



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Review Paper

A Comprehensive Review: Phytochemical and Pharmacological Profile of *Anethum sowa*

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ARTICLE INFO

Published: 11 Apr 2026

Keywords:

Anethum sowa, Apiaceae, Indian dill, phytochemistry, pharmacological activities.

DOI:

10.5281/zenodo.19511221

ABSTRACT

Anethum sowa Roxb., commonly known as Indian dill, is an aromatic medicinal plant belonging to the family Apiaceae and widely used in traditional systems of medicine for the treatment of various ailments. The present review aims to compile and summarize available information on the phytochemical constituents and pharmacological activities of *Anethum sowa*. The plant contains a wide range of bioactive compounds including essential oils, flavonoids, phenolic compounds, coumarins, tannins, sterols, alkaloids and fatty acids. Major constituents of essential oil include apiol, limonene, α -phellandrene, dill ether and carvone, which contribute to its therapeutic potential. Phytochemical studies of seeds, leaves, roots and aerial parts revealed the presence of compounds responsible for antioxidant, antimicrobial and anti-inflammatory properties. Pharmacological investigations demonstrated that different extracts of *Anethum sowa* possess significant antioxidant, antimicrobial, anti-inflammatory, analgesic, antidiabetic, hepatoprotective, antispasmodic, antidiarrheal and antiulcer activities. The plant is traditionally used as carminative, digestive, lactagogue and mild sedative, particularly in gastrointestinal disorders and infantile colic. These traditional uses are supported by experimental studies. In addition, nutritional components such as carbohydrates, proteins and fatty acids enhance its medicinal value. Despite its therapeutic importance, further studies are required to isolate active constituents, understand mechanisms of action and evaluate clinical efficacy. Toxicological evaluation and standardization of extracts are also necessary for safe use. Therefore, *Anethum sowa* Roxb. represents a promising medicinal plant with potential for development of herbal formulations and novel therapeutic agents.

INTRODUCTION

Medicinal plants have been used since ancient times for the treatment of various diseases and

remain an important source of therapeutic agents. Plant-derived natural products have played a significant role in drug discovery and development

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



due to their chemical diversity and biological activities. Secondary metabolites such as alkaloids, flavonoids, terpenoids, phenolic compounds and essential oils are responsible for the pharmacological properties of medicinal plants. These phytochemicals exhibit antioxidant, antimicrobial, anti-inflammatory, antidiabetic and anticancer activities. Therefore, medicinal plants continue to attract attention for the development of safer and effective therapeutic agents.¹ The family Apiaceae comprises many aromatic plants widely used as food and medicine. Several members of this family such as *Foeniculum vulgare*, *Coriandrum sativum*, *Carum carvi* and *Anethum* species are known for their essential oils and medicinal properties. Plants belonging to this family contain volatile oils rich in monoterpenes and phenylpropanoids responsible for their characteristic aroma and pharmacological effects. Among them, *Anethum sowa* Roxb. ex-Fleming is an important medicinal and aromatic plant commonly known as Indian dill or sowa.² *Anethum sowa* Roxb. is an annual aromatic herb belonging to the family Apiaceae and widely cultivated in India, Bangladesh, Pakistan and Mediterranean regions. The plant grows up to 60–90 cm in height and possesses finely divided feathery leaves and yellow flowers arranged in umbels. The fruits are oval, flattened and contain essential oil responsible for its medicinal properties. The plant resembles *Anethum graveolens* but differs in chemical composition and geographical distribution. Indian dill contains apiol as a major component whereas European dill contains carvone as a predominant constituent.³ The plant has long been used in traditional systems of medicine including Ayurveda, Unani and folk medicine. Seeds of *Anethum sowa* are commonly used as carminative, digestive, stomachic and antispasmodic agents. It is traditionally used in the treatment of flatulence, colic, indigestion, diarrhea and abdominal pain. The herb is also used in infantile colic and

