향끽미종 잎담배 성분조성에 관한 연구
Ⅱ. 헤드스페이스 휘발성 유기성분의 특성 조사

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Composition Studies on the Aromatic Tobacco Varieties (Nicotiana tabacum L.) : Ⅱ. Characteristics of Headspace Vapors

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(Received March 20, 1981)

초 록

5가지 향끽미종 잎담배의 헤드스페이스 휘발성 성분들을 중합체 흡착방법 및 고성능 유리 캐피러리 가스 크로마토그라피로 분석하였다.

얻어진 가스 크로마토그라피의 프로파일을 비교한 결과 각 담배 시료는 독특한 방향성분의 조성을 보여주며 주요성분의 정량적인 차이가 현저함이 확인되었다.

Abstract

Volatile compounds in the headspace vapors of five aromatic tobacco varieties have been examined using the polymer adsorption method and high-resolution glass capillary gas chromatography.

The gas chromatographic profiles thus obtained were compared, and the aroma composition was found to be characteristic of each tobacco sample with significant differences in the concentrations of major components.

Introduction

Oriental tobacco leaves have been flavor enhancer in many countries. This has been attributed to their distinctive flavors.

Food flavors are partly determined by an impression on the nose (aroma) of the volatile organic components.

Therefore the difference in olfactory characteristics among tobacco varieties may be attributable to the difference in the compositions of their volatile components. Varietal differences could thus possibly be reflected in characteristic changes in the profiles of the volatile constituents.

Tobacco headspace vapors represent the highly volatile compounds continually released to the air and accumulated in the headspace over tobacco. Most of the compounds forming the headspace vapors of tobacco will also be evaporated from tobacco during smoking. Therefore, the headspace sampling of tobacco will permit an exmination of the tobacco aroma in a manner analogous to be perceived by the nose.

Both as a grade indicator and a source for flavor identification, tobacco headspace vapors had been studied in the past (1,2, 4, 5, 7, 8,). Using polymer adsorption method for headspace collection (6), qualitative differences in headspace profiles of flue-cured and Burley tobaccos were found. Tobacco grades also could be distinguished by the quantitative differences in their headspace profiles.

In the course of our on-going work on the composition studies of aromatic tobaccos, we undertook to examine the headspace vapors prepared by the method (3) previously developed for this purpose. The measured headspace concentration of major components were compared among varieties for the detection of the varietal differences.

Materials and Methods

Aromatic tobacco varieties (Nicotiana tabacum L.): Ground tobaccos (16mesh) used for this study were Greek Basma (I/111), Turkish Izmir (B/G), Yugoslavian Prilep (I/III), Korean Sohyang (Tip) and Korean Hyangcho (Tip) of the 1978 crops.

Reagents: Tenax GC, 60/80mesh (Alltech Associates, Arlington Heights, Ill, USA).

Headspace sampling : The headspac vapors over the ground tobacco was collected and concentrated using an apparatus as shown in Figure 1.

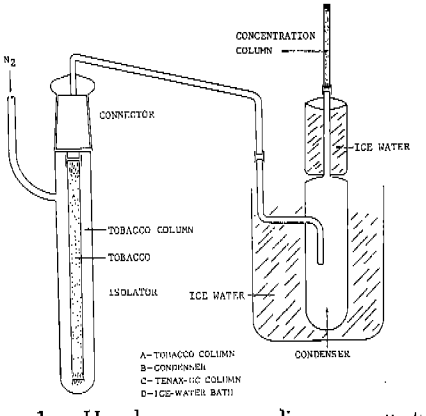

Figure 1. Headspace sampling apparatus.

Details of the apparatus and the technique were described previously (3).

Gas chromatography : Analyses of the entrapped headspace vapors were performed on a Hewlett-Packard Model 5840A gas chromatograph equipped with a flame ionization detector, a Model 18835B capillary inlet system, and a Model 5840A GC terminal. A fused silica capillary column (12m x 0.20mm I. D.) coated with SP-2100 was used. The volitiles trapped on Tenax GC was transferred

