The Glyceride Structure of Camphor *(Cinnamomum camphora)* Seed Fat[1]

ABSTRACT

The glyceride structure of a specimen of *Cinnamomum camphora* seed fat has been studied using oxidation procedure for determining the trisaturated and the gravimetric azelaoglyceride analysis technique for determining di- and monosaturated glycerides. The fat contains 93% saturated acids and the molecular proportions of tri-, di- and monosaturated and triunsaturated glycerides are found to be 80,17,1 and 2% respectively. The pattern of acyl group distribution is in close agreement with the requirements of Random Distribution, Glyceride Type Distribution Rule, Widest Distribution and the three theories of Gunstone. There is no restriction in synthesis of fully saturated glycerides. The mean position of first double bond in fatty acids suggests the presence of positional isomers.

Cinnamomum camphora (family: Lauraceae), commonly known as the cinnamon tree, camphor, kapur, karpur or karpuram, mostly distributed in Asia and Australia, is cultivated as an ornamental plant and is valued for its product, camphor, which is widely used in medicine. The fruits are dark green, ovoid, 0.3 in diameter, and ripen in October. The seeds yield about 42% yellowish white crystalline aromatic fat melting at 21-23 C with lauric acid as the predominant fatty acid. Because of similarities in properties to coconut oil, it is suitable for soap making (1). Puntambekar (2) and Sekimoto and Hirao (3) have studied some of its characteristics. With a view to studying the validity of various acyl group distribution theories and determining the exact relationship between the contents of trisaturated glycerides and saturated acids, the present communication reports the glyceride structure as determined by gravimetric azelaoglyceride analysis technique (4). Only a few such fats containing predominantly short carbon chain saturated fatty acids have been studied. Kartha (5) has shown that it is possible to assay lauric acid also with reasonable accuracy by the oxidation procedure.

The specimen of fat was Soxhlet extracted from sun-dried seeds using light petroleum ether (bp 40-60 C) and refined as usual. The kernels gave 38.8% yellowish white crystalline aromatic fat melting at 21.5 C, and of iodine value (Hanus) 4.2, acid value 0.4, saponification value 273, Hehner value 91.4, unsaponfiable matter 1.6% and acetyl value (6,7) 3.6. The insoluble acids (iodine value 4.9) amounted to 89.8% on a fat basis. The unesterifiable acids amounted to 9.7%, as determined by esterification with methanolic sulphuric acid. The fat contained no other non fatty acid matter. Mixed fatty acids amounted to 80.1% corresponding to 84.5% triglycerides. The saturated acids as determined by oxidation of fat and Bertram separation of hydrolyzed oxidation products (5) amounted to 93.3% and are of short carbon chain length (mean mol wt 232). The unsaturated acids prepared by lead salt separation were found to have a mean molecular weight of 280-2 indicating that they are exclusively C_{18}. The fat contained 93 mol % saturated acids and 7 mol % unsaturated acids.

The results of glyceride structure are given in Table I. The molecular proportions of trisaturated (GS_3) glycerides [as determined by oxidation (5)], disaturated (GS_2U) and monosaturated (GSU_2) glycerides [by azelaoglyceride analysis technique (4)], and triunsaturated (GU_3) glycerides (by difference) are 80, 17, 1 and 2 respectively. The glyceride type composition is in agreement with the values predicted from Random Distribution (80,19,1 and 0). Since there is no restriction in GS_3 synthesis (GS_3 chance-GS_3 found = nil), the other glyceride types shall also be in chance proportions and hence this fat follows the Glyceride Type Distribution Rule (8). The proportions (79,21, 0 and 0) predicted from Widest Distribution and the three theories of Gunstone (9) are also in agreement within the limits of experimental error and thus the fat follows these theories too.

The mean molecular weight of dibasic acids isolated (10) from insoluble azelaoglycerides is 198, which is substantially different from that of azelaic acid (188), indicating thereby that the mean position of first double bond in fatty acids of this fat is different from $\Delta^{9:10}$ and hence appreciable amounts of positional isomers occur.

ACKNOWLEDGMENT

The Central Silviculturist, Forest Research Institute, Dehradun, supplied the seeds.

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TABLE I

The Glyceride Structure of *Cinnamomum camphora* Seed Fat

Component	Amount
1. Trisaturated (GS_3) glycerides, on fat, wt%	66.3
2. GS_3 on triglycerides, wt%	78.4
3. Apparent azelaoglyceride number	80.8
4. Actual azelaoglyceride number	95.8
5. Saturated acids (S) in azelaoglycerides, %	42.5
6. S in monoazelaoglycerides (GS_2A), %	63.7
7. S in diazelaoglycerides (GSA_2), %	32.5
8. GS_2A, on triglycerides, wt%	16.1
9. GSA_2, on triglycerides, wt%	1.3
10. Per cent monosaturated (GSU_2) glycerides, wt on triglycerides	1.6
11. Per cent disaturated (GS_2U) glycerides, wt on triglycerides	18.2
12. Per cent triunsaturated (GU_3) glycerides, wt on triglycerides (by difference)	1.8
13. GS_3 mol %	80[a]
14. GS_2U mol %	17[a]
15. GSU_2 mol %	1[a]
16. GU_3 mol %	2[a]

[1]Part of author's Ph.D. thesis, Agra University, 1969.

[a]Round numbers.

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[Received April 6, 1971]

Direct Gas Chromatographic Analysis of Volatiles From Raw and Roasted Peanuts

ABSTRACT

Ground samples of raw and roasted peanuts were packed in glass liners and introduced into the heated injection port of a gas chromatograph where the volatiles were vaporized in situ. Chromatograms from ground peanuts are qualitatively similar to those from expressed oil samples. Fourteen compounds were tentatively identified.