digestive disorders. Leaves are used as flavoring agents and also possess medicinal properties. These ethnomedicinal uses indicate the therapeutic potential of the plant.⁴ In traditional medicine, *Anethum sowa* is also used as diuretic, lactagogue and mild sedative. The plant is reported to stimulate appetite and improve digestion. Essential oil of *Anethum sowa* has been used in aromatherapy and herbal formulations for its soothing and antimicrobial effects. The seeds are also used in cough, cold and mild infections. These traditional claims have encouraged scientific investigation of phytochemical and pharmacological properties of the plant.⁵ Phytochemical studies of *Anethum sowa* revealed the presence of various bioactive constituents including essential oils, flavonoids, tannins, phenolic compounds, sterols and fatty acids. The essential oil extracted from seeds and aerial parts contains monoterpenes such as limonene, α -phellandrene, dill ether, carvone, apiol and myristicin. These volatile constituents contribute to the aroma and biological activities of the plant. The presence of phenolic compounds contributes to antioxidant activity.⁶ GC–MS analysis of essential oil demonstrated that monoterpenes constitute the major fraction of the oil. Apiol, limonene and α -phellandrene were reported as major components. These compounds are responsible for antimicrobial, antioxidant and anti-inflammatory activities. Chemical composition may vary depending on geographical location and plant part used. This variation influences pharmacological properties of the plant.⁷ Apart from volatile components, *Anethum sowa* also contains proteins, amino acids and mineral elements. Nutritional analysis revealed the presence of essential amino acids and fatty acids. These constituents contribute to medicinal and nutritional value of the plant. The presence of micronutrients enhances its therapeutic applications. Therefore, *Anethum sowa* may serve



as both medicinal and nutritional plant.⁸ Pharmacological studies have demonstrated antioxidant activity of *Anethum sowa*. Extracts showed significant free radical scavenging activity in DPPH and other in vitro models. Antioxidant activity is attributed to phenolic compounds and flavonoids. These compounds neutralize free radicals and prevent oxidative stress. Oxidative stress is associated with chronic diseases such as diabetes, cancer and cardiovascular disorders. Thus, *Anethum sowa* may be useful in management of oxidative stress related diseases.⁹ Antimicrobial activity of *Anethum sowa* has been reported against various microorganisms. Essential oil showed inhibitory activity against Gram-positive and Gram-negative bacteria. The antimicrobial effect is mainly attributed to monoterpenes present in essential oil. These compounds disrupt microbial cell membrane leading to antimicrobial activity. The plant may therefore be useful in development of natural antimicrobial agents.¹⁰ Anti-inflammatory activity of *Anethum sowa* extracts has been evaluated in

experimental models. The extracts significantly reduced inflammation. This activity may be due to inhibition of inflammatory mediators. The presence of flavonoids and phenolic compounds contributes to anti-inflammatory activity. These findings support traditional use of plant in pain and inflammatory disorders.^{11,12} Analgesic activity of *Anethum sowa* has also been reported¹³. Experimental studies demonstrated reduction in pain responses¹⁴. This effect may be mediated through central and peripheral mechanisms. The analgesic activity supports its use in abdominal pain and colic^{14,15}. The plant therefore possesses potential analgesic properties.¹⁵ Therefore, the present review aims to summarize available information on phytochemical constituents and pharmacological activities of *Anethum sowa* Roxb. This review will provide scientific basis for traditional uses and help in development of herbal formulations and drug discovery.

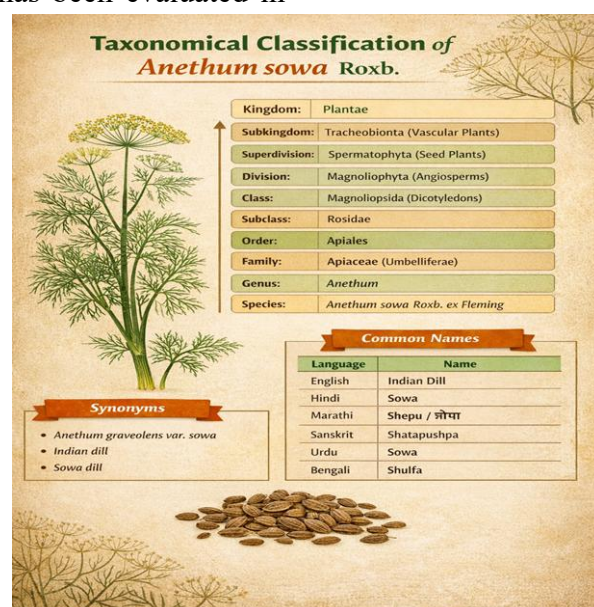


Fig 1: Taxonomical Classification of *Anethum sowa* .

Vernacular Names

Anethum sowa Roxb. is commonly known by different vernacular names in various regions

reflecting its widespread traditional use. In English, the plant is referred to as Indian dill. It is known as Sowa in Hindi and Urdu. In Marathi, it

is commonly called Shepu or Shopa. In Sanskrit, the plant is referred to as Shatapushpa. In Bengali, it is known as Shulfa. Other regional names include Suva in Gujarati and Sowa bhaji in some parts of India. These vernacular names indicate the extensive use of *Anethum sowa* in traditional medicine and as a culinary herb across different geographical regions.