to the GC column as shown in Figure 2,

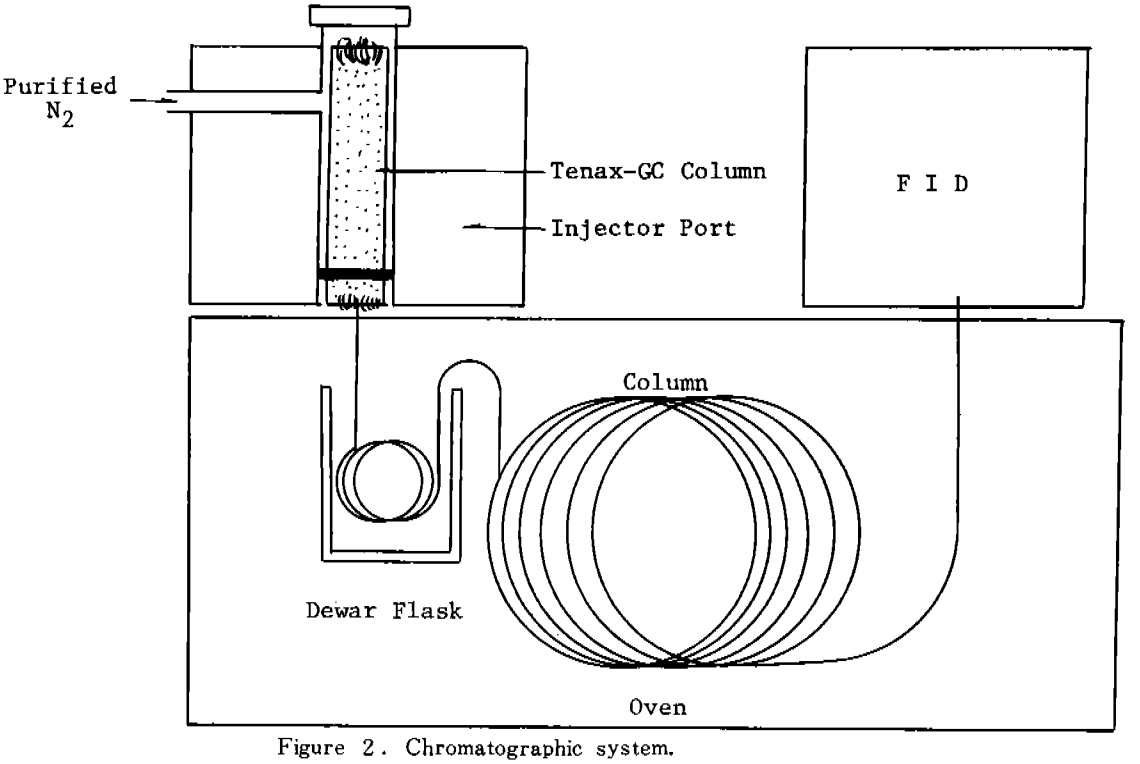

Figure 2. Chromatographic system.

in exactly same manner as before (3). Upon removal of the cold bath, the analysis started isothermally at 35°C for 10 minutes, then programmed at 4°C /min to 160°C, and held for 10 minutes. The built-in computing integrator determined the peak areas and % composition by peak area normalization.

Results and Discussion

The present procedure allowed efficient concentration of the headspace volatile components present even at submilligram quantities.

Figure 3 depicts a typical GC pattern of the headspace vapor.

