International Journal of Environment and Health Sciences (IJEHS)
2021, VOL. 3, NO. 3, 33-37
https://doi.org/10.47062/1190.0303.05

CHEMICAL CONSTITUENTS AND PHARMACOLOGICAL PROPERTIES OF ANISE SEEDS (*PIMPINELLA ANISUM* L.)

Upma Singh[1], Monika Chamoli[2], Sukhraj Punar[3], Lakha Ram[3], Raaz K. Maheshwari[3]

[1]Department of Applied Chemistry, School of Vocational Studies & Applied Sciences Gautam Buddha University, Gautam Buddha Nagar, Greater Noida, Uttar Pradesh
[2]Department of Applied Sciences, Pt LR College of Technology, Faridabad, Haryana
[3]Department of Chemistry, SBRM Govt PG College, Nagaur, Rajasthan

Received on: 31.12.2021 **Revised on:** 15.02.2022 **Accepted on:** 13.04.2022

Abstract
Pimpinella anisum (anise), belonging to Umbelliferae family, is an aromatic plant which has been used In Iranian traditional medicine (especially its fruits) as carminative, aromatic, disinfectant, and galactagogue. *Pimpinella anisum* is a plant rich in volatile oils, which are employed in the folk medicine. So far, different studies were performed on aniseeds and various properties such as antimicrobial, antifungal, antiviral, antioxidant, muscle relaxant, analgesic and anticonvulsant activity as well as different effects on gastrointestinal system have been reported of aniseeds. It can also reduce morphine dependence and has beneficial effects on dysmenorrhea and menopausal hot flashes in women. In diabetic patients, aniseeds showed hypoglycemic and hypolipidemic effect and reduce lipid peroxidation. The most important compounds of aniseeds essential oil were trans-anetole, estragole, γ-hymachalen, para-anisaldehyde and methyl cavicol.

Keywords
Galactagogue, Anethole, Hypoglycemic effect, Antifungal, Analgesic

Introduction

Pimpinella anisum L., an annual herb belonging to the Umbelliferae family, is one of the oldest medicinal plants. It is an annual grassy herb with 30–50 cm high, white flowers, and small green to yellow seeds, which grows in the Eastern Mediterranean Region, West Asia, the Middle East, Mexico, Egypt, and Spain. *P. anisum* is primarily grown for its fruits (aniseeds). Anise is grown for fruit (Anisifructus), containing essential oil (Anisiaethroleum) with trans-anethole which is a dominant compound and has a characteristic sweet taste and smell. *Pimpinella anisum* has been used as carminative, aromatic, disinfectant, and galactagogue. [1-3]Anise seed contains volatile oil, fixed oil, proteins, mucilage and starch. Essential oil of Anee seeds contains eugenol trans-anethole, anisaldehydeestragole, coumarins, scopoletin, umbelliferon, estrolterpene hydrocarbons polyenes and polyacetylenes, methyl chavicolanisaldehyde. Aniseeds contain 1.5–5% essential oil and used as flavouring, digestive, carminative, and relief of gastrointestinal spasms. Consumption of aniseed in lactating women increases milk and also reliefs their infants from gastrointestinal problems. Anise seeds are used as analgesic in migraine and also as carminative, aromatic, disinfectant, and diuretic in traditional medicine [4]. Aniseed has warm and dry nature and can increase milk production, menstruation, urine, and sweat secretion and also making good complexion. It is also effective in polishing of teeth. In some traditional texts, anise is mentioned for melancholy, nightmare, and also in treatment of epilepsy and seizure. Aniseed or anise essential oil is derived from anise or aniseed. More often than not, this oil is confused with star anise essential oil but that oil comes from star anise plant, scientifically known as Illicum verum. The plant is prevalent in the Mediterranean regions and it undoubtedly has a long historical record. In fact, it was introduced to northern Europe by the Romans after they discovered that the aniseed herb could be used as a digestive, specifically added to cakes which contained other digestive seeds like cumin and fennel, eaten after meals. Early settlers brought it to North America. Its essential oil possesses a very distinctive aroma that resembles that of black licorice and it is widely known for its digestive benefits. However, aniseed oil also contains other potent health benefits. [4-7]

CONTACT *Corresponding author: *gcacs60@gmail.com*
Color versions of one or more of the figures in this article can be found online at www.stenvironment.org

