with increase in the length of the side chain; and that the normal chain compound is more active than the corresponding branched chain derivatives. They differ, however, in the effect of position isomerism, as shown by the three isomeric hydroxyphenyl butyl sulfides. In marked contrast, the three isomeric butylphenols[4] show no variation whatever.

This phase of the subject will be dealt with more fully in a later paper.

Summary

1. A series of hydroxyphenyl alkyl sulfides has been prepared.
2. A preliminary bactericidal study of these compounds has been made, which indicates that they are more powerful than corresponding alkyl phenols.
3. The investigation of phenol alkyl sulfides is being continued in this Laboratory.

[4] Read and Miller, THIS JOURNAL, **54**, 1196 (1932).

PHILADELPHIA, PENNSYLVANIA

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[CONTRIBUTION FROM THE DEPARTMENT OF CHEMISTRY, STANFORD UNIVERSITY]

Capric Acid from the Seed Fat of the California Bay Tree

BY C. R. NOLLER, I. J. MILLNER AND J. J. GORDON

In 1882 Stillman and O'Neill[1a] reported the isolation of an eleven carbon acid, which they called "umbellulic acid," from the seed fat of the California laurel or bay tree (*Umbellularia californica*). Lewkowitsch[2] states that "umbellulic acid" is really lauric acid, but the only other reference to work on this fat that we have been able to find is a further note by Stillman and O'Neill[1b] stating that their previous work was in error and that they were dealing with a mixture of fatty acids, one of which was lauric acid.

Because their original analyses indicated an eleven carbon acid, it seemed likely to us that they were dealing with a mixture of capric and lauric acids. Accordingly a quantity of the seeds was collected, shelled and ground through a food chopper, and the fat extracted with hot carbon tetrachloride. On evaporating the solvent, the fat to the extent of 58.5% of the ground nuts was obtained, a yield almost identical with the 59% previously reported.[1a] The physical and chemical constants of the fat were as follows: m. p. 28–30°; saponification number, 275.1; unsaponifiable material, 2.1%; iodine number, 5.7; acid number, 2.8. The fat showed no optical rotation in chloroform solution.

The methyl esters of the fatty acids were prepared by alcoholysis of 530 g. of fat and separated by four fractional distillations at a pressure of 17.5 mm. using a lagged 30-cm. column of the Vigreux type. There were obtained two main fractions boiling at 119–122° and 145–147°, which weighed 133 g. (28%) and 256 g. (54%), respectively. Saponification equivalents of 187 and 213 indicated that they consisted of pure methyl caprate and pure methyl laurate. The remainder of the material, 84 g. (18%), was almost uniformly distributed among eight other fractions distilling from below 115° to above 153°.

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[1] (a) Stillman and O'Neill, *Am. Chem. J.*, **4**, 206 (1882): (b) *ibid.*, **28**, 327 (1902).

[2] Lewkowitsch, "Oils, Fats and Waxes," 6th ed., 1921, Vol. I, p. 158.

In order to get a better estimation of the relative amounts of the acids present in the fat, the saponification equivalents of all the fractions were determined. Assuming the intermediate fractions to be composed solely of the pure higher and lower boiling main fractions, the mixed esters were found to consist of 0.9% methyl caprylate, 37.5% methyl caprate[3] and 61.6% methyl laurate. Fractionation of a 1630-g. lot of fat gave almost identically the same results.

Although the iodine value would indicate the presence of about 6% of oleic acid, the saponification equivalents of the highest fractions of the methyl esters gave no indication of any acids of higher molecular weight than lauric. The presence of caprylic acid and absence of lower acids were shown by fractionating at atmospheric pressure all the fractions below methyl caprate from the total 2160 g. of fat. A pure methyl caprate fraction was isolated but no lower boiling ester.

The three acids were positively identified by saponifying the esters and converting the free fatty acids into the amides. These showed no depression in melting point when mixed with the amides prepared from specimens of caprylic, capric and lauric acids obtained from coconut oil.

Summary

The chemical constants of the seed fat of the California bay tree have been determined and the composition of the free fatty acids studied by fractionating their methyl esters. This showed that the fat is an excellent source of capric acid since the free fatty acids consist of approximately 1% caprylic, 37% capric and 62% lauric acids.

(3) This is by far the best source of capric acid. For other sources see Taylor and Clarke, THIS JOURNAL, **49**, 2829 (1927); Marvel and Hager, *ibid.*, **46**, 726 (1924); Kao and Ma, *J. Chem. Soc.*, 2047 (1931).

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The Preparation of Furil

BY W. W. HARTMAN AND J. B. DICKEY

In recent years furil dioxime has found favor as an analytical reagent. A new method for the preparation of furil from inexpensive materials should prove to be of interest.

Furil can be prepared by the oxidation of furoin in alkaline alcoholic solution with oxygen,[1] iodine[2] and nitrobenzene.[3] The method described in the Experimental Part is an application of a method for the preparation of benzil.[4]

Experimental

Furoin.—The furoin used was prepared in slightly improved yields[5] by a modification of the method of Fischer.[6] In a 22-liter flask fitted with a mechanical stirrer, an

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(1) Fischer, *Ber.*, **13**, 1337 (1880); *Ann.*, **211**, 218 (1882).

(2) Corson and McAllister, THIS JOURNAL, **51**, 2822 (1929).

(3) Nisbet, *J. Chem. Soc.*, 3121 (1928).

(4) Clarke and Dreger, *Org. Syn. Coll.*, **1**, 80 (1932); Fischer, *Ann.*, **211**, 214 (1932).

(5) The best yield reported previous to this is 25%.

(6) Fischer, *Ann.*, **211**, 218 (1882).