# A model Apparatus for Isolation of volatile oils from various plant materials

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Abstract

A description is given of apparatus for isolation volatile oils form various parts of plants. The determination of volatlie oil in the agricultural products were made by distilling the materials with water, collecting the distillate in a graduated tube in which the aqueous portion of the distillate is uatomatically separted and returned to the distilling flask, and measuring the volume of the oil. the averaqe percetage of volatile oil content was calculated on dried plant material by volume\weghit (v\w). the concentrate was then examined by gas liquid chromatogaphy.

Volatile oils are the odorus principles found in various plant parts. Because they evaporate when exposed to the air at ordinary temperature, they called volatile oils, ethereal oils or essential oils. volatile oils consists of mixtures of chemical which are often quite complex and vary widely in chemical compoition (1,2,3,4). Several methods were used for isolation or extraction the volatile oils from the plant materials. Distillation was the most common method used by industrial firms: Three types of distilation were used (1) watir distillation is applied to the dried plant material and not subjected to injury by boiling . (2) water and stem distillation is employed for substances either dried or fresh that may may be injured by boiling. (3) direct steam distillation applicable to fresh plant materials (5,6,4). In the perfume industry the solvent extraction method was used for extraction of the volatile Oils by using organic solvent such as petroleum ether or benzen. however, becaus of the high cost involved the extraction process probably will not be adopted by firms producing volatile oil. the establisged distillation method is a low cost operation compared to the extraction process (7,8). Identification of the volatile constituents were carried out by gas liquid chromatography (9,10)

The present paper gives a detailed description of apparatus which were sutable for isolation the lighter and the heavier than water volatile oils from differenet plant materials. Meanwhile the purity of the concentrates were ex mined by gas liquid chromatography(GLC).

## Materials and methods

The equipments and techniques used in this study are shown in fig-

ure (1). weight(20gm) of sample and plcae in one liter flat bottom flask with a magnetic bar for stirring. Added about (300ml) of water and fill the trap with water. the flask was coupled at the lower right joint. place an efficient water-cooled condenser on top of the trap and heat the flask with good stirring until boiling starts and continue boiling moderately briskly but so that the lower part of condenser remains cold. Set the apparatus so that the condensate will not drop directly on the surface of the liquid in the trap but run down the side walls. The distillate volatile oil was collected in a graduated tube in which the agueous portion of the distillate is automatically separated and retuned to the distilling flask. Distil until change in oil content (about three hours). Remove the source of heat and read the volume of oil later after cooling. calculate as dried plant material by volume\weight (v\w). The volatile oils were obtaiined by the above model system from the dried ripe seeds of anise (Piminella anisum. L.) dill (Anethum quaveolent. L.): fennel (Foeniculm capillaceum. Gilib) and ground bark of cinnamon (Cinnamomum zeylaicum). The volatile oils (2 drops) were dissolved in 5 ml petroleum ether, then seprated into its various constituents using a packard 419 gas liquid chomatography (GLC)fitted with dual flame ionization detectors (FID) and 3% silar 10C° glass column (2.1 x 2 mm i.d) packed with 100-120 mesh Gaschrom Q was used . The temperature programme was isothermal at 150C°. The flow rates for the carrier were 30ml/min He and for the detector gases 30ml\min $H_2$ and 300ml\min air, respectively. the detectors and injection ports temperatures were kept at 25C°. volumes of 0.5 µl were injected.

Results and discussion

The main reason for extraction of the volatile oil is to obtaining flavour concentrates for commercial use in food prparations. flavouring from plant material sources can be added to food in the form of concentrations or extracts. Such concentration or extracts were obtained by using our distillation model system. The volatile oils can devided into two classes according to their physical properties. The specific gravity at 25C° of anise, dill and fennel oils was 0.978, 0.953 and 0.890. respectively. Meanwhile the specific gravity of ground bark of cinnamon oil was 1.040. Therefor two different apparatus (Figure 1) were used for extraction the volatile oils. the anise dill and fennel volatile oils were lighter than water so their extraction was carried out by using the apparatus (A). Meanwhile the apparatus (B) was used for extraction the volatile oils of cinnamon. the heavier than water. Table (1) shows the specific gravity at 25C° and the yield of the volatile oils obtained by the distillation apparatus method from the seeds of anise dill fennel and ground bark of cinnamon.

This simple and inexpansive extraction is yield a product of good guality which reguiress no further processing and no further refining or rectifying operations to increase purity. The purity of volatile oils was examined by GLC analysis. The volatile compounds partition themselves between the stationary and mobile phases depending upon their individual affinities for each. The volatile oils are separated and compound arrives at the detector at its own rate. An individual compounds elute from the GLC column, a peack is traced on the chromatogram the area under the peack is proprtional to the amount of material present. Anethol was account up to 90% of the total volatile oils of anise and about 70% of fennel oil. Carvone was the main constituent ofdill oil. While cinnamic aldehyde was the major constituent of cinnamon volatile oil. From our laboratory results on the above model system a semipilot plant was designed to use this technigue with a capacity of 10-20 Kg\batch of plant raw material on dry basis for extraction the volatile oils.