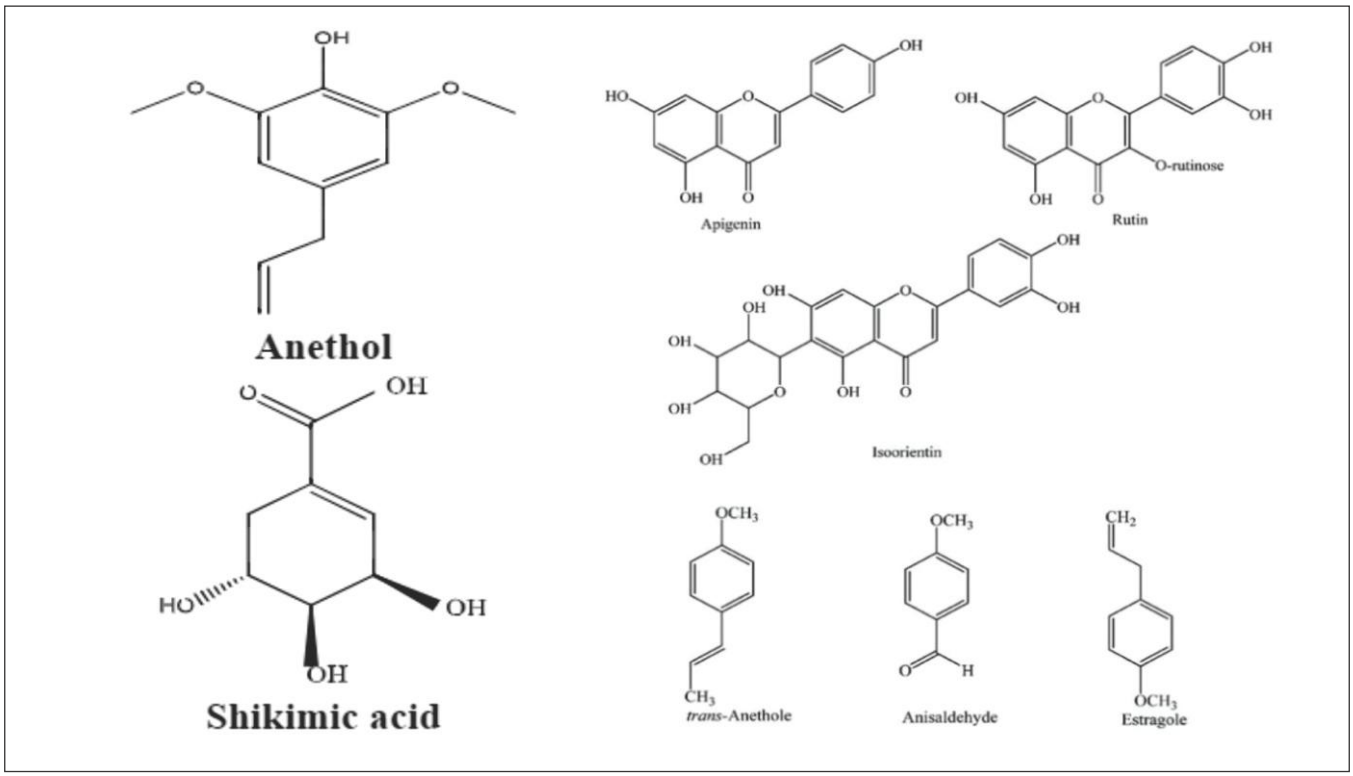

Figure 1: Chemical structures of aniseed constituents.

Chemical Constituents

The chemical constituents of aniseed extract obtained by Supercritical extraction using CO_2 were determined by GC-MS. The major compounds were anethole (~90%), γ-himachalene (2−4%), p-anisaldehyde (<1%), methylchavicol (0.9−1.5%), cis-pseudoisoeugenyl 2-methylbutyrate (~3%), and trans-pseudoisoeugenyl 2-methylbutyrate (~1.3%). A new terpene hydrocarbon called neophytadiene was isolated from aniseed. 4-(β-D - glucopyranosyloxy) benzoic acid which is one of the phenolic glycosides of the Umbelliferae family was also isolated from aniseed. Four aromatic compound glucosides, an alkyl glucoside, and a glucide were isolated as new compounds from the polar portion of methanolic extract of anise fruits. The structures of the new compounds were clarified as (E)-3-hydroxy-anethole β-D-glucopyranoside, (E)-10-(2-hydroxy-5-methoxyphenyl) propane β-D-glucopyranoside, 3-hydroxyestragole β-D-glucopyranoside, methyl syringate 4-O-β-D-glucopyranoside, hexane-1,5-diol 1-O-β-D-glucopyranoside, and 1-deoxy-l-erythritol 3-O-β-D-glucopyranoside. Isolation and structure elucidation of flavonoid constituents from anise, caraway, coriander, and fennel by means of chromatography on cellulose columns lead to isolation of quercetin 3-glucuronide, rutin, luteolin 7-glucoside, isoorientin, and isovitexin as crystalline compounds and apigenin 7-glucoside and a luteolin glycoside as noncrystalline compounds from anise. Pectin substances isolated from the Pimpinella anisum herbs, was found that pectin substances are practically not toxic and exhibit pronounced laxative effect. Water Soluble polysaccharide Compounds isolated from the Pimpinella anisum herbs contain two monosaccharides - glucose and ramnose. [8-11]

Figure 2: Anise plant and inflorescence.