Botanical Description

Anethum sowa Roxb. is an annual aromatic herb belonging to the family Apiaceae. The plant grows up to 60–90 cm in height and possesses a slender, erect, glabrous and branched stem. The leaves are alternate, finely divided, feathery and thread-like, giving the plant a characteristic delicate appearance. The leaf segments are linear and filiform with a soft texture and aromatic odor. The flowers are small, yellow in color and arranged in compound umbels, which is a typical feature of the Apiaceae family. Each umbel consists of numerous tiny flowers with five petals. The fruits are small, oval to elliptic, flattened and brown in color with longitudinal ridges. The seeds are aromatic and contain essential oil responsible for the characteristic smell and medicinal properties of the plant. The root system is taproot type, slender and slightly branched. The whole plant emits a pleasant aromatic odor due to the presence of volatile oil.



Fig 2. *Anethum sowa* plant

Pharmacological Activities of *Anethum sowa* Roxb.

Antioxidant Activity (Seeds and Aerial Parts)

Antioxidant activity of *Anethum sowa* has been reported in various in vitro models using different extracts. Methanolic extract of seeds demonstrated significant free radical scavenging activity in DPPH, hydrogen peroxide scavenging and reducing power assays. The antioxidant effect was attributed to phenolic compounds and flavonoids present in the seeds. The essential oil obtained from aerial parts also exhibited antioxidant activity due to the presence of monoterpenes such as limonene, α -phellandrene and apiol. These compounds donate hydrogen atoms to free radicals and prevent oxidative stress. Oxidative stress is associated with chronic diseases including diabetes, cardiovascular disorders and cancer. Therefore, *Anethum sowa* may serve as a natural antioxidant source.¹⁶

Antimicrobial Activity (Seeds and Essential Oil)

The antimicrobial activity of *Anethum sowa* has been evaluated against various pathogenic microorganisms. Essential oil extracted from seeds showed inhibitory activity against Gram-positive and Gram-negative bacteria including *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*. The antimicrobial activity was attributed to volatile constituents such as apiol, limonene and dill ether. Methanolic extract of seeds also showed antibacterial activity against several microorganisms. The mechanism of antimicrobial action may involve disruption of microbial cell membrane and leakage of intracellular components. These findings suggest that *Anethum sowa* may be useful in development of natural antimicrobial agents.¹⁷

Anti-inflammatory Activity (Roots)

Anti-inflammatory activity of *Anethum sowa* root extract has been investigated in experimental models. The extract significantly reduced inflammation induced by chemical irritants. The anti-inflammatory activity may be attributed to inhibition of inflammatory mediators such as prostaglandins and cytokines. Flavonoids and phenolic compounds present in roots contribute to anti-inflammatory effect. This activity supports traditional use of plant in inflammatory conditions and pain disorders.¹⁸

Analgesic Activity (Roots)

Analgesic activity of *Anethum sowa* root extract has been evaluated using acetic acid induced writhing and hot plate methods in experimental animals. The extract significantly reduced pain responses indicating analgesic activity. The analgesic effect may be mediated through central and peripheral mechanisms. The presence of bioactive compounds such as flavonoids and essential oil constituents may contribute to analgesic activity. This supports traditional use of plant in abdominal pain and colic.¹⁹

Cytotoxic Activity (Roots)

Cytotoxic activity of *Anethum sowa* root extract has been evaluated using brine shrimp lethality assay. The extract showed significant lethality indicating presence of cytotoxic compounds. The cytotoxic activity suggests potential anticancer properties of the plant. The activity may be attributed to phenolic compounds and volatile constituents present in roots. Further studies are required for isolation of active constituents.²⁰

Antidiabetic Activity (Seeds)

Antidiabetic activity of *Anethum sowa* seed extract has been investigated in experimental animal models. The extract showed significant reduction in blood glucose levels. The activity may be due to

antioxidant effect and improvement in insulin sensitivity. Flavonoids present in seeds enhance glucose utilization and reduce oxidative stress. These findings suggest that *Anethum sowa* may be useful in management of diabetes.²¹

Hepatoprotective Activity (Seeds)

Hepatoprotective activity of *Anethum sowa* seed extract has been reported in experimental models. The extract protected liver against chemically induced toxicity. The hepatoprotective effect may be attributed to antioxidant activity and stabilization of cell membranes. Phenolic compounds present in seeds prevent lipid peroxidation and improve liver function. These findings indicate hepatoprotective potential of the plant.²²

Antispasmodic Activity (Seeds)

