the others. Phenols and aromatic amines were the most effective stabilizers. Raw peanut oil produced a heavy shellac-like deposit when used in aero-engines.

Gas oil, heated gas oil, peanut oil, palm oil and cottonseed oil were tested as fuels in a Diesel engine equipped with a Perkins P6 compression-ignition (Seddon—*Gas Oil Power 37*, 136). Peanut oil was equal to cold Diesel fuel and superior to palm oil. Cottonseed oil was fair. Similar work (Chowbury *et al.*—*Ibid. 80*) with a Lister Diesel engine equipped with a Bosch fuel pump and injector supplied the following comparison:

Fuel	Starta-bility	Operation	Exhaust	Power (h.p.) output at 1,200 r.p.m.
Diesel	easy	smooth	colorless	7.83
Peanut oil	easy	smooth	colorless	7.6
Karanj oil	medium	smooth	colorless	7.3
Castor oil	difficult	unsteady	smoky	6.8
Kapok oil	difficult	smooth	colorless	6.9
Cottonseed oil	medium	smooth	colorless	7.8
Rapeseed oil	medium	smooth	colorless	7.7
Coconut oil	medium	unsteady	colorless	7.6

Information on lesser known oils and condition of motors, nature of carbon deposit and like information was also recorded.

The Saturated Fatty Acids of Elderberry Seed Oil*

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In an earlier communication (1) were presented data showing the relation of yield of oil from the seeds of the elderberry (*Sambucus canadensis* L.) to the nature of the menstruum employed in its extraction, a few of the simple constants of the oils so recovered, and a comparative tabulation of the reported characteristics of the oils of different species of the plant. Additional data on this oil have since been obtained in the examination of a later crop. They are herein presented as an illustration of the application of the solidification-point technique (2). A report on the nature and constitution of its unsaturated fraction, wherein probably lies the source of a potential technical interest in elderberry seed oil, is reserved for a future time when more material shall have been made available for study.

The clear, greenish-yellow oil used in this investigation was obtained in approximately 30-per cent yield by petroleum ether (40-60°C.) extraction of seeds recovered from the fruit which had matured in the summer of 1938. Its constants (Table 1) suggested the following conclusions as to the type and nature of the constituent acids of elderberry seed oil: very little, if any, of the low-molecular weight acids are present; practically all of the acids would be found to lie in the C_{16}-C_{18} range, and unsaturation is due, to a large extent, to the multiple type.

TABLE 1
Characteristics of Elderberry Seed Oil

Saponification number	188.5
Iodine number (Wijs)	184.1
Thiocyanogen number of acids	104.7
Reichert-Meissl number	1.4
Polenske number	0.4
Hydroxyl number	20.0
Saturated acids (*pct.*)	8.5
Insoluble acids (*pct.*)	92.1
Unsaponifiable matter (*pct.*)	2.94

The saturated fatty-acid fraction in approximately 70-gram yield and of low iodine number (less than 4) was separated from the unsaturated by a modified Twitchell lead salt-alcohol procedure. Its mean molecular weight was 271, or roughly midway between that of palmitic and stearic acids.

After esterification with methanol and then treatment with bromine for the purpose of holding back the unsaturated esters it was fractionally distilled in a Widmer column at 0.2 mm. Hg. pressure. Four fractions plus a residue containing bromo-stearic esters were obtained. The latter were removed by crystallization.

For the purpose of making qualitative and quantitative examinations of these fractions, the fatty acids were regenerated, purification being effected through the medium of their barium salts (3). Fractional distillation had been so carried out that the mixtures of fatty acids obtained by this regeneration were binary ones. For the identification of each fraction the method of using solidification point curves was used (3). The molecular weight and solidification point of each fraction was determined. The composition of the individual fraction was then found both by calculation from mean molecular weight and by reading it off from the binary solidification point curve. In each case good agreement between the two values was obtained.

Each of the first four, or the distilled, fractions was composed of varying amounts of palmitic and stearic acids, while the small residual fraction was made up of stearic and arachidic acid. The distribution of these three acids is as follows: palmitic, 62 pct., stearic, 31 pct., and arachidic, 7 pct.

The absence of myristic acid was clearly indicated by the fact that the first distilled fraction could be shown to fall on to the palmitic-stearic acid curve, thus precluding the possibility of myristic acid being present since the fraction was definitely a binary mixture of the other two acids. The absence of acids higher than arachidic is indicated by the same method of approach in that the distillation residue showed itself to be a binary mixture of stearic and arachidic acids.

In conclusion, it was found that the oil investigated contained the following percentages of saturated fatty acids: palmitic, 5.3 pct., stearic, 2.6 pct., and arachidic, 0.6 pct.

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