Pharmacological aspects

Anise is used in folk medicine in many countries for treatment of digestive, respiratory and neurological diseases, as well as natural estrogen. It has been found recently to have anti-cancer, antioxidant and antimicrobial properties, and in many countries anise is included in the pharmacopeias as the official drug. Anise is generally recommended as a carminative, digestive agent and improves the regulation of digestion. Experiments showed that anise, in combination with other plants is a safe and efficient alternative therapy for chronic constipation. Also, it was found that anise increases the secretion of salivary glands leading to an increase of pH in the mouth. Furthermore, it can be used for mechanically rinsing the oral cavity, thereby removing dental plaque. Apart from possessing antibacterial activity, anise is effective in the suppression of bacteria which cause dental caries. Anise fruit extract significantly decreases the gastric acid secretion and acidity and thereby inhibits the formation of ulcers in the stomach. Additionally, it possesses anti-diabetic activity, i.e. anise significantly increases glucose absorption in the small intestine, while having no effect on the amount of the water absorbed from the colon. In addition, anise significantly reduces the diuresis. [12-14]The introduction of anise in the diet ensures that the glucose is available to cells and that water is conserved in the body thus preventing dehydration. In many countries, anise is recommended for the treatment of the respiratory tract. Experiments have shown the bronchodilatory and anti-inflammatory effect of anise, thus confirming its effectiveness in the treatment of bronchial asthma. Also, anise is used throughout the world in the treatment of neurological diseases. Studies have found that the plant works as an antiepileptic and as an analgesic. Anise is a herb that has been used for centuries as an estrogenic agent. In women with symptoms of primary dysmenorrhoea the application of anise leads to a reduction of the bleeding period and menstrual pain. In postmenopausal women it effectively reduces hot flashes. In addition, anise acts preventively on osteoporosis caused by estrogen deficiency as it retains calcium in the bones. By using modern scientific methods it has been found that the reactive oxygen species cause oxidative damage to biomolecules, which as a result form many acute and chronic diseases such as atherosclerosis, cancer, aging, neurodegenerative diseases, diabetes, myocardial infarction, apoplexy, chronic inflammation, etc. Anise shows high antioxidant activity. Furthermore, it can be classified as a food for prevention and treatment of cancer, because it was found to have cytostatic activity on human prostate cancer cells and is safe for normal cells. [15-16]Numerous studies found a wide range of anise effects on microorganisms. It works on bacteria as gram positive and gram-negative, which indicates a high antibacterial potential of this plant, especially if we take into account production costs, availability and efficiency. It can be concluded that the extract is effective and inexpensive alternative to synthetic antibiotics. Additionally, in contrast to synthetic antibiotics, bacteria do not develop resistance to phytochemicals. A large number of fungi on which the anise essential oil has antifungal effects are confirmed. The same effect was observed on viruses such as Herpes simplex virus, cytomegalovirus, measles viruses and amoebas (Entamoebahistolytica) that cause dysentery. All this classifies anise as a functional food against infectious diseases. [17-19]

Traditional benefits of Anise seed products

Anise seed as well its oil has discovered application in several traditional medications because of their exclusive health endorsing as well as disease stopping functions. A concoction of seeds in hot water is used as a carminative, antiseptic, diuretic, digestive and a folk remedy to insomnia and constipation. Furthermore, several therapeutic effects including those on digestive disorders, gynecologic, and also anticonvulsant, anti-asthma and dyspnea have been described for the seeds of Pimpinella anisum. Stir a teaspoon of crushed anise seeds in the cup of boiling water. Steep for Ten minutes. Drink the tea after having a huge meal. Furthermore the tea relax you, anise helps digestion of food, puts a stop to indigestion and contains an anti-flatulence agent. Use the essential oil of anise just as one expectorant. The oil behaves as a decongestant simply by favorably affecting secretory cells within the respiratory system. Anise can also be frequently present in cough syrups as well as cough drops because of its anti-microbial qualities. [17-18] Add anise seeds within sweet foods just like pastries, cakes as well as cookies. The moderate liquorice taste boosts the sweetness. In cooking, mix anise along with cinnamon. Their tastes enhance one another. The fairly sweet, powerful odor attracts fish. Combine anise along with coriander, fennel seed as well as sugared vodka. It seems sensible a fairly sweet liqueur known as anisette. Anise preparations are a fantastic treatment for asthma, bronchitis cough in addition to digestive complaints just like flatulence, bloating, colicky stomach pain, nausea as well as indigestion. The essential oil includes 75 – 90% anethole that has a noticed estrogenic effect. The decoction extracted from the seeds frequently is recommended within the breastfeeding mothers to enhance breast-milk manufacturing. Anise seed water is extremely useful in reducing running nose symptom in babies. The seeds usually are chewed right after a meal in India to invigorate the breath. [19-20]