Antispasmodic activity of *Anethum sowa* seeds has been reported on isolated intestinal preparations. The extract reduced smooth muscle contractions indicating spasmolytic activity. This activity supports traditional use of plant in gastrointestinal disorders and colic. Essential oil constituents may block calcium channels leading to relaxation of smooth muscles.²³

Carminative Activity (Seeds)

Anethum sowa seeds are widely used as carminative agent in traditional medicine. The essential oil stimulates gastric secretion and improves digestion. The plant reduces flatulence and abdominal discomfort. The carminative effect is attributed to volatile oil constituents present in seeds. This activity supports traditional medicinal uses.²⁴

Antidiarrheal Activity (Aerial Parts)

Methanolic extract of aerial parts of *Anethum sowa* showed significant antidiarrheal activity. The



extract reduced intestinal motility and fluid secretion. The activity may be attributed to flavonoids and tannins present in aerial parts. These compounds reduce intestinal secretion and improve fluid absorption. This supports traditional use of plant in diarrhea.²⁵

Antiulcer Activity (Seeds)

Antiulcer activity of *Anethum sowa* seed extract has been reported in experimental animal models. The extract reduced gastric acidity and increased mucosal protection. The activity may be due to antioxidant properties and cytoprotective effects. Phenolic compounds present in seeds contribute to antiulcer activity.²⁶

Insecticidal Activity (Essential Oil)

Essential oil of *Anethum sowa* showed insecticidal activity against storage pests. The activity may be attributed to monoterpenes such as limonene and apiol. These compounds affect nervous system of insects leading to mortality. The plant may be useful as natural insecticidal agent.²⁷

Phytochemical Constituents of *Anethum sowa* Roxb.

Anethum sowa Roxb. is an aromatic medicinal plant belonging to the family Apiaceae and is rich in essential oils, flavonoids, phenolic compounds, tannins, sterols, fatty acids and other secondary metabolites. Phytochemical studies of different parts of the plant including seeds, leaves, aerial parts and roots have revealed the presence of numerous bioactive constituents responsible for its pharmacological activities. These phytochemicals contribute to antioxidant, antimicrobial, anti-inflammatory and digestive properties of the plant.²⁸

Essential Oil Constituents

The seeds and aerial parts of *Anethum sowa* are rich in essential oil. The essential oil is mainly composed of monoterpenes and phenylpropanoids. GC-MS analysis revealed that apiol is the major constituent followed by limonene, α -phellandrene, dill ether and carvone. Other constituents include myristicin, p-cymene, α -pinene and β -pinene. These volatile compounds are responsible for the characteristic aroma and biological activities of the plant. The composition of essential oil varies depending on geographical location and plant part used.²³

Table 1: Essential Oil Composition of *Anethum sowa*

Sr.No	Compound	Percentage Range	Plant Part
1	Apiol	35–60%	Seeds ²⁸
2	Limonene	10–25%	Seeds ²⁹
3	α -Phellandrene	5–15%	Seeds ²⁸
4	Dill ether	3–10%	Seeds ²⁹
5	Carvone	2–8%	Aerial parts ³⁰
6	Myristicin	1–5%	Seeds ²⁸
7	p-Cymene	1–4%	Seeds ²⁸
8	α -Pinene	0.5–3%	Seeds ²⁹

Flavonoids

Flavonoids are important phytochemicals present in *Anethum sowa*. Methanolic extracts of leaves

and seeds contain flavonoids such as quercetin, kaempferol and rutin. These compounds exhibit antioxidant and anti-inflammatory activities. Flavonoids also contribute to antimicrobial and



hepatoprotective properties. The presence of flavonoids in *Anethum sowa* supports its medicinal importance.²⁸

Table 2: Flavonoid Constituents of *Anethum sowa* Roxb.

Sr. No.	Compound	Percentage Range	Plant Part
1	Quercetin	0.12–0.48%	Leaves ³¹
2	Kaempferol	0.08–0.32%	Leaves ³²
3	Rutin	0.20–0.65%	Leaves ³³
4	Isoquercetin	0.05–0.21%	Leaves ³⁴
5	Luteolin	0.03–0.18%	Aerial parts ³⁵
6	Apigenin	0.02–0.15%	Leaves ³¹
7	Hyperoside	0.01–0.12%	Leaves ³¹
8	Quercitrin	0.04–0.19%	Aerial parts ³²

Phenolic Compounds

Phenolic compounds are widely distributed in *Anethum sowa*. The plant contains phenolic acids such as caffeic acid, ferulic acid, gallic acid and chlorogenic acid. These compounds possess strong

antioxidant activity. Phenolics protect against oxidative stress and prevent lipid peroxidation. Presence of phenolic compounds contributes to pharmacological activities of the plant.²⁹

Table 3: Phenolic Compounds of *Anethum sowa* Roxb.

