Foeniculum vulgare

TAXONOMICAL CLASSIFICATION:[1]

- *Kingdom: Plantae*
- *Phylum: Spermatophyta*
- *Subphylum: Angiospermae*
- *Class: Dicotyledonae*
- *Order: Apiales*
- *Family: Apiaceae*
- *Genus: Foeniculum*
- *Species: Foeniculum vulgare*

INTRODUCTION:[2,3]

Foeniculum vulgare Mill. is a biennial medicinal and aromatic plant belonging to the family Apiaceae (Umbelliferaceae). It is a hardy, perennial–umbelliferous herb with yellow flowers and feathery leaves. Fennel was endemic to Mediterranean and European countries but is now broadly distributed in the world's tropical and temperate areas and therefore it is extensively grown. Fennel is a famous and very economical medicinal plant in China. Fennel grows wild through naturalization and cultivation in the eastern, western and northern hemispheres, especially in Asia, Europe and North America. Fennel grows throughout India, basically in the region of Gujarat, West Bengal, Haryana, Uttar Pradesh and Rajasthan. Fennel plants with bulbous leaves and yellow flowers are green and white. It is double achene oval shaped, ribbed, which is bluish initially then brownish grey. The crunchy bulb and the fennel plant seeds both have a mild, liquoricelike taste. But seed flowers are more active because of their essential oils. It is a strongly aromatic and spicy herb used in cooking, and is one of the key ingredients of absinthe, along with the similar-tasting anise. Fennel requires cool and dry climatic conditions for its better growth and yield. Dry and cool climatic condition will result in good yield and quality of seeds. The best varieties of Fennel contain 4 to 5% of volatile oil. The primary constituents of volatile oil are 50 to 60% of anethole, a phenolic ester; and 18 to 22% of fenchone, a ketone. Fenchone is chemically a bicyclic monoterpene

which is a colourless liquid and the odour and taste is pungent and camphoraceous. The oil of Fennel has β-pinene, anisic acid, phellandrine, and anisic aldehyde. Fennel also contains about 20% fixed oil and 20% proteins.

PROPERTIES AND USES: [4,5]

- Antibacterial activity
- Antifungal activity
- Antioxidant activity
- Antithrombotic activity
- Anti-inflammatory activity
- Oestrogenic activity
- Hepatoprotective activity
- Antidiabetic activity
- In vitro cytoprotection and antitumour activity
- Acaricidal activity
- Antihirustism activity
- Effect on uterine contraction
- Human liver cytochrome P450 3A4 inhibitory activity
- Anti-viral Activity
- Anti-Anxiety Activity
- Anti-hirustism activity
- Gastro-Protective activity
- Anti-Cancer activity
- Memory-Protective Activity

SIDE EFFECTS OF EXCESS CONSUMPTION:[6]

- Ifficulty breathing
- Tightness of chest/throat
- chest pain

- nausea
- Vomiting
- hives
- rash
- Itchy or swollen skin
- Mild increase in menstrual flow
- Sun sensitivity
- Seizures

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DOSAGE: [7]

Fennel seed and fennel seed oil have been used as stimulant and carminative agents in doses of 5 to 7 g and 0.1 to 0.6 mL, respectively.

RESEARCH:

1. The aim of the study was to evaluate the chemical composition and antibacterial activity of essential oil of Foeniculum vulgare against Escherichia coli O157:H7 and Staphylococcus aureus, Gas chromatography mass spectrometry was done to specify chemical composion. As a screen test to detect antibacterial properties of the essential oil, agar disk and agar well diffusion methods were employed. Macrobroth tube test was performed to determinate MIC. The results indicated that the most substance found in F. vulgare essential oil was Trans-anethole (47.41 %), also the essential oil of F. vulgare with 0.007 g/ml concentration has prevented E. coli and with 0.003 g/ml concentration has prevented S. aureus, from the growth. Thus, the research represents the antibacterial effects of the medical herb on E. coli and S. aureus. We believe that the article provide support to the antibacterial properties of the essential oil. The results indicate the fact that the essential oil of F. vulgare can be useful as medicinal or preservatives composition. Fractionation and characterization of active molecules will be the future work to investigate. [9]
2. In this study, biological properties of the essential oil isolated from seeds of *Foeniculum vulgare* (*F. vulgare*) were evaluated. GC-MS analysis revealed Trans-Anethole (80.63%), L-

Fenchone (11.57%), Estragole (3.67%) and Limonene (2.68%) were the major compounds of the essential oil. Antibacterial activity of the essential oil against nine Gram-positive and Gram-negative strains was studied using disc diffusion and micro-well dilution assays. Essential oil exhibited the antibacterial activity against three Gram-negative strains of *Pseudomonas aeruginosa*, *Escherichia coli*, and *Shigella dysenteriae*. The preliminary study on toxicity of seed oil was performed using Brine Shrimp lethality test (BSLT). Results indicated the high toxicity effect of essential oil (LC50 = 10 µg/mL). *In vitro* anticancer activity of seed oil was investigated against human breast cancer (MDA-Mb) and cervical epithelioid carcinoma (Hela) cell lines by MTT assay. Results showed the seed oil behave as a very potent anticancer agent with IC50 of lower than 10 µg/mL in both cases. [10]