Culinary uses

Aniseed has similar uses to that of fennel seeds but is a popular option for making sweet dishes such as smoothies, desserts, cookies, cakes and drinks. Anise is the preferred spice used to add liquorice flavour to candy and liqueur. Anise is used widely as a flavouring for dairy products, gelatins, puddings, meats, and candies. Both Fennel seeds and Aniseed spice is used as breath fresheners. Anise seeds, oil and also fresh young foliage is utilized in cooking. The taste is increased by dry-frying the seeds. Anise is utilized in delicious as well as fairly sweet dishes in which it imparts sweet-aromatic taste to number of foods. The entire seeds as well as often-times newly grounded powder included with the recipes in the last moment to restrict the evaporation of essential volatile oils inside them. This sensitive spice is now being utilized as flavoring base for soups, sauces, breads, cakes, biscuits as well as confectionary. Popular aniseed

flavor drinks consist of prenod, frenchpastis, spanishojen etc. Anise seeds along with its oil have been around in use in the preparation of sweet dishes in several Parts of Asia. It is utilized like a flavoring base within the preparation of herbal tea; along with liquor known as anisette. Star anise (bajiao) is probably the most significant spices in Chinese cuisine, and it's also the dominating flavor in Chinese five-spice powder together with cloves, cinnamon, huajiao (Sichuan pepper) and ground fennel seeds. In the food industry, anise is used as flavoring and aromatic agent for fish products, ice cream, sweets, and gums.

Conclusion

Pimpinella anisum is one of the medicinal plants which have been used for different purposes in traditional medicine of Iran. So far, different studies were performed on the extracts and essential oil of *Pimpinella anisum* to identify the chemical compounds and pharmacological properties of this plant, and various properties such as antimicrobial, antifungal, antiviral, antioxidant, and insecticidal effects have been reported of aniseeds. The findings also revealed that aniseeds can cause gastric protection, muscle relaxant, and affect digestive system. In diabetic patients, it has hypoglycemic and hypolipidemic effects and reduces lipid peroxidation. Aniseed also has beneficial effects on dysmenorrhea and menopausal hot flashes in women. The most important compounds of aniseeds essential oil were *trans*-anethole, estragole, *γ*-hymachalen, *p*-anisaldehyde, and methyl chavicol.

