon, Garhwal region of Uttarakhand and also in various other parts of India. During winters, the native people of Uttarakhand use the roots to make horse gram (Kulthi beans) recipes (Joshi, 2016). The root is utilized to make a variety of decoctions that are used to cure a range of conditions such as respiratory disorders,

rheumatism, stomach related issues, and urinary infections (Muhammad et al., 2011; Sowndhararajan et al., 2017). The essential oil of this plant has a strong aromatic smell that makes it useful for commercial purposes, such as fixing perfume, making gin and liqueurs from the root component (Butola & Vashistha, 2013). The paste from the leaves used to treat skin allergy (Arya et al., 2021). In several areas of Himachal Pradesh, the root is used in combination with other plant species to make herbal tea, which is effective in treating cough, cold, headache, and many stomach issues (Butola et al., 2016). Many indigenous communities used their roots as insect and snake repellent (Butola & Vashistha, 2013; Kumar et al., 2022). The *Angelica* genus contains highly demanded plant species with commercial traders in both national and international market because of their therapeutic and fragrant qualities. For financial purposes, the local people are also marketing these herbs and are getting more expensive in the herbal and pharmaceutical markets. So, in this study we have examined the different market products of *Angelica* species.

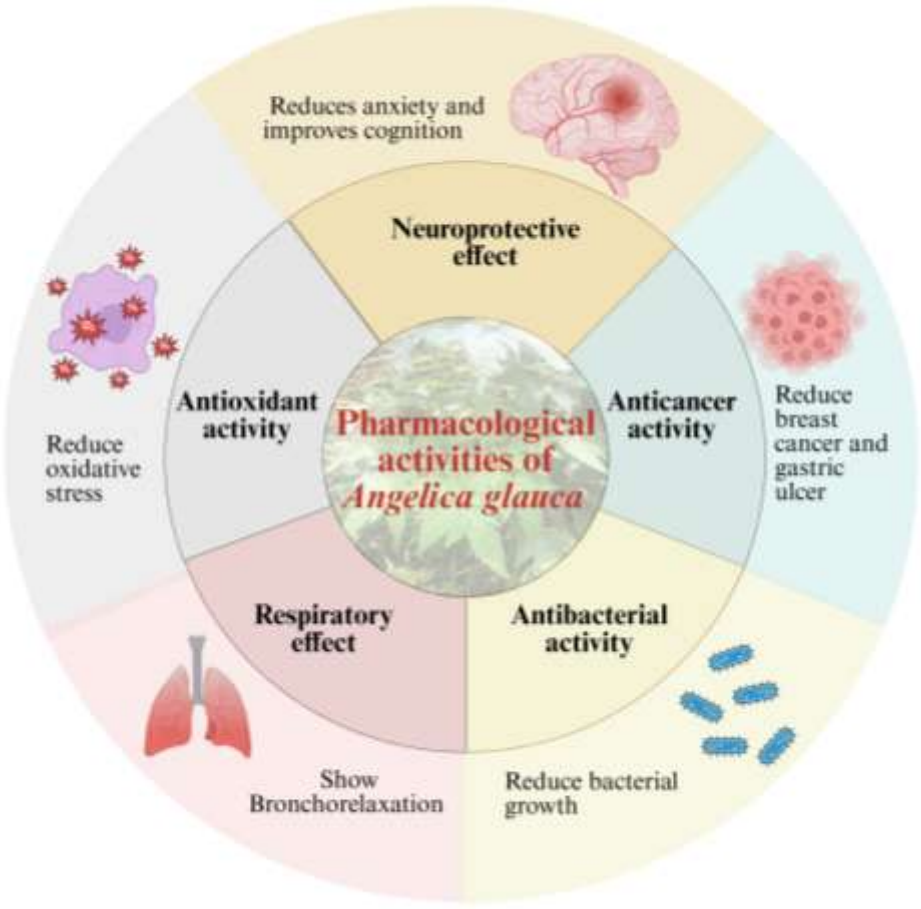


Figure 1. Various pharmacological activities of *A. glauca* (Created in BioRender. https://BioRender.com/vadno80)

