

Pharmacological review on *foeniculum vulgare*

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Abstract

Foeniculum vulgare usually called fennel has been used in traditional medicine for a wide range of ailments related to digestive, endocrine, reproductive, and respiratory systems. In Ayurvedic and other traditional medicinal practices the herbal plant has been used against diseases like arthritis, irritable bowel and it will increase urine flow, improves digestive system, and improves milk flow. Different pharmacological experiments in a number of *in vitro* and *in vivo* models have convincingly demonstrated the ability of *Foeniculum vulgare* to exhibit antioxidant, antifungal, antithrombotic antibacterial, and hepatoprotective activities, lending support to the rationale behind several of its therapeutic uses. The present review aim is detailed study of the literature on various traditional uses, phytochemical and pharmacological properties of *Foeniculum vulgare*.

Keywords: *foeniculum vulgare*, hepatoprotective, antifungal, antibacterial, antioxidant, antithrombotic

1. Introduction

The use of herbs to treat disease has been common since very old times. Also the use of medicinal plants unlike parts is common in community health. Using natural remedies and medicinal plant medicines is helpful cost-effective method for treating diseases [1, 2]. Now medicinal herbs are excellent alternative to chemical drugs, one of the major reason for this is short side effect compare to chemical drugs [3, 4]. Plants have all time played a vital role in the health and treatment of human society [5]. Medicinal herbs have less side effects than synthetic drugs and due to their antioxidant property they reduce drugs toxicity [6, 7]. Also, the natural effective ingredients cause biological balance and prevent drug accumulation in body [8]. So herbal plants can be used in the treatment of different diseases [9] from 422 000 flowering plants around the world, more than 5000 ones are used for medicinal purposes. Among these herbs can point to *Foeniculum vulgare* Mill which is of more importance and is used in the pharmaceutical, food, cosmetic and healthcare industries [10]. Fennel is one of the ancient spice plants which widely grows in arid and semi-arid and due to its economic significance and pharmaceutical industry practice, it is one of the world's mainly dimension medicinal herb [11]. Fennel has anti-inflammatory, antispasmodic, antiseptic, carminative, diuretic and analgesic effect and is effective in gastrointestinal disorder treatment. It have anti-ulcer and anti-oxidant properties it is used to treat neurological disorders [12, 13]. According to medicinal significance the aim of the present study was to evaluate the phytochemical characteristics, and therapeutic properties of *Foeniculum vulgare*.

1.1 Description

Size- *Foeniculum vulgare* is upto 2 meters in height bearing alternative leaves, branched stems and narrowed leaflets. Fruits are 6-10mm in length and 1-4mm in diameter. Fruits of fennel are greenish incolor and have an oblong cremocarp. Fruits have glabrous mericarp which are dorsally compressed and have semi cylindrical shape. Flowers of fennel are yellow in color and seeds are of concave shape [14].

1.2 Synonyms

Foeniculum azoricum Mill *A. rupestre* Salisb, *Anethum foeniculum* Clairv, *A. foeniculum* L., *Feniculum commune* Bubani, *F. capillaceum* Gilib, *F. dulce* DC, *F. foeniculum* (L.) H. Karst, *F. officinale*

1.3 Morphological Characteristic

1. **Odor:** characteristic, aromatic in nature.
2. **Taste:** Sweet to bitter [14].

1.4 Pharmacological activity

i) Antidiabetic activity

Abou N *et al.*, (2011) carried out antidiabetic activity of *Foeniculum vulgare*. Fennel was traditionally reported to be highly recommended for diabetics. The essential oil which is present in *Foeniculum vulgare* possesses to exhibit an antidiabetic effect in Streptozotocin Induced diabetic Rats. In this study rats were divided into 3 groups 10 rats in each group. Group I was taken as normal control and group II was taken as diabetic control. Group III in which diabetic rats received *Foeniculum vulgare* Mill essential oil (30 mg/kg bw orally). The dose was selected according to the LD50. The results has been reported the marked improvements of hyperglycemia and pathological changes induced by streptozotocin after *Foeniculum vulgare* ingestion which can prove its effect as antidiabetic in folk Medicine. A protective effect was obtained by using *Foeniculum vulgare* Mill essential oil to diabetic rats [15].

ii) Antioxidant activity

Singh G *et al.*, (2006) carried out antioxidant activity of *Foeniculum vulgare* using acetonic extract prepared by soxhlet extraction. Gas chromatography (GC) and Gas chromatography- Mass spectroscopy (GC-MS) were used for the chemical analysis of the fennel. These techniques showed the presence of 35 components in volatile oils of *Foeniculum vulgare*. Trans-anethole was the major component. Acetonic extract showed the presence of 9 components. Linoleic acid, oleic acid and palmitic acid were the major components.

