

XVI.—*The Volatile Constituents of the Wood of Goupia tomentosa.*

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Goupia tomentosa is a large tree growing in British Guiana, where it is known as "Kabucalli," and used in the colony for boat-building; it has recently been sent with other timbers by the Government of the Colony to the Scientific Department of the Imperial Institute, so that its general merits as a timber might be ascertained. The timber has been submitted to mechanical tests by Professor Unwin, F.R.S., in the course of an examination of the various timbers of British Guiana which he has conducted for the Imperial Institute. An account of these tests has been published (*Imperial Institute Journal*, 3, p. 51).

When the log sent from the colony was cut, the wood was seen to be reddish, very hard, with a fine, close grain. When first cut, it emitted a strong odour resembling that of valeric acid, and when shaved with a plane, the cut surface became covered with a thin film of oil. On account of these peculiarities, it was decided to examine its chemical constituents; for this purpose, the wood was cut up into fine shavings, which were at once placed under water, and, after standing about

12 hours, were steam distilled. The distillate was then concentrated by steam distillation, and the process repeated until fatty particles began to separate from the distillate; the liquid was now shaken with ether, and the ethereal solution dried with calcium chloride and distilled. In this way, a dark-coloured oil was obtained, which became semi-solid on cooling; this was dissolved in boiling alcohol, and decolorised with animal charcoal; on cooling, the filtered solution deposited a colourless, fatty substance, which was obtained in small needles by repeating the process. When pure, it melted at 45° ; it distilled under reduced pressure, and was slowly dissolved by alkaline solutions, and reprecipitated from them by acids. A combustion of the pure material gave the following result.

0.1624 gave 0.4281 CO_2 and 0.1783 H_2O . C = 72.04; H = 12.19 percent.

Lauric acid, $\text{C}_{12}\text{H}_{24}\text{O}_2$ requires C = 72; H = 12 per cent.

A sodium salt was prepared by exactly neutralising an alcoholic solution of the acid with alcoholic soda and evaporating the solution in a vacuum desiccator over potash. A white precipitate slowly separated, and this, on analysis, gave the following result.

0.142 gave 0.0450 Na_2SO_4 . Na = 10.2 per cent.

$\text{C}_{12}\text{H}_{23}\text{O}_2\text{Na}$ requires Na = 10.4 per cent.

The substance therefore agrees in composition and properties with *lauric acid* (m. p. 43.6°).

This acid occurs, usually as the glyceride, in many plants, but notably in the oils obtained from the fruit of *Laurus nobilis* and *Cocos nucifera*. As lauric acid is only slightly volatile in steam, its isolation by steam distillation is extremely tedious, and having identified it, an attempt was made to obtain it by extracting the wood shavings with ether; this, however, was not found to be feasible, owing to the large amount of resin also removed by the ether, and from which it is very difficult to isolate the lauric acid by crystallisation.

The aqueous distillate left after extraction with ether was made strongly alkaline with solution of soda, evaporated to dryness over the water bath, and then acidified with dilute sulphuric acid; the oil which separated was removed by ether, the ethereal solution dried with calcium chloride, the ether distilled off, and the residue fractionated several times; in this way, three fractions were obtained, boiling respectively at about 46° , 150° , and 206° .

The first of these fractions was very small; it had a pungent odour, and its aqueous solution reduced silver nitrate and mercuric chloride. It probably, therefore, contained *formic acid*, but enough could not be obtained for complete identification.

The fraction boiling at about 150° was dissolved in dilute soda

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solution and the solution evaporated; two fractions of crystalline sodium salt were obtained. These were converted into the silver salts, the second fraction of sodium salt being precipitated in two portions with silver nitrate; the silver salts, on analysis, gave the following numbers.

First fraction of sodium salt gave a silver salt containing 48.6 per cent. Ag.

Second fraction of sodium salt gave two fractions of silver salt, A and B. A, containing 49.9 per cent. Ag; B, containing 50.6 per cent. Ag.

In a second experiment, in which a larger amount of sodium salt was obtained, the crystals were separated into two fractions, and these again fractionated by addition of silver nitrate solution; the first fraction of silver salt contained 48.3 per cent. Ag. From the results of these analyses, and the properties of this fraction of oil, it evidently consists of a mixture of *isovaleric* and *caproic acids*.

Silver isovalerate requires 51.4 per cent. Ag.

Silver caproate requires Ag = 48.2 per cent.

The fraction of oil boiling at 206°, which constituted about 60 per cent. of the whole, had all the properties of *normal hexoic (caproic) acid*, but it was not quite pure, since on conversion into the sodium salt and fractional precipitation of the solution of this salt with silver nitrate, some fractions containing 56 to 58 per cent. of silver were obtained, but the greater portion of salt contained 47.82 per cent. of silver. The oil was therefore redistilled very slowly, and the first portion, which boiled almost constantly between 206° and 209°, collected. Normal caproic acid boils at 206°, and silver caproate contains 48.2 per cent. of silver.

The oily residue left after the redistillation of the second fraction of oil became coloured on further heating, and it was strongly acid to litmus. The residue was dissolved in ether, decolorised by animal charcoal, and the ether distilled off; the oil, on being allowed to stand for some months, deposited a small quantity of a crystalline substance. These crystals were removed, dried first on a porous tile and then at 100°. The substance melted at 180°, and sublimed when heated gently in a test tube; it was acid to litmus. The whole of the material obtained was converted into the silver salt, and the latter ignited, with the following result.

0.0082 gram gave 0.0051 Ag. Ag = 62.2 per cent.

Silver succinate requires Ag = 64.4 per cent.

This agreement is as good as can be expected, since the quantity

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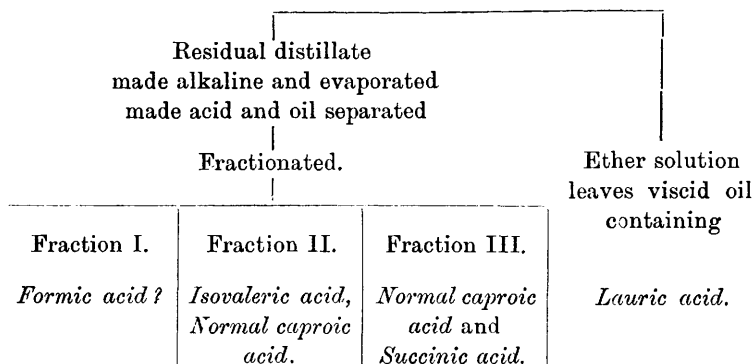
available for analysis was so small that a difference of one unit in the fourth decimal place causes an error of 1 per cent. in the result.

The properties of the substance leave little room for doubt that it is *succinic acid* (m. p. 180°).

SUMMARY OF SEPARATION OF CONSTITUENTS.

Wood, steam distilled.

Concentrated distillate extracted with ether.



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