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## PUERTO RICAN FATTY OILS

### VIII. THE CHARACTERISTICS AND COMPOSITION OF THE OILS FROM THE FATTY COVERING AND THE KERNEL OF THE ANACAGÜITAS SEED (*STERCULIA APETALA* (JACQ.) KARST)

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#### INTRODUCTION

The anacagüitas tree is native to northern South America. It has spreading branches and measures up to 20 m. in height (1).<sup>2</sup> At present it is widely used in Puerto Rico as an ornamental tree. It fruits some time during February, March, or April. The fruit consists of 5 large leatherlike follicles containing many black seeds having a thin and easily removable cuticle under which the hard husk is found coated with a pulp of fatty material; inside the husk is the kernel. The oils from this particular species of *Sterculia*, as far as we could determine, have not been investigated in the past. Only three species from this same genus have been examined chemically: *Sterculia foetida* L. contains in the pulp, covering the husk, about 10 percent of oil; in the kernel about 50 percent of oil (2). The kernel oil according to Brill and Agcaoili (3) is nondrying having a saponification number of 212 and an iodine number of 76. The kernels of *Sterculia appendiculata*, according to Grime (4), contain 29 percent of oil with a saponification number of 185 and an iodine number of 76. The seeds of the *Sterculia tragacantha* contain in the coat 44.4 per cent and in the kernel 38.2 percent of nondrying oils (5).

The present investigation was undertaken to supply information about the composition of the oils obtained by petroleum-ether extraction of the

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<sup>2</sup> Numerals in parentheses refer to Literature Cited, p. 4

fatty covering and kernel respectively of the dried seed of *Sterculia apetala* (Jacq.) Karst.

## EXPERIMENTAL PROCEDURE

### MATERIAL

The seeds for this investigation were obtained from a tree in the Miramar district of San Juan. They were picked from the ground where they had fallen and were dried at a temperature of 60–70°C. for 72 hours in a circulating air oven.

The average weight of the whole dried seed was 2.1 gm. The dried seed consisted of 6.4-percent cuticle, 7.5-percent fatty covering, 27.5-percent husk, and 58.6-percent kernel.

TABLE 1.—*Proximate analysis of the different parts of anacaquitas seed*

Determination	Whole seed	Husk	Pulp	Kernel
	Percent	Percent	Percent	Percent
Total solids.....	84.0	90.4	94.1	92.2
Fat (ethyl-ether extract).....	23.9	2.2	62.8	29.9
Proteins (N × 6.25).....	13.4	3.2	22.8	18.1
Crude fiber.....	11.6	35.5	1.8	1.5
Ash.....	3.9	1.9	.5	4.3
Nitrogen-free extract.....	47.2	57.2	12.1	46.2

### PROXIMATE COMPOSITION OF THE SEED

A proximate analysis of the different parts of the dried seed are recorded in table 1.

The fatty material covering the husk was found to consist of 50-percent petroleum ether extractables. The residue left was composed principally of proteins, as it gave strong reaction with the usual protein reagents.

Extraction of 1 kg. of dried kernel with petroleum ether yielded 20.3 percent of oil.

### PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE OILS

The physical and chemical characteristics of the oils extracted with petroleum ether from the fatty covering and the kernel respectively were determined by the usual procedures (6). The results are recorded in table 2.

As the oil obtained from the fatty layer covering the husk accounted for only 3.8 percent of the whole dried seed, it was not studied further. On the other hand, the kernel oil, which amounted to 12 percent of the weight of the dried seed, was investigated in more detail.

UNSATURATED ACIDS IN THE KERNEL OIL

The unsaturated acids were separated from the saturated acids by the lead-salt-ether method (7). These acids were in turn brominated at a temperature of  $-10^{\circ}\text{C}$ . in ethyl-ether solution. No hexabromide separated from the ether solution, indicating the absence of linolenic acid. After removal of the solvent, the residue was dissolved in petroleum ether and again no precipitate separated out, indicating the absence of linoleic acid. The average molecular weight of the unsaturated acid fraction was 286, as cal-

TABLE 2.—Characteristics of the fatty covering and kernel oils of the *anacagiütas* seed

Determination	Oil from fatty covering	Kernel oil
Specific gravity $25^{\circ}/25^{\circ}$ .....	0.9421	0.9200
Refractive index $20^{\circ}$ .....	1.4700	1.4791
Saponification number.....	197.5	196.1
Iodine number (Hanus).....	51.83	67.15
Acid value.....	84.5	50.6
Reichert-Meissl number.....	4.09	.06
Polenske number.....	1.05	.26
Unsaponifiable residue, (percent).....	.48	.52
Saturated acids, (percent cor.).....	34.93	21.47
Unsaturated acids, (percent cor.).....	58.03	74.52
Iodine number of unsaturated acids (Hanus).....	80.48	93.68
Saponification number of unsaturated acids..		196.07

TABLE 3.—Unsaturated and saturated acids in *anacagiütas* kernel oil

Acids	In unsaturated acids	In saturated acids	In original oil	Glycerides in oil
	Percent	Percent	Percent	Percent
Oleic.....	100	—	74.52	77.60
Myristic.....	—	56.75	12.20	12.70
Palmitic.....	—	43.23	9.30	9.65

culated from the saponification value, and the iodine number was 93.68. As these values are very close to the corresponding ones for oleic acid, it was concluded that this acid is the only one present in the unsaturated acid fraction.

SATURATED ACIDS IN THE KERNEL OIL

The saturated acids were converted into methyl esters by the method of Hilditch (8), and freed from moisture and solvents by heating to  $100-$

150°C., under diminished pressure. The distillation of the esters were carried out at a 2-mm. pressure. Five fractions were collected between 137–164°C., and the composition of each fraction was determined by the method of Baughman and Jamieson (9), from which the percentage of each saturated acid was calculated with results given in table 3.

The acids present in each fraction were separated by fractional crystallization from 95-percent alcohol. The anilides of the acids obtained were prepared.

Myristic acid (m.p. 53.8°C.): From the 5 fractions an acid melting between 53–56°C. was obtained. The anilide derivative prepared from this acid had a m.p. of 84.5°C. Myristic acid anilide melts at 83.4°C.

Palmitic acid (m.p. 62.0°C.): Each of the 5 fractions yielded an acid melting between 62–63°C. The anilide derivative prepared from this acid melted at 89.0°C. Palmitic acid anilide melts at 89.5°C.

#### SUMMARY

1. The anacagiitas seed contains 2 oils. One is present in the fatty covering of the husk and other in the kernel; the first accounts for 3.8 percent and the second for 12 percent of the dried weight of the whole seed.
2. The principal characteristics of these two oils were determined. Both are nondrying oils.
3. The kernel oil contained 74.52 percent of oleic, 12.20 percent of myristic, and 9.30 of palmitic acid.

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