Several investigators have used gas chromatographic (GC) profiles for assessing aroma and flavor of various foods and commodities, e.g., raw peanuts (1), roasted peanuts (2,3), cereal grains (4), grapefruit essence (5), apple essence (6) and popcorn (7). In general the isolation and separation of components is tedious and may lead to the formation of artifacts or loss of volatiles (1-3,5,7).

In the course of our investigation into the chemical composition of the volatile fraction of roasted and raw peanuts, the simple and very rapid technique of Dupuy and coworkers (8) was adapted for the GC analysis of peanuts and other foods. Our method is based on the in situ vaporization of the volatiles from peanuts and other food samples which have been inserted directly into the injection port of a gas chromatograph. The technique has been used with good success for assessing raw and roasted peanuts as well as for cabbage, grapefruit rind, meats and tobacco.

A plug of volatile-free glass wool is inserted in the bottom of a glass injection port liner from a gas chromatograph. A sample consisting of a few hundred milligrams or less of ground peanuts or oil is placed on top of the glass wool and backed with additional glass wool. The liner is then inserted into the heated injection port, and the port is sealed with the septum nut. Volatiles flash distil from the sample and are swept onto the GC column. After the chromatographic run has been completed, the liner is easily

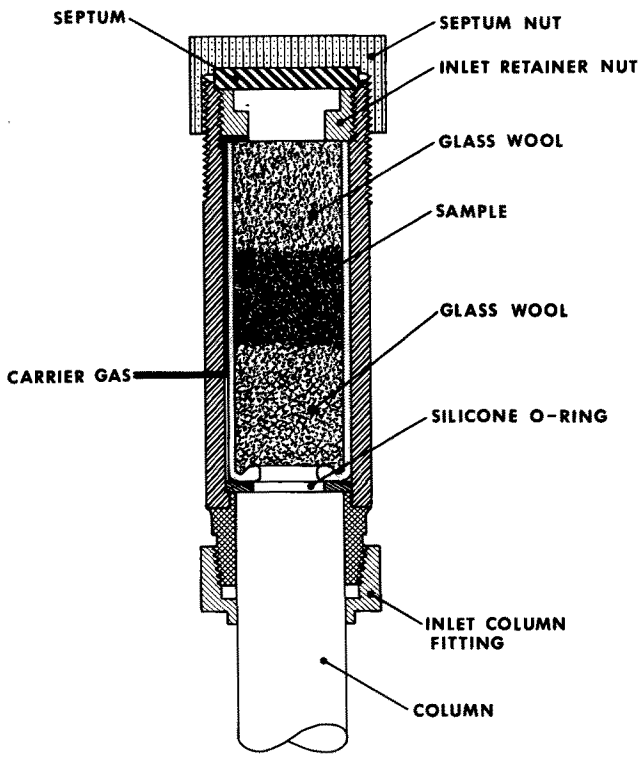

FIG. 1. Schematic diagram showing the injection port liner and peanut sample inserted in the gas chromatogram injection port.

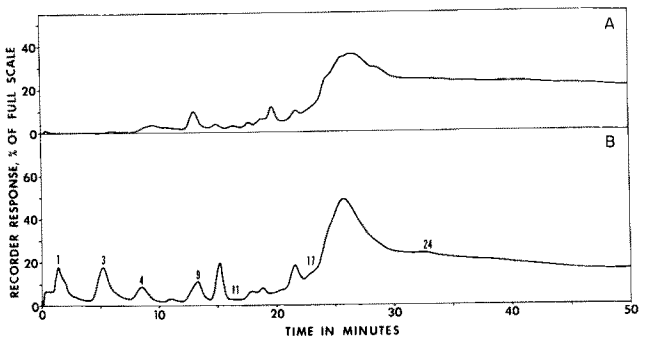

FIG. 2. Gas chromatograms of the volatiles present in raw peanuts and oil expressed from raw peanuts. (A) 200 mg expressed oil; (B) 500 mg whole peanuts. Tentative identifications of peaks: (1) methanol, (3) ethanol, (4) pentane and butanol, (9) pentanal, (11) hexanal and (17) octanal.

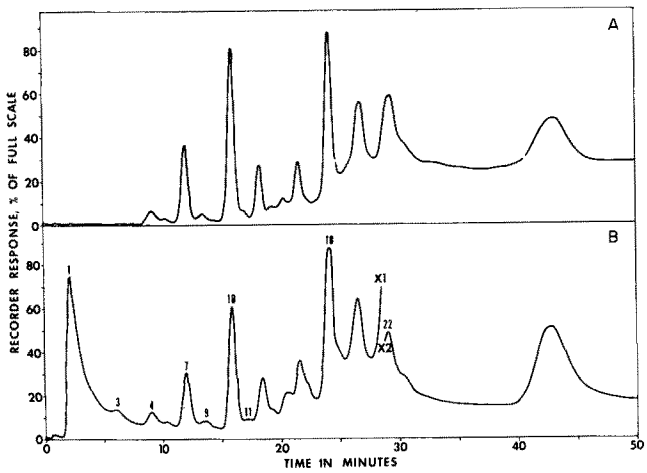

FIG. 3. Gas chromatograms of volatiles present in roasted peanuts and oil expressed from roasted peanuts. (A) 50 mg expressed oil; (B) 100 mg whole peanuts. Tentative identifications of peaks: (1) methanol, (3) ethanol, (4) pentane and butanol, (7) 2-methylpropanal, (9) pentanal, (10) 2-methylbutanal and 3-methylbutanal, (11) hexanal, (18) dimethylpyrazines, and (22) decanal and phenylacetaldehyde.