

Foeniculi fructus (DAB 10), Fennel, Foeniculum (BHP 1983)



1 cm

Fig. 1: Fennel

Description: The drug consists of the 3-12 mm long and 2-4 mm broad yellowish green to yellowish brown mericarps; occasionally, the mericarps are still attached to each other. Often, the remains of the pistil can be seen at the upper end of the stylopod. Each mericarp has 5 straight, projecting ridges which are particularly prominent on the commissural surface (Fig. 3).

Odour: Intensely spicy.

Taste: Aromatic and spicy, somewhat pungent.

Fig. 2: *Foeniculum vulgare* MILL.

A biennial to perennial plant up to 2 m in height. Feathery leaves with narrow, thread-like segments. Double umbels with mostly unequal rays, lacking involucre and sheath; flowers yellowish.



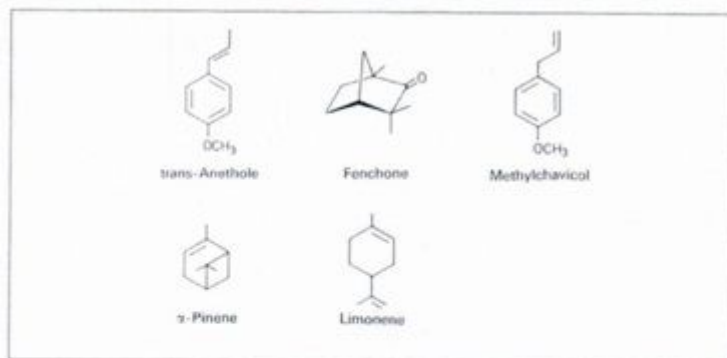
DAB 10: Bitterer Fenchel
ÖAB: Fructus Foeniculi
Ph. Helv. VII: Foeniculi fructus
St.Zul. 5199.99.99

Plant origin: According to the DAB 10 *Foeniculum vulgare* MILL. var. *vulgare* (Apiaceae). The Ph. Helv. VII and ÖAB permit fruits of the two varieties *vulgare* and *dulc-* (MILL.) THILL., and the next volume of the Ph. Eur. and the BHP will have two monographs: one for bitter fennel and one for sweet fennel. The two varieties derive from the cultivated subsp. *capillaceum* (GILL.) HOLMBOE.

Synonyms: Fennel fruit or seed (Engl.), Fenchel, Bitterfenchel (Ger.), Fruit de fenouil, Aneth doux (Fr.).

Origin: Native to the Mediterranean region nowadays, cultivated in Europe, Asia, part of Africa and South America. Imports come from China, Egypt, Bulgaria, Hungary, and Romania.

For the cultural history of fennel, see the summary in [6].



Constituents: 2-6% essential oil, comprising up to 50-70% of the sweetish *trans*-anethole and up to 20% of the bitter and camphoraceous (+)-fenchone. In addition, there are methylchavicol, anisaldehyde, and some terpenoid hydrocarbons, including α -pinene, α -phellandrene, and limonene. In addition, the fruits contain a fixed oil, protein, organic acids, and flavonoids [1, 2]. - About the occurrence of the oestrogens dianethole and dianisoin, see the data under Anisi fructus.

Indications: As a secretomotor, secretolytic, and antiseptic expectorant, as a spasmolytic and carminative in mild digestive disorders [1, 3, 4]; and therefore often added to laxa-

tives to counteract the mild cramps accompanying their use. It is particularly favoured in paediatrics. The *pure essential oil* reinforces inflammation and has an irritant action on the intestinal musculature. Pure fennel oil must not be used for infants or young children because of the danger of laryngeal spasm, dyspnoea, and excitatory states [1]. In *folk medicine*, it is also used as a galactagogue for lactating women and externally as an eye lotion (decoction) and in functional visual disorders [4]. Fennel is also employed as a taste enhancer.

Making the tea: Boiling water is poured over 2-5 g of the drug crushed or stamped

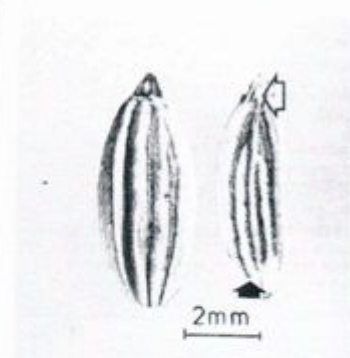


Fig. 3: Mericarp (left, outside surface; right, commissural surface) of *Foeniculum vulgare*, showing the dark secretory canals (vittae) (dark arrow) and carophore (light arrow)

immediately before use, covered, and allowed to stand for 10-15 min. before being passed through a tea strainer.

1 Teaspoon = ca. 2.5 g.

Herbal preparations: The drug is available in tea bags (mostly 2 g); this is pointless, since only very little oil can be extracted from the uncrushed drug. On the other hand, the crushed drug (even in tea bags) rapidly loses its essential oil.

Fennel is also available from various firms in the form of an instant tea.

Phytomedicines: As a component of cough remedies (antitussives, expectorants), stomach and bowel remedies (carminatives, laxatives), especially in paediatrics in the form of

Extract from the German Commission E monograph (BAN: no. 74, dated 18/04/91)

Uses

Dyspeptic complaints, such as mild cramp-like gastrointestinal disorders, a feeling of distension, flatulence.

Catarrh of the upper respiratory tract.

Fennel syrup, fennel honey: catarrh of the upper respiratory tract in children.

Contraindications

Drug for infusions and preparations containing an equivalent amount of the essential oil: None known. Other preparations: Pregnancy.

Side effects

In a few cases, allergic reactions by the skin and the respiratory tract.