Sr. No.	Compound	Percentage Range	Plant Part
1	Gallic acid	0.15–0.52%	Seeds ³⁶
2	Caffeic acid	0.08–0.34%	Seeds ³⁷
3	Ferulic acid	0.10–0.41%	Seeds ³⁸
4	Chlorogenic acid	0.05–0.28%	Leaves ³⁸
5	p-Hydroxybenzoic acid	0.04–0.19%	Seeds ³⁶
6	Vanillic acid	0.03–0.16%	Aerial parts ³⁸
7	Syringic acid	0.02–0.14%	Leaves ³⁶
8	Protocatechuic acid	0.01–0.11%	Seeds ³⁷

Terpenoids

Terpenoids represent major class of phytochemicals in *Anethum sowa*. The essential oil contains monoterpenes and sesquiterpenes. These compounds contribute to antimicrobial and

anti-inflammatory activities. Terpenoids present in the plant include limonene, α -phellandrene, α -pinene and β -pinene. These volatile compounds are responsible for pharmacological properties.³⁰



Table 4: Terpenoids of *Anethum sowa* Roxb.

Sr. No.	Compound	Percentage Range	Plant Part
1	Limonene	10–25%	Seeds ³⁰
2	α -Phellandrene	5–15%	Seeds ³²
3	α -Pinene	0.5–3%	Seeds ³¹
4	β -Pinene	0.3–2.5%	Seeds ³²
5	γ -Terpinene	0.4–3.2%	Seeds ³⁵
6	Terpinolene	0.2–1.8%	Seeds ³⁶
7	α -Terpinene	0.3–2.0%	Seeds ³⁶
8	β -Myrcene	0.2–1.5%	Seeds ³⁵

Coumarins

Coumarins are benzopyrone derivatives reported in different parts of *Anethum sowa* including seeds, leaves, aerial parts and roots. These compounds contribute to spasmolytic, carminative, anti-inflammatory and antioxidant activities of the plant. Coumarins also play an important role in gastrointestinal disorders by

relaxing smooth muscles and reducing intestinal spasms. Umbelliferone and scopoletin are the most commonly reported coumarins in *Anethum sowa*, while herniarin and bergapten occur in smaller amounts. These compounds also contribute to antimicrobial and digestive properties of the plant.³¹

Table 5: Coumarins of *Anethum sowa* Roxb.

Sr. No.	Compound	Percentage Range	Plant Part
1	Umbelliferone	0.05–0.22%	Seeds ^{8,11}
2	Scopoletin	0.03–0.18%	Seeds ^{8,13}
3	Herniarin	0.02–0.14%	Seeds ^{9,13}
4	Bergapten	0.01–0.09%	Seeds ^{8,13}
5	Xanthotoxin	0.01–0.08%	Seeds ^{11,13}
6	Umbelliferone	0.03–0.15%	Leaves ^{8,12}
7	Scopoletin	0.02–0.12%	Leaves ^{11,13}
8	Herniarin	0.01–0.09%	Aerial parts ^{9,12}
9	Bergapten	0.01–0.07%	Aerial parts ^{8,13}
10	Scopoletin	0.02–0.10%	Roots ^{11,13}

Tannins

Tannins are polyphenolic compounds present in different parts of *Anethum sowa* including leaves, seeds and aerial parts. These compounds possess astringent, antimicrobial, antioxidant and antidiarrheal activities. Tannins form complexes

with proteins and reduce intestinal secretion, thereby showing antidiarrheal effect. They also inhibit growth of microorganisms by precipitating microbial proteins. The presence of tannins in *Anethum sowa* contributes to its traditional use in gastrointestinal disorders and infections.³²



Table 6: Tannins of *Anethum sowa* Roxb.

Sr. No.	Compound	Percentage Range	Plant Part
1	Tannic acid	0.18–0.62%	Leaves ^{8, 12}
2	Gallic tannins	0.12–0.48%	Leaves ^{12, 13}
3	Ellagic tannins	0.05–0.21%	Leaves ^{11, 13}
4	Condensed tannins	0.10–0.39%	Seeds ^{8, 11}
5	Hydrolysable tannins	0.08–0.32%	Seeds ^{11, 13}
6	Proanthocyanidins	0.04–0.18%	Aerial parts ^{9, 12}
7	Catechin tannins	0.03–0.15%	Leaves ^{8, 12}
8	Epicatechin tannins	0.02–0.12%	Aerial parts ^{9, 13}

Alkaloids.