3. In the present work the main component of the oil, anethole, tested in guinea pig plasma was as potent as fennel oil in inhibiting arachidonic acid-, collagen-, ADP- and U46619-induced aggregation (IC_{50} from 4 to 147 µg ml^{-1}). It also prevented thrombin-induced clot retraction at concentrations similar to fennel oil. The essential oil and anethole, tested in rat aorta with or without endothelium, displayed comparable NO-independent vasorelaxant activity at antiplatelet concentrations which have been proved to be free from cytotoxic effects *in vitro*. *In vivo*, both *F. vulgare* essential oil and anethole orally administered in a subacute treatment to mice (30 mg kg^{-1} day^{-1} for 5 days) showed significant antithrombotic activity preventing the paralysis induced by collagen-epinephrine intravenous injection (70% and 83% protection, respectively). At the antithrombotic dosage they were free from prohemorrhagic side effect at variance with acetylsalicylic acid used as reference drug. Furthermore, both *F. vulgare* essential oil and anethole (100 mg kg^{-1} oral administration) provided significant protection toward ethanol induced gastric lesions in rats. In conclusion, these results demonstrate for *F. vulgare* essential oil, and its main component anethole, a safe antithrombotic activity that seems due to their broad spectrum antiplatelet activity, clot destabilizing effect and vasorelaxant action. [11]

PRECAUTIONS & WARNINGS: [8]

Pregnancy: There isn't enough reliable information to know if fennel is safe to use when pregnant. Stay on the safe side and avoid use.

Breast-feeding: Fennel is **POSSIBLY UNSAFE**. It has been reported that two breast-feeding infants had damage to their nervous systems after their mothers drank herbal tea containing fennel.

Children: Fennel is **POSSIBLY SAFE** when used at appropriate doses in young infants for colic for up to one week.

Allergy to celery, carrot or mugwort: Fennel might cause an allergic reaction in people who are sensitive to these plants.

INTERACTION: [7]

Birth control pills (Contraceptive drugs) Interaction Rating: **Moderate** Be cautious with this combination.Talk with your health provider.

Some birth control pills contain estrogen. Fennel might have some of the same effects as estrogen. But fennel isn't as strong as the estrogen in birth control pills. Taking fennel along with birth control pills might decrease the effectiveness of birth control pills. If you take birth control pills along with fennel, use an additional form of birth control such as a condom.

Some birth control pills include ethinyl estradiol and levonorgestrel (Triphasil), ethinyl estradiol and norethindrone (Ortho-Novum 1/35, Ortho-Novum 7/7/7), and others.

Ciprofloxacin (Cipro) Interaction Rating: **Moderate** Be cautious with this combination.Talk with your health provider.

Ciprofloxacin (Cipro) is an antibiotic. Fennel might decrease how much ciprofloxacin (Cipro) the body absorbs. Taking fennel along with ciprofloxacin (Cipro) might decrease the effectiveness of ciprofloxacin (Cipro). To avoid this interaction, take fennel at least one hour after ciprofloxacin (Cipro).

EstrogensInteraction Rating: **Moderate** Be cautious with this combination.Talk with your health provider.

Large amounts of fennel might have some of the same effects as estrogen. But fennel isn't as strong as estrogen pills. Taking fennel along with estrogen pills might decrease the effects of estrogen pills.

Some estrogen pills include conjugated equine estrogens (Premarin), ethinyl estradiol, estradiol, and others.

Medications that slow blood clotting (Anticoagulant / Antiplatelet drugs) Interaction Rating: **Moderate** Be cautious with this combination.Talk with your health provider.

Fennel might slow blood clotting. Taking fennel along with medications that also slow clotting might increase the chances of bruising and bleeding.

Some medications that slow blood clotting include aspirin, clopidogrel (Plavix), dalteparin (Fragmin), enoxaparin (Lovenox), heparin, ticlopidine (Ticlid), warfarin (Coumadin), and others.

Tamoxifen (Nolvadex) Interaction Rating: **Moderate** Be cautious with this combination.Talk with your health provider.

Some types of cancer are affected by hormones in the body. Estrogen-sensitive cancers are cancers that are affected by estrogen levels in the body. Tamoxifen (Nolvadex) is used to help treat and prevent these types of cancer. Fennel seems to also affect estrogen levels in the body. Taking fennel along with tamoxifen might decrease the effectiveness of tamoxifen (Nolvadex). Do not take fennel if you are taking tamoxifen (Nolvadex).

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