Interactions with other remedies

None known.

Dosage

Unless otherwise prescribed: daily dose 5-7 g, fennel syrup or honey (l.r.g. B. 6) 10-20 g, compound fennel tincture (l.r.g. B. 6) 5-7.5 g, preparations correspondingly.

Mode of administration

Powdered drug for infusions, tea-like products, and other galenic formulations for internal use.

Duration of use

Preparations of fennel should not be taken for a prolonged period (several weeks) without consulting a doctor or pharmacist.

Warning: Fennel syrup and fennel honey: Diabetics must bear in mind the sugar content of bread exchange-units (according to the manufacturer's information).

Effects

Promotes gastrointestinal motility, in higher concentrations acts as a spasmolytic. Experimentally, anethole and fenchone have been shown to have a secretolytic action in the respiratory tract; in the frog, aqueous fennel extracts raise the mucociliary activity of the ciliary epithelium.

Wording of the package insert, from the German Standard Licence:

6.1 Uses

Against flatulence and cramp-like pains in the gastrointestinal tract, especially in infants and small children, and to dissolve mucus in the respiratory tract.

6.2 Dosage and Mode of administration

Boiling water (150 ml) is poured over 1-3 teaspoons of crushed **Fennel** and after 5-10 min. passed through a tea strainer.

Unless otherwise prescribed, for gastrointestinal complaints a cupful of the freshly prepared infusion is drunk warm between meals two to four times a day. For infants and young children, the infusion may be used to dilute their milk or pap.

6.3 Note

Store protected from light and moisture.

teas, tea extracts, dragees, sweets, syrups, and juices; it is often combined with other essential-oil-containing drugs, e.g. aniseed.

Regulatory status (UK): General Sales List – Schedule 1, Table A.

Authentication: Macro- (see: Description) and microscopically, following [1]. Note especially: the reticulately thickened and lignified parenchyma of the mesocarp and the 4–8 µm broad and up to 100 µm long "parquetry" cells of the endocarp. See also the BHP 1983 and [7]. The DAB 10 TLC test of identity is as follows:

Test solution: 0.30 g freshly pulverized drug is shaken for 2–3 min. with 5.0 ml dichloromethane and filtered over ca. 2 g anhydrous sodium sulphate.

Reference solution: 3 µl anethole and 5 µl each of anisaldehyde and olive oil dissolved in 1.0 ml dichloromethane.

Loadings: 20 µl test solution and 10 µl reference solution, as 2-cm bands on silica gel GF₂₅₄.

Solvent system: dichloromethane, 10 cm run.

Detection and Evaluation: in UV 254 nm light. After marking the quenching zones, the plate sprayed with ethanolic phosphomolybdate solution and heated at 100–

105 °C while under observation; the still warm layer oversprayed with a freshly and carefully prepared solution of 0.5 g potassium permanganate in 96% sulphuric acid and heated at 100–105 °C, again while under observation for a further 5–10 min.

Reference solution: after the first spray, the anethole and anisaldehyde quenching zones becoming faint bluish grey and brownish yellow, respectively; on heating, the anethole zone (in the upper part of the chromatogram) quickly turning dark blue; between the anethole and anisaldehyde zones, the dark blue triglyceride zone.

Test solution: two dark blue zones corresponding in position, size, and intensity of colour with those of the reference solution; in addition, faint blue zones also visible; after spraying with potassium permanganate/sulphuric acid, the initially pale fenchone zone, directly above the anisaldehyde zone, rapidly becoming dark blue on heating. Particular attention should be paid to the distinct blue-coloured fenchone zone on the chromatogram. It allows the official drug, with a fenchone content of 10–20%, to be differentiated from sweet fennel (not permitted by the DAB 10), which has only ca. 1%.

Quantitative standards: DAB 10; *Volatile oil*, not less than 4.0%. *Foreign matter*, not more than 1.5% umbel rays (peduncles) and not more than 1.5% other foreign matter. *Loss on drying*, not more than 13.0%. *Ash*, not more than 8.0%.

ÖAB: *Volatile oil*, not less than 3.5%. *Foreign matter*, not more than 1%; no large amounts of stout fibres or vessels with wide lumen. *Ash*, not more than 8.0%. Ph. Helv. VII; *Volatile oil*, not less than 2% (and for veterinary purposes, not less than 1.7%). *Foreign matter*, not more than 1% (chiefly peduncles and foreign seeds). *W content*, not more than 7.0%. *Sulphated* not more than 10%.

Adulteration: Rare, but recently fennel ports containing foreign seeds have been counterfeited (millet [*Sorghum species*], wheat, etc.).

Storage: Protected from moisture and light in glass or lead (but not plastic) containers.

Literature:

- [1] Kommentar DAB 10.
- [2] V. Formicek and K.-H. Kubeczka, *Essential oil analysis by capillary gas chromatography and carbon NMR spectroscopy*, J. Wiley, Chichester, 1982.
- [3] R. Hämsel and H. Haas, *Therapie mit Phytotherapeutika*, Springer, Berlin – New York, 1983, 2nd ed., 1991.
- [4] H. Braun and D. Frohne, *Heilpflanzenlexikon: Ärzte und Apotheker*, G. Fischer, Stuttgart – York, 1987.
- [5] P. Pachaly, *Dünnschichtchromatographie in Apotheke*, 2nd ed., Wissenschaftliche Verlagsgesellschaft, Stuttgart, 1983.
- [6] F.-C. Crygan, *Z. Phytotherap.* 8, 82 (1987).
- [7] B.P. Jackson and D.W. Snowdon, *Atlas of medicinal plants, culinary herbs and spices*, Haven Press, London, 1990, p. 98.