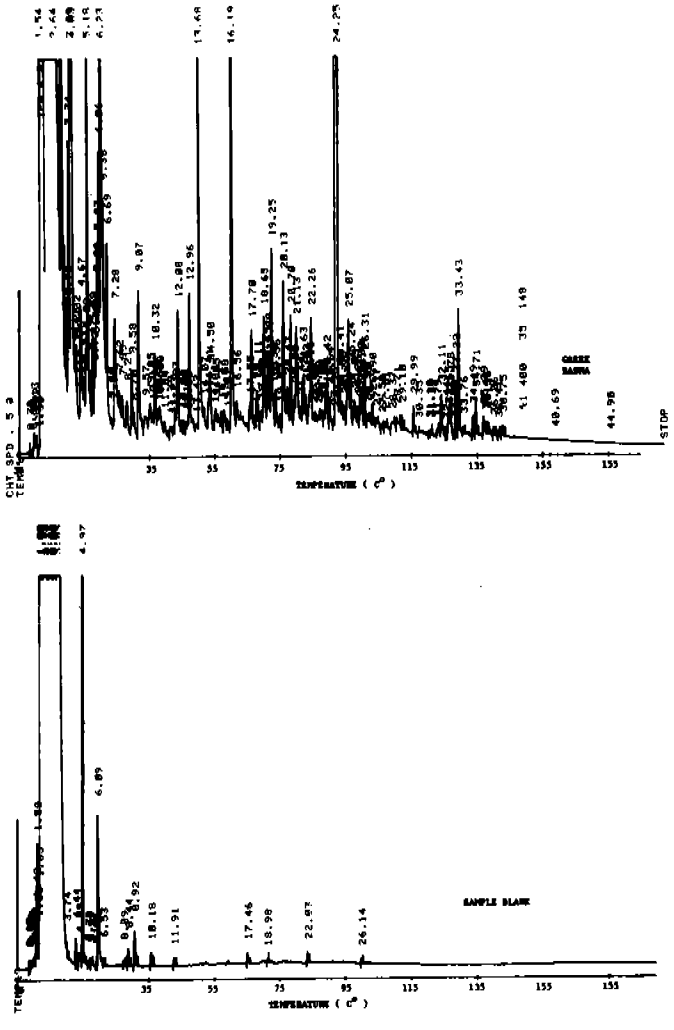

Figure 3. GC profiles o. Greek Basma compared to sample blank.
Column, fused silica capillary column (12m x 0.20mm I. D.) coated with methyl silicone fluid SP-2100; N_2 carrier, 0.55 mℓ/min; oven temperature, isothermally at 35° for 10 minutes and programmed at 4°/min to 160°; injector 280°; detector, 280°

The sample blank shows no serious contaminant peaks, indicating that reliable comparison of profiles among tobacco varieties is possible,.

Oriental aromatic varieties are compared in Figures 4 and 5.

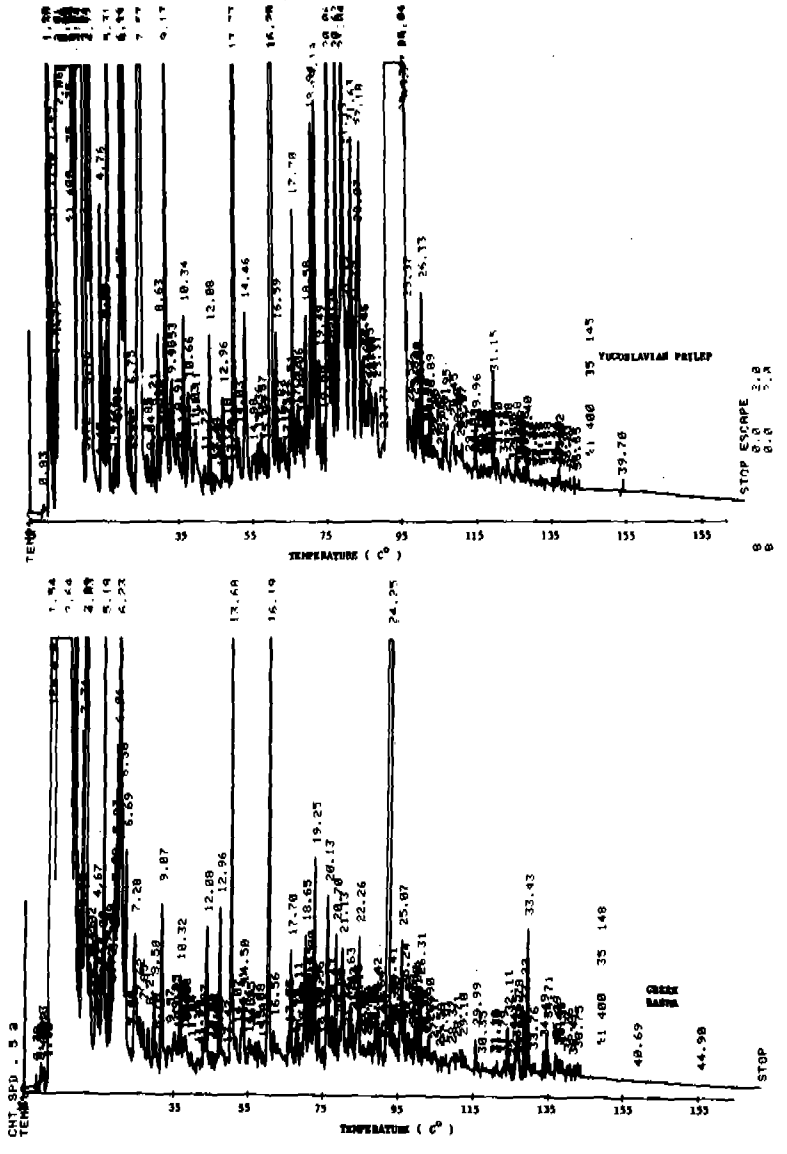

Figure 4. GC profiles of Greek Basma vs. Yugoslavian Prilep. Conditions in Figure 3.