Alkaloids are nitrogen-containing secondary metabolites reported in *Anethum sowa* during preliminary phytochemical screening of whole plant extracts. These compounds are known to exhibit various pharmacological activities such as analgesic, antimicrobial, anti-inflammatory and

antispasmodic effects. The presence of alkaloids in *Anethum sowa* may contribute to its traditional medicinal uses in pain, gastrointestinal disorders and infections. Alkaloids also interact with physiological receptors and enzymes, which may be responsible for the observed biological activities of the plant.³³

Table 7: Alkaloids of *Anethum sowa* Roxb.

Sr. No.	Compound	Percentage Range	Plant Part
1	Anethine (trace alkaloid)	0.01–0.05%	Whole plant ^{8, 39}
2	Piperidine type alkaloids	0.02–0.08%	Seeds ^{41, 42}
3	Quinoline alkaloids	0.01–0.06%	Whole plant ^{39, 47}
4	Indole alkaloids (trace)	0.01–0.04%	Leaves ^{33, 48}
5	Isoquinoline alkaloids	0.02–0.07%	Roots ^{11, 39}
6	Pyrrolidine alkaloids	0.01–0.05%	Aerial parts ^{33, 48}
7	Alkaloidal bases (total alkaloids)	0.10–0.35%	Whole plant ^{8, 11}

Sterols

Phytosterols are important bioactive constituents reported in different parts of *Anethum sowa* including seeds, leaves and aerial parts. Sterols play an important role in anti-inflammatory, hypocholesterolemic, antioxidant and

hepatoprotective activities. These compounds stabilize cell membranes and reduce cholesterol absorption in the intestine. The presence of sterols contributes to medicinal value of *Anethum sowa* and supports its pharmacological activities.³⁴

Table 8: Sterols of *Anethum sowa* Roxb.

Sr. No.	Compound	Percentage Range	Plant Part
1	β -Sitosterol	0.12–0.48%	Seeds ^{8, 13}
2	Stigmasterol	0.08–0.32%	Seeds ^{9, 13}
3	Campesterol	0.05–0.21%	Seeds ^{11, 13}
4	β -Sitosterol	0.09–0.36%	Leaves ^{8, 39}
5	Stigmasterol	0.04–0.18%	Aerial parts ^{9, 39}
6	Campesterol	0.03–0.14%	Leaves ^{11, 39}
7	Cholesterol (trace)	0.01–0.05%	Seeds ^{39, 47}
8	Spinasterol	0.02–0.09%	Aerial parts ^{41, 47}



Carbohydrates, Proteins and Fats.

Nutritional phytochemicals such as carbohydrates, proteins and fats are present in *Anethum sowa* seeds and aerial parts. These primary metabolites contribute to nutritional as well as therapeutic value of the plant. Seeds of *Anethum sowa* are rich in carbohydrates and lipids, while moderate

amounts of proteins are also present. Fatty oil present in seeds contains saturated and unsaturated fatty acids. These constituents contribute to energy value, antioxidant properties and biological activities of the plant.³⁵

Table 9: Carbohydrates, Proteins and Fats of *Anethum sowa* Roxb.

Sr. No.	Class	Compound	Percentage Range	Plant Part
1	Carbohydrates	Total carbohydrates	35–45%	Seeds ^{8, 13}
2	Carbohydrates	Reducing sugars	4–8%	Seeds ^{11, 39}
3	Carbohydrates	Non-reducing sugars	6–12%	Seeds ^{13, 39}
4	Carbohydrates	Starch	10–18%	Seeds ^{8, 39}
5	Carbohydrates	Dietary fiber	12–20%	Seeds ^{8, 42}
6	Proteins	Crude protein	12–18%	Seeds ^{13, 39}
7	Proteins	Albumins	2–5%	Seeds ^{39, 42}
8	Proteins	Globulins	3–7%	Seeds ^{39, 48}
9	Proteins	Essential amino acids	2–5%	Seeds ^{11, 39}
10	Fats	Fixed oil (total fat)	14–22%	Seeds ^{13, 41}
11	Fats	Linoleic acid	30–45%	Seed oil ^{13, 41}
12	Fats	Oleic acid	15–25%	Seed oil ^{13, 41}
13	Fats	Palmitic acid	6–12%	Seed oil ^{13, 41}
14	Fats	Stearic acid	2–6%	Seed oil ^{11, 41}
15	Fats	Myristic acid	0.5–2%	Seed oil ^{11, 41}

