The Seed Oil of the Highbush Cranberry

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THE highbush cranberry, *Viburnum opulus* L. var. *americanum* (Miller) Ait., is a member of the honeysuckle family (Caprifoliaceae) whose habitat reaches from Newfoundland and eastern Quebec to British Columbia, south to New Jersey and Oregon, and extends into Pennsylvania, Michigan, Wisconsin and northeastern Iowa. It is a shrub of four to twelve feet in height much used for ornamental planting because of its scarlet, translucent fruit which keeps its color until the following spring. The fruit has a rather pleasant acid taste mildly suggestive of the cranberry, for which it has sometimes served as a substitute; hence the name highbush cranberry. It has, besides, a variety of other names among which are crampbark tree, cranberry tree, high cranberry, American guelder rose, pincushion tree, rose elder, witch hobble, gaiter tree, squaw bush, etc.

A decoction of its bark was used by North American Indians as a diuretic; some western tribes smoked the bark itself instead of tobacco. In later days, root and stem bark began to find a recognized use in the preparation of elixirs for medicinal use as anti-spasmodics. From the leaves of this and other species of *Viburnum* the early settlers and Indians brewed a tea.

Data on the constants and composition of the seed oil of this species are not available. Nowak and Zellner (Monatsh., 42: 1922, 298) some years ago reported the results of a cursory examination of the oil of the European variety (*V. opulus* L.). Their data are here summarized (Table 1) for comparison with ours with the thought that the differences can probably be ascribed to varietal differences in parent sources.

For this investigation eight kilograms of seed representing a four-year collection were extracted with acid-washed petroleum ether of boiling range 40°-60°. A reddish-golden oil (30 yellow, 4.4 red in Lovibond units) was obtained in 11.5 per cent yield. It gave a positive Carr-Price color reaction for vitamin A. The Liebermann-Burchard test when applied to the unsaponifiable matter, contrary to the reported findings of Nowak and Zellner, indicated the presence of phytosterol.

Its chemical characteristics (Table 1) classify this oil with the semi-drying group; contraindicate the presence of glycerides of the volatile fatty acids; reveal little, if any, conjugated unsaturation and a negligible amount of hydroxylated acids. An obvious characteristic is the presence of unsaturated acids (93.8 *pct.*) to the practical exclusion of the saturated (1.6 *pct.*). Subsequent attempts to separate the latter as a fraction by the conventional lead salt-ether method were unsuccessful. Efforts to distill them out of mixtures of the brominated esters of the total fatty acids were futile because of unmistakable evidence of decomposition in the distillation flask before a temperature of 220° (5 mm.) was reached. Inasmuch as the methyl esters of any saturated acids likely to be present have boiling points well below this temperature, it was assumed that this type of acid occurs here in amounts too small for accurate measurement by current technics.

Unsaturated Acids

Representatives of two common types of unsaturated fatty acids were identified by means of their bromo-derivatives which after isolation in the usual manner were characterized from halogen content and physical constant. No evidence, through hexabromide formation, for the presence of linolenic acid was found. Oleic acid proved to be the predominating unsaturated acid. Linoleic acid comprises the rest of the fraction in question.

Summary

The seed oil of the American variety of the highbush cranberry is, apparently, of unusual composition in that it contains only small amounts of saturated acids. It consists almost entirely of the glycerides of oleic and linoleic acids. Its calculated composition has been found to be oleic acid 58 per cent; linoleic acid 35.8 per cent; saturated acids 1.6 per cent; unsaponifiable matter 1.65 per cent.

TABLE 1.—CHARACTERISTICS OF HIGHBUSH CRANBERRY SEED OIL

Characteristic	*V. opulus* L. var. *americanum*	*V. opulus* L. (Nowak-Zellner)
Specific gravity at 25°/25°	0.9116	0.9252[1]
Refractive index at 25°	1.4710	1.4842
Saponification number	184	192
Iodine numbers (Wijs)	120.4	108[3]
Thiocyanogen number	78.63	.....
Diene number	5.0	.....
Hydroxyl number	4.18	.....
Reichert-Meissl number	0	.....
Polenske number	0.24	.....
Insoluble acids *(pct.)*	95.45	.....
Saturated acids *(pct. corr.)*	1.63	.....
Unsaturated acids *(pct. corr.)*	93.82	.....
Unsaponifiable matter *(pct.)*	1.65	2.34

[1] at 15°/15° [2] at 23° [3] Procedure not given.