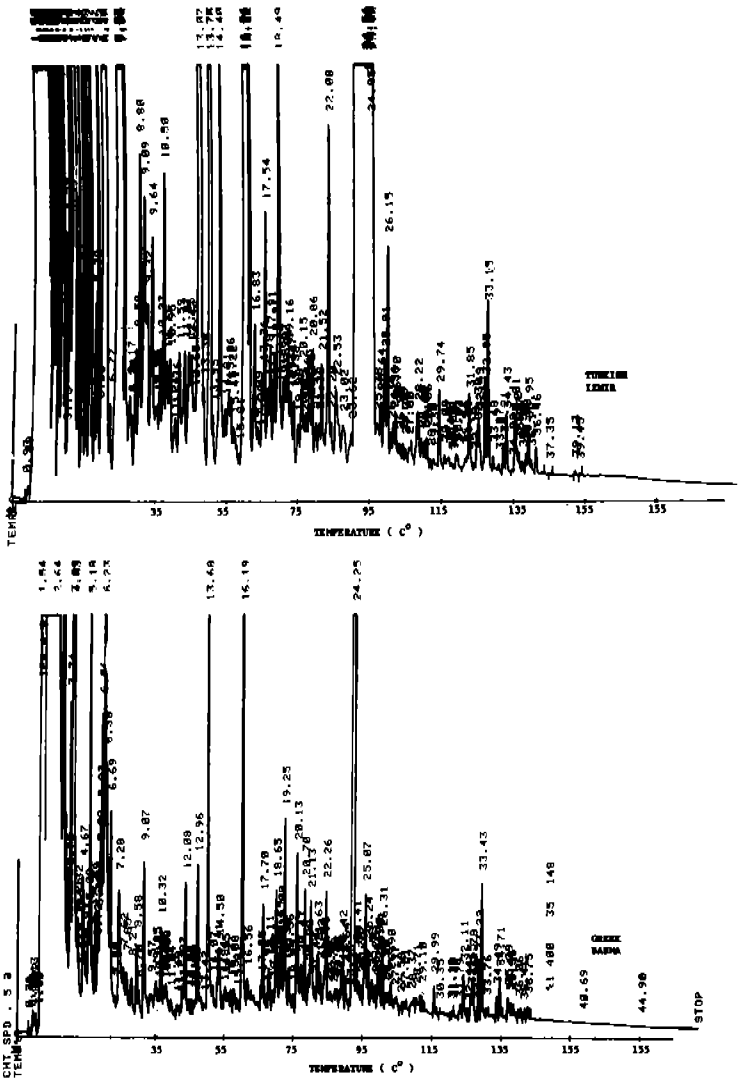

Figure 5. GC profiles of Greek Basma vs. Turkish Izmir. Conditions in Figure 3.

Yugoslavian Prilep and Turkish Izmir are very similar in their overall complexity. The two tobaccos have much higher amounts of the major components than does Greek Basma. Turkish Izmir gave the largest total area, with Yugoslavian Prilep next and Greek Basma with the least. This agrees with the strength of their aromas percepted by nose.

Figures 6 and 7 compare Korean aromatic tobaccos with Greek Basma.