A survey was conducted on online market platform to explore different products linked with the *Angelica* species. Data was collected from various online shopping sites such as "Amazon, Flipkart, IndiaMART, Desertcart, Healthmug, and JioMart". The following keywords were used in the search: "*Angelica*", "*Angelica glauca*", and "Market Product". All extracted products were then systematically screened for their authenticity, quality, and complete information, and then organized based on specific item types such as name, plant part used, plant species name, and manufacturer/brand name.

After the analysis, 75 commercially available products based on *Angelica* species were found on various websites in various forms, including dried roots, powdered roots or leaves, essential oils, and capsules (Table 1). Some products of *A. glauca* were also identified; the most widely accessible product form was root powder. This observation was consistent with the traditional use of its roots as a spice. The commercial products of *A. glauca* are primarily sold under several brands, including Kedar Valley Organic Farming, Sai Herbs, K.R. Impex Enterprises, Indian Jadi Booti, and Terravita.

The study showed that root-based products were most frequently used and widely used for various ailments. They are used to treat gastrointestinal disorders, menstrual cramps, premenstrual syndrome (PMS), and menopausal issues. Additionally, many products are used to boost immunity. The *A. glauca* is most commonly used as a spice ingredient and also used to treat headache, sore throat, fever, constipation, digestion and many more (Figure 2). The essential oils are widely used in aromatherapy. Due to high aromatic properties, they are used in perfumes and massage to relax body and

mind. In addition, these oils are also used to treat skin-related diseases and are occasionally mixed with other oils for applications to reduce inflammation, promote hair growth, and used as room diffusers for relaxation and stress relief.

This investigation found that the demand for *Angelica*-based commercial products has increased significantly in recent years, as many new products have been introduced to the market. This increasing demand has led to threatened status of this plant. Attention should therefore be paid to the sustainable use of these species so that their natural populations do not decline with increasing demand. Furthermore, it can be challenging for customers to identify which plant they are using because some commercial items do not mention a specific species name on their labels. Adulteration has also been observed; for example, if we search for "chora" products, products made from *A. archangelica* will appear, even though "chora" is the common name for *A. glauca*. It is therefore important to improve the labeling accuracy and address adulteration issues in the market.

Compared to other *Angelica* species, *A. glauca* has been less commercialized, possibly due to its lack of proper investigation. Therefore, more attention should be paid to promoting the production of its products, as this plant has important medicinal properties. Currently, most of the available products of *A. glauca* are root-based; however, there is a possibility of developing products using other parts of the plant as well. Moreover, *A. glauca* essential oil-based products are very few in the market. Therefore, extracting and commercializing its essential oils can open new avenues for its use in various industries.



Figure 2. Various traditional uses of *A. glauca* (Created in BioRender. https://BioRender.com/8ikp5uh)

Table 1. Commercially available products derived from *Angelica* species in the market

Sr. No.	Product Name	Plant Part Used	Plant Name	Brand/ Manufacturer
1.	*Angelica glauca* Herbs (Gandrayan)	Roots	*A. glauca*	Kedar Valley Organic Farming
2.	Value Life *Angelica* Root	Roots	*A. archangelica*	Value Life
3.	*Angelica* Root Spray	Roots	*A. archangelica*	St. Severin Natural Product/ Gall-Pharma
4.	*Angelica* Roots (Powder)	Roots	*A. archangelica*	IndianJadiBooti