Different techniques were used for the evaluation of the anti-oxidant activity such as petriplate method; the volatile oil showed complete zone inhibition against *Aspergillus niger*, *Aspergillus flavus*, *Fusarium graminearum* and *Fusarium moniliforme*. Another technique was food poison technique in which both extract and volatile oils showed good to moderate zone of inhibition [16].

iii) Antifungal activity

Singh G *et al.*, (2006) carried out the antifungal activity of *Foeniculum vulgare*. The fennel essential oil and its seed extracts have been reported to exhibit anticandidal activity. The essential oil of *F. vulgare* have been reported to show complete zone of inhibition against *Aspergillus niger*, *Aspergillus flavus*, *Fusarium graminearum* and *Fusarium moniliforme* [16].

iv) Antimicrobial activity

Mahady GB *et al.*; (2000) carried out the anti-microbial activity using methanolic extract of the fruits of *Foeniculum vulgare* which inhibited the growth of *Helicobacter pylori* in vitro, in this the minimum inhibitory concentration of 50.0µg/ml [17].

Janseen AM *et al.* (1986) carried out the evaluation of this activity by using an essential oil obtained from the fruits inhibited the growth of *Candida albicans*, *Escherichia coli*, *Lentinus lepideus*, *Lenzites trabea*, *Polyporus versicolor*, *Staphylococcus aureus* and *Kloeckera apiculata*, *Rhodotorula rubra* and *Torulopsis glabrata* in vitro. Izzo AA *et al.* (1995) investigated this activity by using another extract, the ethyl acetate extract of the seeds which also inhibited the growth of some microbes [16].

v) Anti-inflammatory activity

Anti-inflammatory activity of the pharmacological effects of fennel plant, anti-inflammatory activity can be noted. Research has shown that the methanol extract of fennel has anti-inflammatory effects. Oral administration of 200 mg per kg of methanol extract of fennel fruit shows inhibitory effects on acute and subacute inflammatory diseases and type 4 allergic reactions. In addition, it decreased the activities of superoxide dismutase (SOD) and catalase (CAT). It also significantly increased plasma levels of HDL cholesterol. In contrast, it significantly reduced the level of malondialdehyde (MDA) as a measure of lipid peroxidation. These results indicate that the methanol extract of fennel fruit is effective in reducing inflammation [17]. Kataoka *et al.* Studied anti-inflammatory effects of fennel. The results showed that the methanol extract of fennel seeds inhibits inflammation through cyclooxygenase and through lipoxygenase pathways [18, 19]. Also Choi *et al.* evaluated fennel methanol extract anti-inflammatory effects. The results showed that the fennel methanol extract had anti-inflammatory activity dependent on the central and peripheral mechanisms [17].

vi) Gastrointestinal effects

Foeniculum vulgare has been proven to have gastrointestinal effects by Niho Y *et al.*, (1977). Intragastric administration of *Foeniculum vulgare* fruits 24.0 mg/kg bw increased spontaneous gastric motility in unanaesthetized rabbits; at a dose of 25.0 mg/ kg bw the fruits reversed the reduction of gastric motility induced by pentobarbital [20].

vii) Antispasmodic activity

Forster HB *et al.*, (1980) evaluated the antispasmodic activity of *Foeniculum vulgare*. An essential oil which is obtained from the fruits of *Foeniculum vulgare*, 25.0µg/ml and 10.0µg/ml, respectively, inhibited oxytocin- and prostaglandin an essential oil from the fruits reduced intestinal spasms in mouse intestine [21].

2. Conclusion

From the time immemorial the medicinal properties of *Foeniculum vulgare* are available both in written and non-written format as traditional knowledge. In traditional medicines the plant has been used as a treatment option against anxiety, arthritis, water retention, appetite suppressant, amenorrhoea, angina etc. Here we have tried to compile all the available information from both traditional and published scientific literatures regarding the medicinal uses of *Foeniculum vulgare*. It will be helpful for the future researchers to get the information. This will provide tremendous opportunities for planning and conducting research related to various aspects of this medicinal plant.

3. References

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