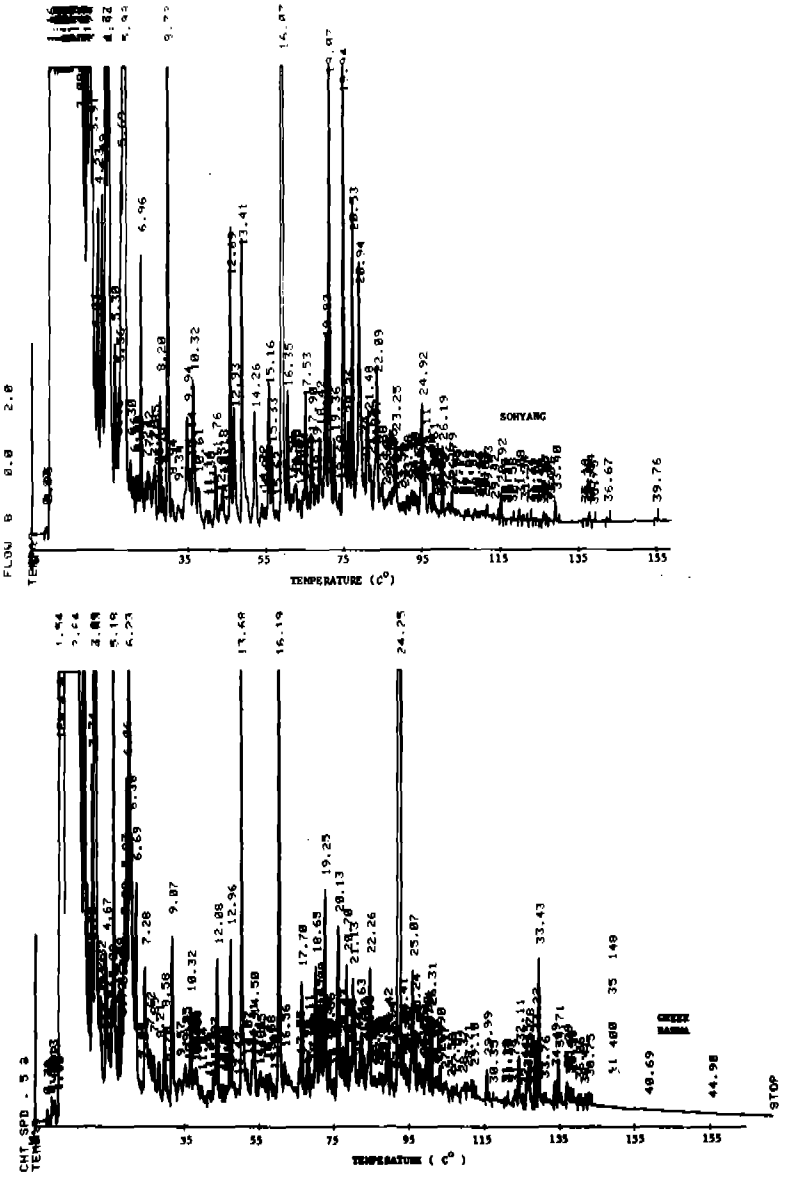

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Figure 6. GC profiles of Greek Basma vs. Sohyang. Conditions in Figure3.