References

1. **Ahmad, A.F. and Youssef, M.S**. Chemical composition and bioactive properties of *Illicium verum* (star-anise) extracts prepared by different methods. *Journal of Chemical, Biological and Physical Sciences* (JCBPS), 2015, 5(2), 1160-1170.
2. **Shojaii, A. and Abdollahi Fard, M**. Review of pharmacological properties and chemical constituents of *Pimpinella anisum*. *International Scholarly Research Notices Pharm*, 2012. doi: 10.5402/2012/510795.
3. **Özcan MM, Chalchat JC.** Chemical composition and antifungal effect of anise (*Pimpinella anisum* L.) fruit oil at ripening stage. *Annals Microbiol.* 2006; 56(4): 353–358.
4. **Gulcin I, Oktay M, Kirecci E, Kufrevioglu OI**. Screening of antioxidant and antimicrobial activities of anise (*Pimpinella anisum* L.) seed extracts. Food Chem. 2003;83(3):371–382.
5. **Orav A, Raal A, Arak E.** Essential oil composition of *Pimpinella anisum L.* fruits from various European countries. Nat Prod Res. 2008; 22(3): 227–232.
6. **Embong MB, Hadziyev D, Molnar S.** Essential oils from spices grown in Alberta. Anise oil (Pimpinellaanisum) *Canadian J Plant Sci.* 1997; 57:681–688.
7. **Rodrigues VM, Rosa PTV, Marques MOM, Petenate AJ, Meireles MAA**. Supercritical extraction of essential oil from aniseed (*Pimpinella anisum* L) using CO_2: solubility, kinetics, and composition data. *JAgri Food Chem*. 2003; 51(6):1518–1523.
8. **Burkhardt G, Reichling J, Martin R, Becker H.** Terpene hydrocarbons in *Pimpinella anisum* L. PharmaceutischWeekblad. 1986;8(3):190–193.
9. **Dirks U, Herrmann K.** 4-(β-d-glucopyranosyloxy) benzoic acid, a characteristic phenolic constituent of the Apiaceae. *Phytochem*. 1984;23(8):1811–1812.
10. **Fujimatu E, Ishikawa T, Kitajima J.** Aromatic compound glucosides, alkyl glucoside and glucide from the fruit of anise. *Phytochem*. 2003;63(5):609–616.
11. **Kunzemann J, Herrmann K.** Isolation and identification of flavon(ol)-O-glycosides in caraway (Carumcarvi L.), fennel (Foeniculumvulgare Mill.), anise (*Pimpinella anisum* L.), and coriander (Coriandrumsativum L.), and of flavon-C-glycosides in anise—I. Phenolics of spices. Zeitschriftfür Lebensmittel- Untersuchung und Forschung. 1977;164(3):194–200.
12. **Singh G, Kapoor IPS, Singh P, Heluani** CSD, Catalan CAN. Chemical composition and antioxidant potential of essential oil and oleoresins from anise seeds *(Pimpinellaanisum L.) Int J Essen Oil Therapeut.* 2008;2(3):122–130.
13. **Rajeshwari CU, Abirami M, Andallu B.** *In vitro* and in vivo antioxidant potential of aniseeds (*Pimpinella anisum) Asian JExpBiol Sci*. 2011;2(1):80–89.
14. **Kosalec I, Pepeljnjak S, Kustrak D.** Antifungal activity of fluid extract and essential oil from anise fruits (*Pimpinella anisum* L., Apiaceae). PubMed. 2005; 55(4):508-515.
15. **Ansari S, Musarrat M , Patel MF, Ara J , Khan TS , ShaikhS, Salar S.** Review of Anisoon (Pimpinella anisum Linn.) with Unani perspectives and modern

pharmacological uses. *Indian Journal of Unani Med.* 2021;XIV(2):135-141 https://doi.org/ 10.53390/ijum.v14.i2.11.

16. **Woźniak KS, Walasek M, Ludwiczuk A, Głowniak K.** Isolation of terpenoids from *Pimpinella anisum* essential oil by high-performance counter-current chromatography. *J Sep Sci.* 2013;36(16):2611-2614 https://doi.org/10.1002/jssc.201300407 20.
17. **Kolisnyk S, Khanin V, Umarov U, Ugli A, Koretnik O.** Study of the monosaccharide composition of water-soluble polysaccharide complexes and pectic substances of Pimpinellaanisum herbs. *Sci Rise Pharmaceut Sci*.2020;3 (25), 33–38. doi: https://doi.org/10.15587/2519-4852.2020.2067.
18. **Acimovic M, Dojcinovic N.** A review of pharmacological properties of anise (Pimpinella anisum L.). Lekovite Sirovine. 2014; 34(34):3-17. doi: 10.5937/leksir1434003A.
19. **Özcan MM, Chalchat JC**. Chemical composition and antifungal effect of anise (*Pimpinella anisum* L.) fruit oil at ripening stage. *Annals of Microbiol*. 2006; 56(4): 353–358.
20. **Gulcin I, Oktay M, Kirecci E, Kufrevioglu OI**. Screening of antioxidant and antimicrobial activities of anise (*Pimpinella anisum* L.) seed extracts. *Food Chem*. 2003;83(3):371–382.

SAVE THE ENVIRONMENT (STE) was founded and registered on 19th November 1990. In 1992 with the collaboration of WWF (India), the organization started working to combat arsenic poisoning problem of water in the arsenic prone areas of West Bengal. Since then STE has been involved in various projects related to combat arsenic problem in India.

Our Vision
To protect present and future generations from various environmental hazards.

Our Mission
To create awareness and motivation among rural communities & provide cost effective, energy efficient & environment friendly technologies.

Our Activities
Conducting interactive sessions, workshops/ seminars, awareness programs, field operations through projects, science fairs, posters & quiz competitions.

Please join us and become part of our family
by enrolling yourself as Life Member of STE Family

Mail us at
info@stenvironment.org
save1990env@yahoo.co.in

Know about us at
www.stenvironment.org