Oil Characteristics of Sweet and Sour Cherry Kernels

F. FARROHI and **M. MEHRAN**, School of Pharmacy,
Tehran University, Tehran, Iran

ABSTRACT

Oil content and oil characteristics of sweet and sour cherry kernels from 8 Iranian cultivars were examined. The ranges of values were: 20.5-37.9% for the oil content of the kernels; 0.77-1.19% for unsaponfiable matter; 188.2-191.5 for saponification value; 123.1-127.8 for iodine value (Hanus); and 1.4692-1.4721 for refractive index at 40 C. As to fatty acid composition of the samples, traces of myristic, 6.7-9.9% palmitic, 0.9-4.2% stearic, 0.3-1.1% arachidic, 0.3-0.7% palmitoleic, 38.6-53.2% oleic, 33.9-51.9% linoleic, and 0.2-0.8% linolenic acids were determined by gas chromatographic analysis.

INTRODUCTION

Several indigenous and imported cherry cultivars or varieties from 2 different genera, *Prunus avium* (sweet cherries) and *Prunus cerasus* (sour cherries) are grown in Iran. In addition to fruit pulp being consumed in human nutrition in Iran, the fruit stem and stone kernel of some cultivars are used for traditional curing of certain diseases. Apart from this, cherry kernel oil is occasionally used for substitution or adulteration of almond oil.

Fat content and fatty acid composition of cherry kernel oils are reported previously (1-3) for cherries or origins other than Iran. However, the fatty acid composition has not been determined by direct separation of the components, but calculated by using iodine number, thiocyanogen number, etc. In our investigation, we examined fatty acid composition of 8 different cherry kernel oils by gas chromatographic analysis. It was aimed also to find possible varietal difference. Furthermore, the analyses of this investigation can be compared with those obtained under similar analytical conditions for Iranian almond oils (4) to find if cherry oil can be distinguished from almond oil by the fatty acid composition.

MATERIALS AND METHODS

Four samples of sweet cherries were collected from trees of 4 different cultivars. Their fruits were considerably different in appearance and flavor. Four samples of sour cherries from 4 different varieties also were examined. The sour cherry fruits did not differ considerably between the various varieties. The ratios of stones and their kernels to whole fresh fruits were determined in large quantities of several kilograms.

For determination of oil content, 10 g dried kernels were ground in a mortar, transferred into a thimble, and extracted with petroleum ether in Soxhlet apparatus for 4 hr. The residue was ground again and extracted once more overnight. Extracts were combined, and the solvent was removed by vacuum distillation in a Büchi-Rotavapor. The remainder was dried at 103 ± 2 C for 20 min and cooled in a desiccator. Then its wt was determined, and the oil content was calculated as percentage of dried kernel, dried stone, and whole fresh fruit.

Oil characteristics were examined in fresh oils extracted with petroleum ether in Soxhlet apparatus for 1 hr. The analyses were carried out mostly in duplicate on two portions of each sample.

Unsaponifiable matter (ether extract) and saponification value were determined according to AOCS methods Ca 6b - 53 and Cd 3 - 35 (5,6). Refractive index (n_D) was determined by a Zeiss-Abbe refractometer at 40 C. Iodine value (IV) (hanus) was determined by AOAC method 28.019 (7).

Fatty acid methyl esters for gas chromatographic analysis were prepared according to AOAC method 25.052a (8). They were separated by a 4 mm inside diameter (ID) x 2 m copper column packed with 20% diethylene glycol succinate on Chromosorb W acid washed 60-80 mesh. Temperatures were 190 C for column, and 210 for detector and inlet ovens. The flow rate of carrier gas (N_2) was 45 ml/min. For the ionization detector flame 35 ml H_2/min and 350 ml air/min were used. The identification of the components was based on their retention time. This was determined previously by analysis of standard mixtures under the above mentioned conditions. The most suitable shapes of the peaks were obtained by a chart speed of 6 in/hr. The proportion of the individual fatty acid methyl esters to the total was calculated by normalization of the peak areas (9). The surface areas were determined by ht x width at half ht of each peak.

RESULTS AND DISCUSSION

The oil content of the kernels from different varieties or cultivars are given in Table I as percent of dried kernels, also calculated for dried stones and whole fresh fruits. The ratio of different parts of fruits, being of less interest here,

TABLE I

Oil Content of Cherry Kernels

Sample number	Kind	Local name[a]	% of kernel[b]	% of seed[b]	% of fruit[c]
1	Sweet	Black, Meshed	34.8	4.0	0.18
2	Sweet	Pink, Tehran	22.2	3.4	0.20
3	Sweet	Pink, Isfahan	37.9	5.8	0.30
4	Sweet	Black, Karaj	28.3	5.0	0.29
5	Sour	Small, Karaj	31.0	6.3	0.54
6	Sour	Small, Shahriar	31.1	6.4	0.51
7	Sour	Large, Shahriar	33.2	7.7	0.59
8[d]	Sour	Small, Karaj	20.5	5.8	0.53

[a]Cultivars or varieties are named with regard to the color and size of their fruits as well as to their origins, i.e., color and origin in sweet cherries and size and origin in sour cherries.

[b]Dried.

[c]Whole, fresh.

[d]An experiment carried out 1 year before the others.

are not mentioned in Table I, but some can be calculated from the oil content. The ratio of undried stones to whole fresh fruits varied from 6.2 to 10.7%. Kernels of both sweet and sour cherries showed considerable differences in their oil content, ranging from 20.5 to 37.9%. The oil contents of the kernels composed 3.4-7.7% of the dried stones and 0.18-0.59% of the whole fresh fruits.

The ranges of the values, means in parentheses, obtained for oil characteristics were: 0.77-1.19% (0.89%) for unsaponifiable matters; 188.2-191.5 (189.5) for saponification values; 123.1-127.8 (125.8) for observed IV; 103.5-122.0 (116.3) for calculated IV; and 1.4692-1.4721 (1.47076– for refractive indexes at 40 C.

Regarding fatty acid composition, the saturates composing an average 10.9% of the total fatty acids, consisted of traces of myristic, 6.7-9.9 (average 7.8%) palmitic, 0.9-4.2% (2.4%) stearic, and 0.3-1.1% (0.73%) arachidic acids. The unsaturates consisted of 0.3-0.7 (0.44%) palmitoleic, 38.6-53.2 (43.9%) oleic, 33.9-51.9% (44.8%) linoleic, and 0.2-0.8% (0.48%) linolenic acids.

In this study, the calculated IV were in all cases lower than the observed values. On the other hand, our observed refractive indexes fall over the line suggested by Earle, et al. (10) for correlation between IV and n_D^{40} in normal cases. These may be due to other unsaturated components probably existing in the samples. These could not be detected by gas chromatographic analysis with the means of different columns we tried in our experiments for best possible separation of normal fatty acids.

Considering oil characteristics of the various samples, no appreciable differences could be indicated except for samples 3 and 4, two sweet cherry cultivars. Their kernel oils contained considerably higher percentages of oleic acid (43.2 and 49.0 respecitvely) and lower amounts of linoleic (33.9 and 38.7 acids than the other samples.

The fatty acid composition of cherry oils determined in this investigation differed considerably from those of Iranian almond oils (4). Thus, substitution of cherry oil for almond oil, but not adulteration with low percentage, can be detected by determination of fatty acid composition.

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