Notes on Mexican Drugs

II. Characteristics and Composition of the Fatty Oil from "Gusanos de Maguey" (Caterpillars of *Acentrocneme hesperiaris*)

*By Marcel Bachstez and Allagracia Aragon**

The use of insects as human food is of rare occurrence. "Gusanos de maguey," Aztec "meocuilin," maguey caterpillars of *Acentrocneme hesperiaris* (Fig. 1) since before the days of Cortez (1) have been considered in Mexico as a delicacy. They are prepared for eating by frying in their own grease or lard. In some places they are eaten raw as a medicine for digestive troubles. They are collected in the early spring and are brought to market in small packages made from the paper-like covering of the maguey leaf.

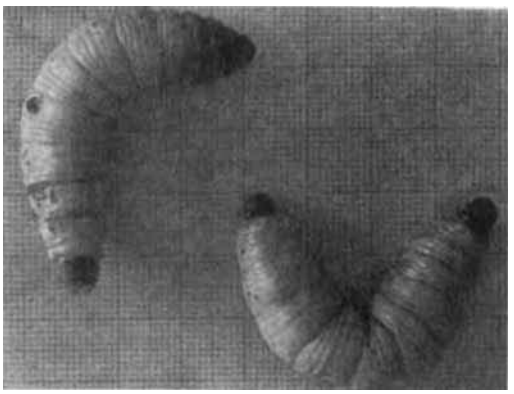

Figure 1.

The only reference to "gusanos de maguey" found is one by E. Rojo Alvarado (Thesis, Mexico, 1934). In this paper is given the composition of this larva including its fat content but with no indication as to its nature.

Accordingly, it appeared of interest to investigate this subject as an example of the transformation of sugar into a fat by a relatively simple animal organism.

The caterpillar is born and lives in the thick leaves of the "maguey" (Agave, especially *Agave atrocirens* Karw.) and nourishes itself from the sap of the plant which contains saccharose and invert sugar (2).

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EXPERIMENTAL

Preparation of the Oil.—The oil was prepared by extracting with ether in a Soxhlet apparatus, the larvæ previously dried to constant weight at 100° C. (moisture content, 70%) and ground with sand. The solvent was distilled off, heating toward the end of the distillation to 120° C. The resulting oil was then filtered and found to represent 10% of the weight of the fresh caterpillars.

Physical and Chemical Examination.—The oil was yellow in thin layers and brownish in moderately thick layers. It had a bland taste and a very faint characteristic odor suggestive of rotten apples. The chemical and physical properties of the oil were determined by the usual procedures (3) with the results given in Table I. These results, curiously enough, closely resemble the values for human fat (4).

TABLE I.—CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE OIL FROM "GUSANOS DE MAGUEY"

Specific gravity, $\frac{25°}{25°}$	0.9114
Refractive index, $n_D^{40°}$	1.4594
Acid value	2.3
Saponification value	179.85
Iodine number (Hanus)	59.25
Unsaponifiable matter, %	2.0
Unsaturated acids, % (corr.)	63.66
Saturated acids, % (corr.)	28.54
Iodine number of unsaturated acids	85.6
Reichert–Meissl number	0.75
Polenske number	0.22
Acetyl value	21.45
Hehner value (corr.)	71.0
Thiocyanogen number	55.5

The Reichert–Meissl and Polenske numbers show small amounts of glycerides of volatile acids.

Examination of Unsaturated Acids.—The unsaturated acids were separated by the lead salt–ether method. The iodine number of the unsaturated acids was 85.6; the neutralization value, 195.6; and the mean molecular weight, 287.8.

Bromination of the unsaturated acids failed to yield ether-insoluble hexabromides, indicating the absence of linolenic acid.

Examination of the Saturated Acids.—The saturated acids were esterified and the mixed methyl esters distilled *in vacuo*. The results are given in Table II.

TABLE II.—RESULTS OF ANALYSIS OF THE FRACTION OBTAINED BY DISTILLING METHYL ESTERS OF SATURATED ACIDS OF OIL FROM "GUSANOS DE MAGUEY"

Temperature, °C.	162–170
Pressure, mm.	4
Iodine number	4.3
Saponification values of esters of saturated acids	205.3
Esters of unsaturated acids, %	2.99
Esters of saturated acids, %	97.01
Mean mol. wt. of esters of saturated acids	273.3
Composition of methyl esters of saturated acids, %:	
Palmitate	89.3
Stearate	10.7

The iodine numbers and saponification values of the distilled fraction were determined, and the mean molecular weight of the esters calculated according to Baughman and Jamieson (5). These results are also given in Table II.

To confirm the data in Table II, the acids were isolated from the distillate and crystallized from 59% ethyl alcohol. An acid melting at 63–64° C. was obtained, which was considered to be evidence of palmitic acid.

Using the thiocyanogen number together with the Hanus iodine number a calculation of the percentages of the glycerides in the oil was made:

Acid	Glyceride, %
Linoleic	4.3
Oleic	60.1
Palmitic	30.0
Stearic	3.6

SUMMARY

A study has been made of the composition of the glycerides of the oil from "gusanos de maguey." The oil consists of the glycerides of linoleic acid (4.3%), oleic acid (60.1%), palmitic acid (30.0%), stearic acid (3.6%). The unsaponifiable matter amounts to 2.0%.

REFERENCES

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(3) Association of Official Agricultural Chemists, "Methods of Analysis," Fifth edition, p. 423.

(4) Hodgman, "Handbook of Chemistry," 1939, p. 858.

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Pharmacological Interactions of Cobra Venom and Thiamine*

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The present investigation was stimulated by long consideration of the profound effect which cobra venom and vitamin B_1, respectively, exert on the central nervous system. The use of cobra venom in clinical therapeutics has been developed in the last eight years by French investigators (1, 2, 3) in Europe, in the United States by Macht (4, 5, 6, 7) and his collaborators, by Chopra and Chowhan (8, 9) in India, and Bullrich (10) and his school in Argentina. Injected in small doses, cobra venom produces marked analgesia and suitable preparations of the drug were first employed for relief of intractable pains of patients in the last stages of malignant disease. Macht (11) and his co-workers have shown experimentally that this relief of pain is not due to a peripheral effect on nerve endings or nerve fibers but to a direct action of the drug on the brain and that the hypothalamus is the center of cobra venom analgesia. Neurotoxin is the constituent of cobra venom which is responsible for the relief of pain. As compared with venoms of vipers, cobra venom is peculiarly rich in neurotoxin and the preparation of this drug now used in the United States is manufactured by these laboratories. Virtually it is a solution of the neurotoxic principle of cobra venom, free from the hematoxins, proteins and other harmful constituents of the crude secretion. The latest work on the chemistry of cobra neurotoxin indicates that it is not a protein and not an alkaloid but is apparently closely related to the alkaloids

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