5.	*Angelica* (Roots)	Roots	*A. archangelica*	Nature Yard
6.	*Angelica* Root C/S	Roots	*A. archangelica*	Herb To Body
7.	Xetomos Chora Essential Oil	-	*A. glauca*	Xetomos/ Raziel Craft
8.	*Angelica* Essential Oil	-	*A. archangelica*	R. K's aroma
9.	*Angelica* Essential Oil, 100% Pure & Natural	-	*A. archangelica*	Salvia Cosmeceuticals Private Limited
10.	*Angelica* Root Oil	Roots	*Angelica*	Allin Exporters
11.	*Angelica* Root Oil	Roots	*A. archangelica*	Meena Perfumery
12.	*Angelica* Oil	-	*Angelica*	B-Urban
13.	*Angelica* Root Absolute Essential Oil	-	*A. archangelica*	Silky Scents
14.	100% Pure *Angelica* Essential Oil	-	*A. archangelica*	Ks Essentials (Kanth Saanvi Essentials)
15.	*Angelica* Dried Root	Roots	*A. archangelica*	Biokoma
16.	100% Pure *Angelica dahurica* Powder	Roots	*A. dahurica*	Plant Gift
17.	*Angelica* Leaves Powder	Leaves	*Angelica*	SAI HERBS
18.	*Angelica* USDA Organic 120 Capsules	Roots	*A. archangelica*	HerbEra
19.	SAI HERBS Gandrayan Herbal Powder	Roots	*A. glauca*	K.R. IMPEX ENTERPRISES
20.	Brown *Angelica glauca* (Gandrayan Herbs)	Roots	*A. glauca*	Kedar Valley Organic Farming
21.	Brown Dried *Angelica* Root	-	*A. glauca*	Indian Jadi Booti
22.	AKARZ *Angelica* Essential Oil is a natural and organic oil	Roots	*Angelica*	AKARZ, origin in Canada
23.	*Angelica* Root Powder	Roots	*A. glauca*	Terravita
24.	Wheezal *Angelica atropurpurea* Dilution	-	*A. atropurpurea*	Wheezal Homoeo Pharma
25.	*Angelica archangelica* Dilution 200 CH	-	*A. archangelica*	Dr Willmar Schwabe India Pvt Ltd
26.	*Angelica* Archang Mother Tincture	-	*A. archangelica*	Dr Reckeweg & Co
27.	*Angelica* Root Cut and Sifted	-	*Angelica*	Holistic Herbal Solutions
28.	SBL *Angelica archangelica* Mother Tincture	-	*A. archangelica*	SBL Pvt Ltd
29.	Organic *Angelica* Root Oil	Roots, rhizome and seeds	*A. archangelica*	SNN Natural Products
30.	100% Pure Natural *Angelica* Root Oil	Roots	*A. Archangelica*	Kanta
31.	*Angelica* Roots Oil	Rhizome	*A. archangelica*	Katyani Exports
32.	*Angelica* Oil	Roots	*A. archangelica*	Maruti Natural Fragrances
33.	*Angelica* root oil	Roots	*A. archangelica*	Rare Essential Oils Pvt. Ltd.
34.	100% *Angelica* Root Essential Oil	Roots	*A. archangelica*	Aromaaz International Pvt. Ltd.
35.	*Angelica* Root Essential Oil	Roots	*Angelica*	Naturoil Aromatics Pvt. Ltd.
36.	99% Angelica Root Oil	Roots	*A. archangelica*	Sivaroma Naturals Pvt. Ltd

