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Constituents of two varieties of Indian dill

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Two varieties of Indian dill, *Anethum sowa*, are available. They differ morphologically and have a different oil composition. They have a low dillapiole content (12–15%) and have a high content of carvone-dihydrocarvone (50–64%).

Anethum graveolens and *A. sowa* represent two separate species, yielding the so called European and Indian dill respectively. The former is official in many pharmacopoeias while the latter is not considered a suitable substitute, as it is reported to contain 40 to 50% of a toxic constituent, dillapiole (Adhikari, 1965; Betts, 1969). However, sowa-dill is used extensively in India and is also exported in large amounts (Wallis, 1965).

We have found that in Gujarat two kinds of sowa-dill are available and these have different external characters and oil composition. Our findings for the oil composition differ from earlier reports (Malaviya & Dutt, 1940: Guenther, 1953; Chakravarty & Bhattacharyya, 1954 & Verma, 1960) as well as from the recent findings of Adhikari (1965) and Betts (1969). Except for Chakravarty & Bhattacharyya's (1954) findings of 19% dillapiole, almost all the workers have reported up to 50% dillapiole in Indian dill oil. Of the two kinds examined, one consists mostly of cremocarps and is considered to be superior; it is referred to as *Variyali sowa* (Fennal sowa). It seems to be that described by Wallis (1965) as Indian dill. The other variety, like *A. graveolens*, consists only of separate mericarps and is considered inferior. It is used in veterinary practice and is thus called *Ghoda sowa* (Horse sowa).

MATERIALS AND METHODS

Materials. Samples of sowa-dill were obtained from the local as well as other drug markets of the states of Gujarat, Delhi, Punjab, Maharashtra, Andhra Pradesh, Mysore and Kerala. Except Gujarat state, the samples received were those of Ghoda sowa.

Methods

Extraction of the oil. The apparatus was that described earlier (Schratz & Qadry, 1966) and the extraction time was 5 h.

Thin-layer chromatography. This was used for testing the purity of the separated fractions of the oil and reference substances. Plates were coated with Silica gel G (E. Merck) and activated at 110° for 1 h. Solvent systems used were: benzene–chloroform (50 : 50); light petroleum (b.p. 40–60°)–ethyl acetate (90 : 10) and benzene–methylene chloride (50 : 50). Vanilin–sulphuric acid and anisaldehyde reagents were used as detecting reagents and the spots were viewed in daylight and under ultraviolet light.

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Table 1. *Constituents of the two varieties of Indian dill*

Variety of sowa-dill	Carvone % g.l.c.*	Dihydro-carvone % g.l.c.*	Total carbonyl compounds % titrimetry	Dillapiole % Spectrophoto-metrically	Dillapiole % g.l.c.*	Limonene % g.l.c.*
Variyali sowa	21	43	66	15	13	20
Ghoda sowa	35	15	54	12	12	34

* Uncorrected for differences in detector response.

Dillapiole was present in all the samples and its spot was about $\frac{1}{4}$ of the area of carvone. Carvone and dihydrocarvone had almost the same R_F values and they were subjected to g.l.c. separation.

Ultraviolet spectrophotometric evaluation of dillapiole. The absorbance of dillapiole was measured at 288 in a Beckman DU spectrophotometer. The reference solution of dillapiole for the standard curve as well as the oil samples were prepared in methanol (Analar, BDH). The percentage of dillapiole in both the samples found by this method and by quantitative g.l.c. was in fair agreement (Table 1).

Assay for carvone (carbonyl compounds). Carvone and dihydrocarvone present in the oils were estimated as carvone by the method described in the Indian Pharmacopoeia (1966). The results are in Table 1.

Gas-liquid chromatography. A Packard gas chromatograph fitted with argon ionization detector (500 V) was used. The column consisted of 20% Reoplex 400 on polypropylene glycol adipate; temperature was increased from 50 → 200° at 3°/min; carrier gas, argon, flow rate of 77 ml/min; chart speed 1 inch/5 min. Samples of the oil were diluted in pentane and aliquots of 2 μl were injected. In all, 8 peaks were detected. Only 4 main constituents namely dillapiole, carvone, dihydrocarvone and limonene were identified and estimated. The other components were in traces and together formed about 3–4% of oil. Thymol was found only in Ghoda sowa.

RESULTS AND DISCUSSION

The volatile oil of sowa-dill has been reported to have a carvone-dihydrocarvone content of 20–40% and a dillapiole content of 40–50%. Betts (1969) mentions that in the dillapiole-containing forms of dill that he examined, the carvone content was about half the amount of dillapiole. Our findings were different. In the two varieties we examined dillapiole was present to the extent of 12 to 15%, while the carvone-dihydrocarvone total in one variety was 50% (35% and 15% respectively) and in the other the carvone-dihydrocarvone was 64% (21 and 43% respectively). The lower specific gravity (0·9475 to 0·9523) of the volatile oils also gave indirect evidence of a lower percentage of dillapiole. According to Adhikari (1965), the specific gravity of the sowa-dill oils that he examined was always >1.

Findings that official *Anethum graveolens* also contains dillapiole (Chaudhry, Singh & Handa, 1956; Khafagy & Mnajed, 1968; Baslas & Baslas, 1969) suggest that the samples containing a low percentage of dillapiole and high percentage of carvone-dihydrocarvone may be substituted for *Anethum graveolens*.

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