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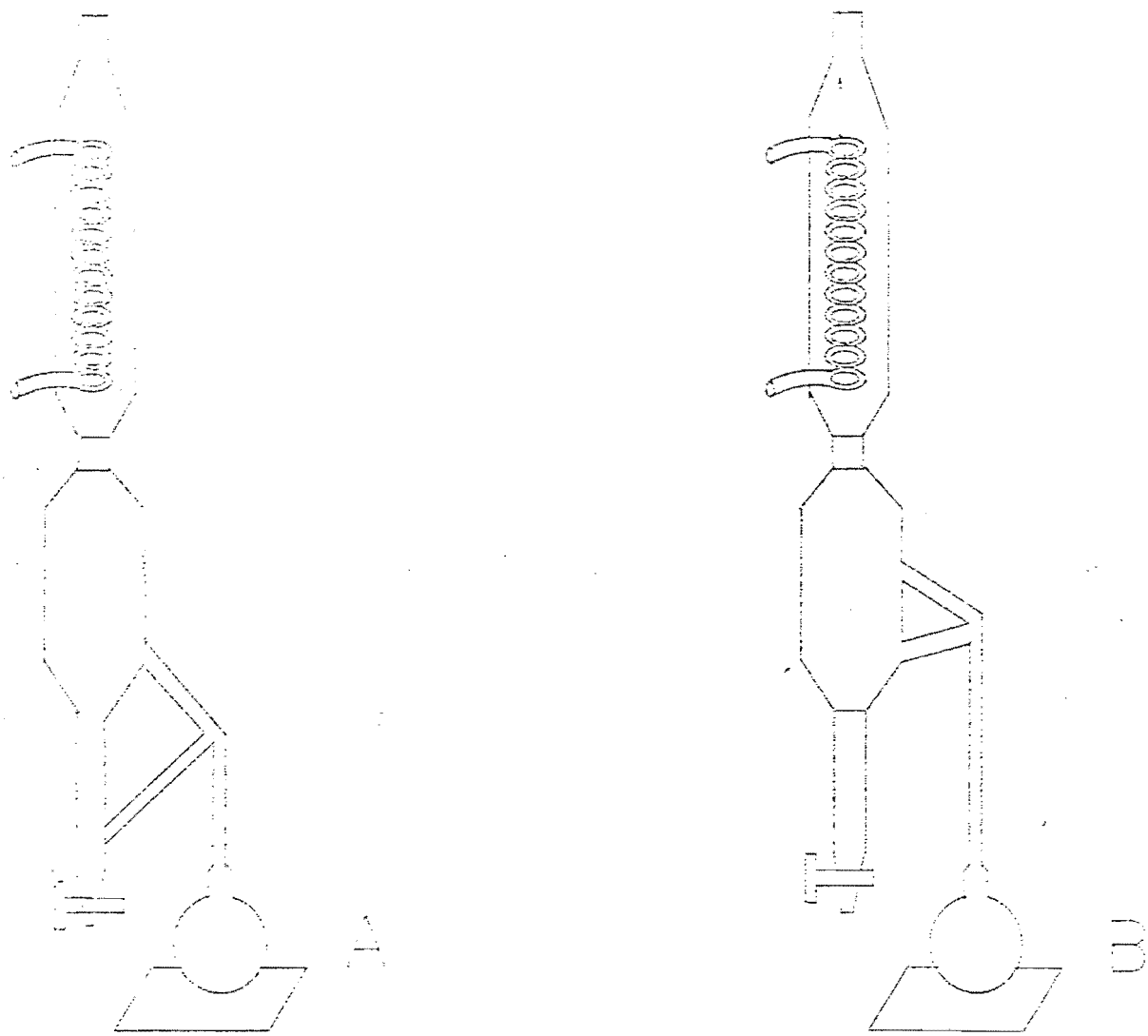


Figure1:module apparatus for isolation of volatile oils

A:—lighter than water B:—heavier than water

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Table (1) : Specific gravity and yield of volatile oils obtained from different plant materials.

| Sample | Specific gravity at 25C° | yield % |
|---|---|---|
| Anise | 0.978 | 2.5 |
| Fennel | 0.953 | 2.2 |
| Dill | 0.890 | 2.0 |
| Cinnamon | 1.040 | 1.5 |

# نموذج لجهاز فصل الزيوت الطيارة من مصادر نباتية مختلفة

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الخلاصة

تم وصف جهاز فصل الزيوت الطيارة من مصادر نباتية مختلفةحيث تم تقديرالزيوت الطيارة في المنتجات الزراعية بواسطة عملية تقطيرها بالماء ثم جمع الزيوت الطيارة في انبوبة خاصة مدرجة مرتبطة في منظومة الاستخلاص والتي بواسطتها يتم استدرجاع الماءالمكثف الى وعاء النموذج. وتم حساب نسبة الزيت الناتجة على اساس الوزن الجاف للنموذج المستخلص منه الزيت وكما تم الكشف عن نقاوة الزيوت الطيارة باستخدام تقنية الكروموتوكراف الغازي.