37.	100% Liquid *Angelica* Root Essential Oil	Roots	*A. archangelica*	Aarnav Global Exports
38.	100% Pure *Angelica* Root Oil	Roots	*Angelica*	Sri Venkatesh Aromas
39.	Liquid 98% *Angelica* Oil	Roots	*Angelica*	Vaibhav Perfumery
40.	*Angelica* Root Powder	Roots	*Angelica*	Ambe NS Agro Product Pvt. Ltd.
41.	100% Pure *Angelica* Root Essential Oil	Roots	*A. archangelica*	Natures Natural India Oils Pvt. Ltd.
42.	99% Pure *Angelica* Root Essential Oil	Roots	*A. archangelica*	Himveda Organic
43.	Pure *Angelica* Hydrosols	-	*Angelica*	Kanha Nature Oils
44.	100% Pure *Angelica* Oil	Roots	*A. Archangelica*	Bodhana Export Private Limited
45.	*Angelica* Seed Essential Oil	Seeds	*A. archangelica*	Expo Essential Oils
46.	*Angelica* Flavour Oil	Roots	*Angelica*	Saanvi Perfumers
47.	*Angelica* Oil	Leaves, and roots	*Angelica*	Parksmith/Orwind Mart LLP
48.	Pale Yellow *Angelica* Root Oil	Roots	*A. archangelica*	Liable Essential Oil Products Private Limited
49.	*Angelica* Essential Oil	Leaves	*A. archangelica*	Archie Enterprise
50.	Liquid Pale-Yellow Pure *Angelica* Root Oil	Roots	*A. archangelica*	Falcon
51.	*Angelica* Extract	-	*Angelica*	Farmoganic Health And Beauty
52.	99.9% *Angelica* Root Oil	Roots	*A. archangelica*	Expo Organics
53.	*Angelica* Root Essential Oil	Roots	*Angelica*	Chem International
54.	Pure *Angelica* Root Oil	-	*Angelica*	Allin Exporters
55.	*Angelica* Essential Oil	-	*Angelica*	Kazima Aromatics
56.	Pure & Natural Essential oil *Angelica* Root Oil	Roots	*A. archangelica*	Amarnath Exports
57.	*Angelica* Root Oil	Roots	*A. archangelica*	Emm Exporter/Emedsmart Pharmacy
58.	100% Pure *Angelica* Root Oil	Leaves	*Angelica*	Flora Essence
59.	*Angelica* Seed Oil	Seeds	*A. archangelica*	Grasse International
60.	100 % Pure & Natural *Angelica* Root Oil	Roots	*A. archangelica*	Shri Ji Aroma
61.	*Angelica* oil	-	*Angelica*	Triveni Chemicals
62.	Liquid 100 % Natural *Angelica* Root Oil	Roots	*Angelica*	Surajbala Exports Pvt. Ltd.
63.	*Angelica* Root Essential Oil	Roots	*Angelica*	Natcon Biolifesciences Pvt. Ltd.
64.	*Angelica* Oil	-	*A. archangelica*	Salvia Cosmeceuticals Pvt. Ltd.
65.	*Angelica* Flower Oil	Flower	*A. archangelica*	Vaible Herbal
66.	Dong Quai Tablets	-	*A. sinensis*	VitaMinute
67.	Green Dong Quai Powder	-	*A. sinensis*	Natural Hub
68.	*Angelica sinensis* Extract Powder	-	*A. sinensis*	Yucca Enterprises
69.	Brown Dong Quai	-	*A. sinensis*	Green Heaven
70.	Brown Dong Quani *Angelica sinensis*	Roots	*A. sinensis*	Jiya Nutraherbs
71.	*Angelica* P.E Powder	Roots	*A. sinensis*	SV Agrofood

72.	Organic Zing *Angelica* Oil	Roots	*A. archangelica*	Organic Zing
73.	Herbaveda- *Angelica* root	Roots	*Angelica*	Herbaveda Overseas
74.	Dong Quai Root Powder	Roots	*A. sinensis*	Mystique Hills
75.	Dong Quai Herbal Tea	Loose leaves	*A. sinensis*	Sai Herbs/KR Impex Enterprises

Conclusion

Angelica genus contains many important aromatic and medicinal plants that have been traditionally used to treat various ailments. *A. glauca* is one such plant which is found in the North-Western Himalayas and is commonly used as a spice or flavouring ingredient among the local people. This plant species contains essential oil, which contains several bioactive compounds that can be used in various pharmaceutical and perfume industries. *A. glauca* has been traditionally used but has been relatively under-explored due to lack of scientific investigation and the predominance of less valuable market products. Hence, future research is needed to explore its untapped therapeutic potential, which will pave the way for future drug development.

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