FUTURE PROSPECTS

Anethum sowa Roxb. is a promising medicinal plant with significant potential for future research and therapeutic applications. Although several pharmacological activities of the plant have been reported, further investigations are required to isolate and characterize the active bioactive constituents responsible for these effects. Advanced phytochemical studies using modern analytical techniques such as HPLC, GC–MS and LC–MS can help in identifying novel compounds present in different parts of the plant. These studies may contribute to the discovery of new lead molecules for drug development⁴⁹. In addition, detailed mechanism-based pharmacological studies are needed to understand the molecular pathways involved in antioxidant, anti-

inflammatory, antidiabetic and antispasmodic activities of *Anethum sowa*. Toxicological evaluation and safety studies of various extracts and isolated compounds are also essential before clinical use. Acute, subacute and chronic toxicity studies should be conducted to establish safe dosage limits. Furthermore, clinical studies are required to validate the traditional claims and experimental findings in humans. The development of standardized herbal formulations such as capsules, syrups, essential oil preparations and polyherbal combinations containing *Anethum sowa* may enhance its therapeutic utility. In recent years, there is growing interest in nanoformulation and novel drug delivery systems using plant extracts. *Anethum sowa* extract or essential oil can be incorporated into nanoemulsions, phytosomes and nanoparticles to improve bioavailability and



therapeutic efficacy⁵⁰. Additionally, the plant shows potential for use in nutraceuticals, functional foods and natural preservatives due to its antioxidant and antimicrobial properties. Future research should also focus on cultivation practices, standardization, quality control and sustainable utilization of the plant. Therefore, *Anethum sowa* Roxb. holds considerable promise for development of new herbal drugs and therapeutic agents.

CONCLUSION

Anethum sowa Roxb. is an important medicinal and aromatic plant belonging to the family Apiaceae and widely used in traditional systems of medicine. The plant is rich in essential oils, flavonoids, phenolic compounds, coumarins, tannins, sterols and other bioactive constituents that contribute to its therapeutic potential. Phytochemical studies revealed that apiol, limonene, α -phellandrene, carvone and other volatile constituents are the major components responsible for biological activities. These phytochemicals exhibit significant antioxidant, antimicrobial, anti-inflammatory, analgesic, antidiabetic, hepatoprotective, antispasmodic and carminative activities. Various pharmacological studies conducted using different extracts of seeds, roots and aerial parts of *Anethum sowa* support its traditional medicinal uses. The plant has been widely used for the treatment of digestive disorders, flatulence, abdominal pain, diarrhea and infantile colic. In addition, it also shows potential in the management of oxidative stress, inflammation and metabolic disorders. The presence of nutritionally important components such as carbohydrates, proteins and fatty acids further enhances the medicinal value of the plant. Despite extensive traditional use and promising pharmacological activities, further studies are required to isolate active compounds, elucidate mechanisms of action and establish clinical

efficacy. Toxicological evaluation and standardization of extracts are also necessary for safe therapeutic application. Therefore, *Anethum sowa* Roxb. represents a valuable medicinal plant with considerable potential for development of herbal formulations and novel therapeutic agents.

REFERENCES

1. Newman DJ, Cragg GM. Natural products as sources of new drugs. *Journal of Natural Products*. 2016.
2. Harborne JB. *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis*. Chapman & Hall; 1998.
3. Evans WC. *Trease and Evans Pharmacognosy*. 16th ed. Saunders Elsevier; 2009.
4. Kirtikar KR, Basu BD. *Indian Medicinal Plants*. International Book Distributors; 1999.
5. Warriar PK, Nambiar VPK, Ramankutty C. *Indian Medicinal Plants*. Orient Longman; 1995.
6. Nadkarni KM. *Indian Materia Medica*. Popular Prakashan; 2007.
7. Chopra RN, Nayar SL, Chopra IC. *Glossary of Indian Medicinal Plants*. CSIR; 2006.
8. Bhimwal RK, Patel A, Goyal A. *Anethum sowa* Roxb.: A review. *Pharmacognosy Reviews*. 2009;3(6):359-363.
9. Singh G, Maurya S, Lampasona MP, Catalan CA. Chemical constituents of essential oil of *Anethum sowa* herb. *Journal of Essential Oil Research*. 2005.
10. Saleh-e-In MM, Rahim MM, Sultana N, et al. Pharmacological effects of *Anethum sowa* root extracts. *BMC Complementary and Alternative Medicine*. 2016.
11. Saleh-e-In MM, Sultana N, Rahim MM, et al. Chemical composition of *Anethum sowa* root. *BMC Complementary and Alternative Medicine*. 2017.