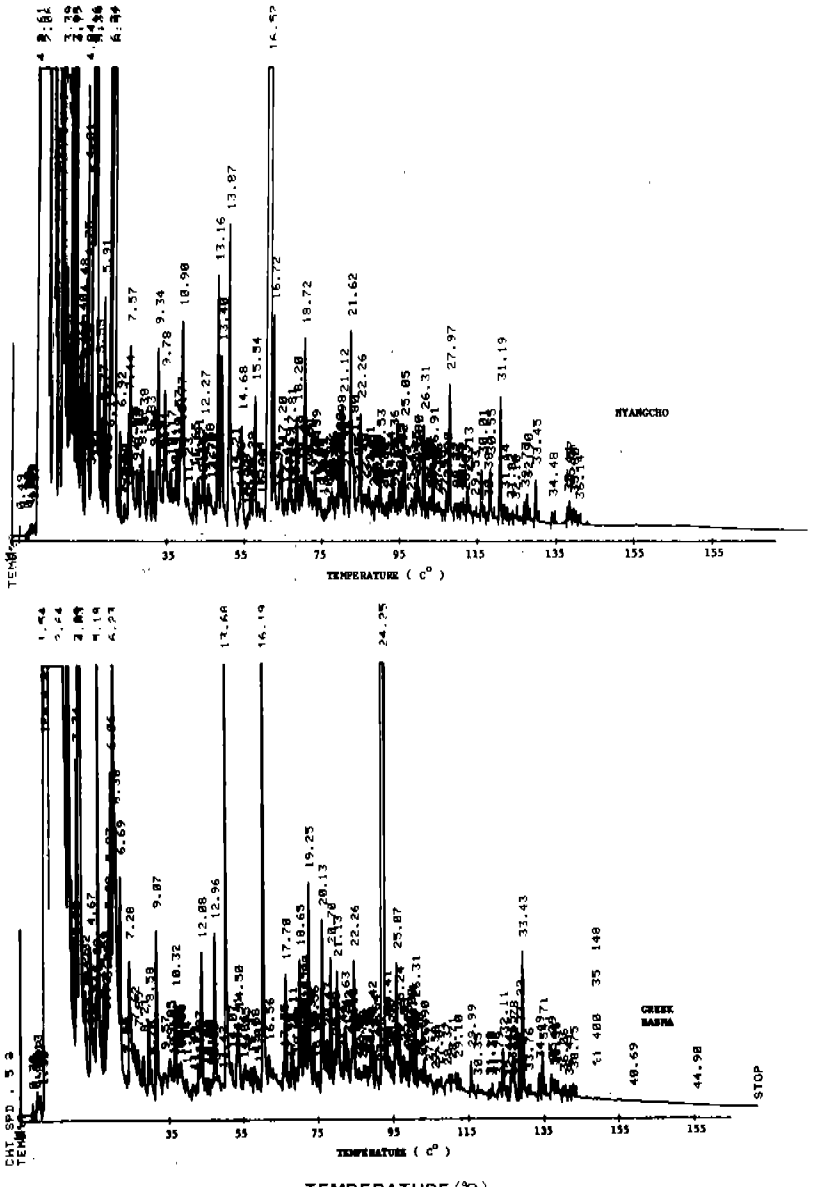

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Figure 7. GC profiles of Greek Basma vs. Hyangcho. Conditions in Figure 3.

Sohyang and Hyangcho are comparable to Greek Basma in the concentrations of their headspace volatiles. Some significant differences could be easily observed in their chromatograms.

The five varieties were directly compared in Table 1, which lists the retention times and the peak area % of the 25 peaks selected for this consideration. The unresolved early peaks were excluded. The components were numbered in order of retention times.

Table 1. Comparison of the major peaks among five varieties.

Peaks		Peak Area %				
No.	Retention time (min)	Basma (Greek)	Prilep (Yugo.)	Izmir (Turkish)	Sohyang (Korean)	Hyangcho (Korean)
1	8.58	0.053	0.147	0.224	0.202	0.156
2	9.07	0.236	0.362	0.206	0.954	0.384
3	10.32	0.114	0.088	0.209	0.178	0.133
4	10.68	0.001	0.114	0.134	0.351	0.445
5	12.08	0.192	0.147	0.145	0.114	0.114
6	12.96	0.237	0.038	1.310	0.460	0.290
7	13.20	trace	trace	0.077	0.338	0.270
8	13.68	0.579	0.606	0.873	0.460	0.460
9	14.50	0.105	0.254	0.362	0.202	0.178
10	15.36	trace	trace	0.093	0.192	0.202
11	16.19	0.778	0.873	1.218	2.354	4.215
12	16.56	trace	0.145	0.278	0.202	0.323
13	17.70	0.116	0.157	0.157	0.116	0.113
14	18.65	0.128	0.147	0.400	0.065	0.351
15	19.25	0.228	0.255	0.104	0.279	trace
16	20.13	0.234	0.400	trace	0.579	trace
17	20.70	0.149	0.362	0.107	0.460	trace
18	21.13	0.197	0.256	0.084	0.445	0.120
19	21.63	0.099	0.224	0.100	0.130	0.223
20	22.26	0.124	0.224	0.255	0.156	0.130
21	24.25	3.031	35.047	35.040	0.338	0.116
22	26.31	0.065	0.088	0.131	0.113	trace
23	27.91	trace	trace	trace	trace	0.156
24	31.15	trace	0.147	trace	trace	0.141
25	33.43	0.141	trace	0.088	trace	trace

* The retention time of each peak was referred to that of Greek Basma.

Korean tobaccos contain higher concentration (2-4%) for peak 11 than do Oriental tobaccos. Peak 21 was 35% both for Yugoslavian Prilep and Turkish Izmir, and 3% for Greek Basma, while less than 0.5% for Korean tobaccos.

Even with large variations in the concentrations of individual peaks, the differences among varieties appear to be more quantitative than qualitative.

Conclusion

The headspace vapors have been examined to determine differences in the headspace aroma compositions of the Oriental aromatic tobaccos as compared with those of the Korean aromatic tobaccos.

Each tobacco could be distinguished by its characteristic GC profile. Korean varieties appear to be distinctively different from the Oriental in the amounts of peaks 11 and 12.

The qualitative identification of individual components and the computer-aided data evaluation will be necessary to find detailed correlations of the amount of each component with the varietal differences.

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