ACORN OIL*

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A SURVEY of literature on vegetable oils and fats reveals the fact that there has been very little work by chemists on acorns or their oil. The abundance of acorns over the country and the fact that they are an important source of food for animals, especially hogs in the South, have caused people to become interested in their value. The Farmers Oil Mill, at Newberry, S. C., made an experimental crush and Mr. B. F. Taylor, Secretary of the South Carolina Cotton Seed Crushers' Association, submitted samples of the oil to the author for investigation.

Acorns from many varieties of oaks vary in their composition, especially in the oil content. The quality of the acorns also affects the percentage of oil content, just as in cotton seed and soy beans. The acorns crushed were from the Pin Oak, or *Quercus Palustris* Muench. It is commonly known as the Swamp Spanish Oak and belongs to the Red Oak group.

THE ANALYSIS OF THE ACORNS*

H_2O	24.08%
Oil	13.40%
Ammonia	0.78%

The acorns were of a rather poor grade, showing 40% bright kernels, 30% slightly damaged kernels, 20% black kernels and 10% shriveled or immature kernels.

TABLE I.—PHYSICAL AND CHEMICAL CHARACTERISTICS

Crude Oil:	
Iodine Value (Wijs)	99.40
Saponification Number	192.85
Acetyl Value (Andre-Cook)	6.9
True Acetyl Value (Lewkowitsch)	7.0
Unsaponifiable (Kerr-Sorber)	1.11%
Iodine Value of Unsaponifiable (Wijs)	120.90
Crismer Test (Freyer and Weston)	68.8° C.
Free Fatty Acidity (Oleic)	3.50%
Refining Lye Used	9.6% of 18° Be'
Refining Loss	11.2%

*Analysis made by R. M. Simpson, of Chas. W. Rice & Company, Columbia, S. C.

TABLE II.

Refined Oil:	
Color of Refined Oil (Lovibond, 5¼" Column)	35Y-50.R
Color of Bleached Oil (6% of Standard XL)	35Y-33.0R
Color of Bleached Oil (6% of 20 Pts. Standard XL to 1 Pt. Carbon)	35Y-18.6R
Color of Bleached Oil (Special Bleach)	16Y-1.6R
Specific Gravity at 25/25° C.	0.9158
Index of Refraction at 40° C. (Abbe Refractometer)	1.4647
Free Fatty Acidity (Oleic)	0.03%
Saponification Value (A.O.C.S.)	193.20
Acetyl Value (Andre-Cook)	3.6
Unsaponifiable Matter (Kerr-Sorber)	0.45%
Iodine Value of Unsaponifiable (Wijs)	119.10
Crismer Test (Freyer and Weston)	70.3° C.
Smoke Test (A.O.C.S.)	180° C.
Flash Point (A.O.C.S.-Cleveland Open Cup)	320° C.
Fire Point (A.O.C.S.-Cleveland Open Cup)	360° C.
Titre of Fatty Acids (A.O.C.S.)	25.9° C.
Ether Insoluble Brom'des of Fatty Acids (Steel-Washborn method)	None

TABLE III.

Glyceride Composition:	
(A) Lead-Salt-Ether Method (Twitchell) Solid Fatty Acids	18.44%
Liquid Fatty Acids (by Difference)	81.56%
Iodine Value (Wijs) of Solid Fatty Acids	16.45
Iodine Value (Wijs) of Mixed Fatty Acids	101.85
(B) Thiocyanogen Method (A.O.C.S.) Iodine Value (Wijs) of Oil	97.20
Thiocyanogen Value of Oil	73.75%

CALCULATIONS FROM ANALYTICAL DATA

	From (A)	From (B)
Glycerides of Linoleic Acid	27.92%	27.06%
Glycerides of Oleic Acid	57.01%	58.00%
Glycerides of Saturated Acids	15.07%	14.49%
Unsaponifiable Matter	.....	0.45%
	100.00%	100.00%

The work on this oil has not progressed to the actual identification and determination of the percentages of the individual glycerides making up its composition. The above calculations, when considered along with the absence of insoluble bromides, the small difference between the acetyl and the true acetyl value and other chemical characteristics, are convincing proof that the general composition as shown in Table II is correct. There is a likelihood of minute traces of other glycerides being present, which have not been detected.

A quickly noticeable characteristic of this oil is the ready separation of the solid glycerides from the liquid glycerides. If a sample is warmed to 40° C. and then subjected to a constant temperature of 13° C. for a period of 16 hours, it will, when filtered at this temperature, produce an oil having a cold test of 6 to 6½ hours.

The refined and bleached oil is easy to deodorize and produces a finished oil of exceptionally high quality. A sample of refined and bleached oil, having the analysis shown in Table II, deodorized in a small laboratory plant, had the following analysis:

Color	15Y-1.5R
Free Fatty Acidity (Oleic)	.015%
Flavor	Good
Odor	Good
Peroxide Value	0.18 mm.
Kreis Number	Negative

The refined and bleached oil is readily hydrogenated by using a nickel catalyst under the usual conditions. The hydrogen combines with the oil at an unusually fast rate and the hydrogenation proceeds to completion at a rate equal to that of any oil, the finished sample showing an iodine number of two. Specimens Shown:

1. Crude Oil.
2. Finished Deodorized Oil.
3. Partially Hydrogenated Oil.
4. Completely Hydrogenated Oil.

The intense yellow color is that produced by carotene, the color of this oil and that of palm oil in a liquid state being very similar. The same methods employed for removing the color of palm oil are applicable to this oil. However, the color is not as difficult to remove as is the color of palm oil.

It is evident from the chemical and physical characteristics, the preliminary processing results and general observation that the oil, if ever produced commercially in sufficient quantity, could be satisfactorily used for edible purposes.

*Presented before the Dallas Convention of The American Oil Chemists' Society, May 13-14, 1937.