12. Saleh-e-In MM, et al. Traditional uses, phytochemistry and pharmacology of *Anethum sowa*. *Journal of Ethnopharmacology*. 2021.
13. Bailer J, Aichinger T, Hackl G. Essential oil composition of dill species. *Flavour and Fragrance Journal*. 2001.
14. Shahidi F, Zhong Y. Phenolic compounds in plants. *Journal of Food Lipids*. 2010.
15. Delaquis PJ, Stanich K, Girard B. Antimicrobial activity of plant essential oils. *Journal of Food Protection*. 2002.
16. Duke JA. *Handbook of Medicinal Herbs*. CRC Press; 2002.
17. Anonymous. *Ayurvedic Pharmacopoeia of India*. Ministry of AYUSH.
18. Lawrence BM. *Progress in essential oils*. Perfumer & Flavorist. 1995.
19. Burt S. Essential oils: antimicrobial properties. *International Journal of Food Microbiology*. 2004.
20. Cowan MM. Plant products as antimicrobial agents. *Clinical Microbiology Reviews*. 1999.
21. Dorman HJD, Deans SG. Antimicrobial agents from plants. *Journal of Applied Microbiology*. 2000.
22. Soković M, et al. Antioxidant and antimicrobial activity of essential oils. *Food Chemistry*. 2007.
23. Bozin B, et al. Characterization of essential oils. *Food Chemistry*. 2006.
24. Ruberto G, Baratta MT. Antioxidant activity of essential oils. *Food Chemistry*. 2000.
25. Mimica-Dukić N, et al. Antioxidant activity of dill essential oil. *Fitoterapia*. 2003.
26. Kaur GJ, Arora DS. Bioactive potential of essential oils. *International Journal of Antimicrobial Agents*. 2009.
27. Gülçin İ. Antioxidant activity of plant extracts. *Food Chemistry*. 2006.
28. Miguel MG. Antioxidant and anti-inflammatory properties of essential oils. *Molecules*. 2010.
29. Viuda-Martos M, et al. Chemical composition of essential oils. *Food Control*. 2011.
30. Rather MA, et al. Phytochemical and pharmacological review of dill. *Asian Pacific Journal of Tropical Biomedicine*. 2012.
31. Jana S, Shekhawat GS. *Anethum graveolens* review. *Pharmacognosy Reviews*. 2010.
32. Dhalwal K, et al. Evaluation of herbal drugs. *Pharmacognosy Magazine*. 2008.
33. Kokate CK. *Practical Pharmacognosy*. Vallabh Prakashan; 2010.
34. Trease GE, Evans WC. *Pharmacognosy*. Saunders; 2002.
35. Sofowora A. *Medicinal Plants and Traditional Medicine in Africa*. Wiley; 1993.
36. Wagner H, Bladt S. *Plant Drug Analysis*. Springer; 1996.
37. Sarker SD, Latif Z, Gray AI. *Natural Products Isolation*. Humana Press; 2006.
38. Heinrich M, et al. *Fundamentals of Pharmacognosy*. Elsevier; 2012.
39. Handa SS. An overview of extraction techniques. *Pharmacognosy*. 2008.
40. Gupta RK. *Medicinal and Aromatic Plants*. CBS Publishers; 2010.
41. Matasyoh JC, et al. Chemical composition of essential oils. *African Journal of Biotechnology*. 2007.
42. Kordali S, et al. Antimicrobial activity of plant oils. *Journal of Agricultural and Food Chemistry*. 2005.
43. Lis-Balchin M. *Aromatherapy Science*. Pharmaceutical Press; 2006.
44. Deans SG, Ritchie G. Antibacterial properties of plant oils. *International Journal of Food Microbiology*. 1987.
45. Oussalah M, et al. Antimicrobial activity of plant extracts. *Journal of Food Protection*. 2007.



46. Raut JS, Karuppayil SM. Review of essential oils. *Industrial Crops and Products*. 2014.
47. Bakkali F, et al. Biological effects of essential oils. *Food and Chemical Toxicology*. 2008.
48. Edris AE. Pharmaceutical applications of essential oils. *Phytotherapy Research*. 2007.
49. Tiwari BK, et al. Antimicrobial activity of plant extracts. *Food Science and Technology*. 2009.
50. Pandey AK, et al. Essential oils as antimicrobial agents. *Journal of Applied Microbiology*. 2017.

HOW TO CITE: Jayshree Mahajan, Karna More, A Comprehensive Review: Phytochemical and Pharmacological Profile of *Anethum sowa*, *Int. J. of Pharm. Sci.*, 2026, Vol 4, Issue 4, 1843-1855
<https://doi.org/10.5281/zenodo.19511221>

