The Seed Oil of the Arrow Wood

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The arrow wood bush (*Viburnum dentatum* L.), a name presumably given it because its straight branches are said to have supplied the Indians with material for arrow shafts, is a member of the honeysuckle family (Caprifoliaceae) many species of which are cultivated in North America for ornamental purposes; a few are valued for the medicinal properties which certain of their parts possess.

This bush grows in well drained or moist spots in either sun or shade to produce thickets which are very resistant to disease or city smoke. It flowers in early June to produce a dark bluish-purple fruit which is available in October. It may be found growing in the eastern, central, and southern areas of the United States from the western Great Lakes to the Appalachians and the Ozarks.

There is no known commercial interest in the seed oil of this bush. It is of academic interest, however, to study the structure of this oil in its relationship to that secreted by other species of the same genus.* This oil has been little investigated. Blake (1), because of an observed saponification equivalent of 212.6, concluded that laurin occurs in it.

Petroleum-ether (b. 60-68°C.) extraction of the seeds recovered from the fruit gave an oil in 13-per cent yield which by transmitted light appears brown, by reflected light a deep green. Its physical constants, all determined at 20°C., were found to be: specific gravity, 0.9089; index of refraction, 1.4731; viscosity (poises), 0.4099; surface tension (dynes per cm.), 31.95.

Its chemical constants (Table 1) do not reveal anything unusual as to the constitution of this oil. Fatty acids of low molecular weight are not part of its glyceride structure and if any representatives of the intermediate group are part of it, their presence here in only small amount is presumptive. Monoethenoid unsaturation apparently predominates over the polytype.

TABLE 1

Chemical Characteristics of the Seed Oil of *V. dentatum* L.

Saponification number	182.8
Iodine number (Wijs)	96.1
Thiocyanogen number of acids	76.7
Hydroxyl number	6.3
Soluble acids (pct. as butyric)	0.4
Insoluble acids (pct.)	88.13
Saturated acids (pct.)	6.0
Unsaturated acids (pct.)	82.70
Unsaponifiable matter (pct.)	1.98

Saturated Acids

The unsaponifiable matter having been first removed by solvent extraction, the saturated acids were separated from the unsaturated by a modified Twitchell lead salt-alcohol procedure (2). Contaminating unsaturated acids (iodine number 0.4) were converted to their bromo-derivatives, after which the whole was esterified with methanol and fractionally distilled under diminished pressure in the usual manner. Three sharply defined fractions were obtained besides the inevitable residue. From analysis of the foregoing by the usual methods and on confirming the results by means of the solidification point technique and binary mixture diagrams as developed in this laboratory (3), it was calculated that the approximate composition of the oil in respect of saturated acids is myristic 0.35 pct., palmitic 4.51 pct., and stearic 1.13 pct. The presence of arachidic acid in the distillation residue was indicated, but not proved for want of sufficient material.

Unsaturated Acids

The unsaturated fatty acids (mean molecular weight 287 and iodine number 106.7), separated from the saturated in the form of their alcohol-soluble lead soaps (2), after esterification with ethanol were fractionally distilled in a Widmer column. Each fraction was then analyzed in the usual manner. In addition, the first three of the seven obtained, after regeneration of the acids, were subjected to the procedure suggested by DeGray and DeMoise (4) for the segregation of high-titer from low-titer acids.

A hexabromide test, made at —8°C. on a portion of the unsaturated fraction gave negative results. From the brominated mixture, however, there was deposited after standing for 15 hours in a refrigerator a crystalline crop which proved to be the tetrabromide of stearic acid (m.p. after recrystallization 114.5-115°C.). Saponification equivalents and iodine numbers indicated the presence of a hexadecenoic acid in the first three fractions and oleic and linoleic acids in the others. The material in the distillation residue could not be identified.

In the light of the data obtained in the foregoing series of determinations it was calculated that the order of magnitude of the content of unsaturated acids in this oil is hexadecenoic acid 3.6 pct., oleic acid 54 pct., and linoleic acid 19 pct.

Summary

The seed oil of the arrow wood bush, *V. dentatum* L., is a non-drying oil in contrast to that of the highbush cranberry, *V. opulus* L. var. *americanum* (Miller) Ait., (5) whose iodine number assigns it to the semi-drying group. Their content of oleic acid is of the same order of magnitude, or 54 and 58 pct., respectively. This is not true, however, with respect to their linoleic acid content for here the ratio is approximately 1:2 or 19 and 35.8 pct. It has been found that the seed oil of the latter is, apparently, of unusual composition in that it contains only small amounts (1.6 pct.) of saturated acids; those of the former are almost four times as much.

The approximate percentage composition of this oil has been found to be myristic acid 0.35, palmitic acid 4.5, stearic acid 1.1, hexadecenoic acid 3.6, oleic acid 54, and linoleic acid 19.

LITERATURE CITED

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* The American Joint Committee on Horticultural Nomenclature lists 33 species of *Viburnum* in its Official Code of Standardized Plant Names (1917).