

ON HEPTANE FROM CONIFEROUS TREES.

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IN 1879, Thorpe¹ showed that the liquid at that time sold in San Francisco under the name of abietene, and there largely used as a cleansing agent and insecticide, consisted of nearly pure, normal heptane. This substance had been previously examined by Wenzell², and was by him reported to be obtained by distilling the exudation of *Pinus Sabiniana*. At the present time this substance is not on the market, though certain abietene cough-remedies find a limited sale. These latter preparations were shown by Lemmon³ to be derived from *Pinus Jeffreyi*.

The occurrence of a normal hydrocarbon of the paraffin series as a vegetable product is of unusual interest and should be fully confirmed. The above facts would seem to warrant a reexamination of the exudations of the species named, as well as those of the other numerous Pacific Coast conifers. The difficulty of obtaining material in sufficient quantity and of unquestioned authenticity for such an investigation is a serious one, as many of the species yield only small amounts of such exudations, and many are difficult of access. The author has been able at various times to collect small samples of such material, representing five different species, and has made such examination of these as the nature of the material would permit. The samples are described as follows:

1. *Pinus Jeffreyi*.—Collected at Lake Tahoe from stumps of recently cut trees. The fresh material consists of a clear, white liquid of about the consistency of glycerine, and has a pleasant auran-tiaceous odor; on standing, it rapidly thickens, loses its pleasant odor and eventually forms a hard, yellow colophony. On distillation with steam the sample yielded about three per cent. of a mobile colorless liquid. This distillate was purified by treatment with concentrated sulphuric acid, washed with water, dehydrated with calcium chloride and redistilled. The greater portion distilled over between 96° and 98°, but some portions boiled as high as 112°.

¹ *J. Chem. Soc.*, **35**, 297; *Am. Chem. J.*, **1**, 155.

² *Am. J. Pharm.*, 4th series, **2**, 97.

³ *San Francisco and Pacific Druggist*, **1**, 17.

2. *Pinus Sabiniana*.—Collected at the Hoopa Valley from incisions made in the trunks of the trees. The secretion closely resembles that of *P. Jeffreyi* but is more viscous. It yielded about 10 per cent. of a mobile distillate which was purified as that obtained from the previous sample.

3. *Pinus Sabiniana*.—A sample of the hardened resin naturally secreted from the trunk and branches. It was collected in Lake County by Mr. W. H. Rees, and was treated the same as the previous samples.

4. *Pinus Murryana*.—Collected at Lake Tahoe from recently peeled, but still living, trees. It was of a light yellow color, a semisolid consistency, and had a pronounced turpentine odor. On distillation it yielded a liquid of pronounced terpene odor, most of which distilled over between 153° and 160° , but portions of it boiled as high as 180° . The former fraction was redistilled and the portion boiling between 158° and 160° used for the determinations enumerated below.

5. *Abies Concolor var. Lowiana*.—Obtained at Lake Tahoe from the cavities in the outer bark. It is a light yellow oleo-resin which closely resembles Canada balsam (from *Abies Canadensis*) and could undoubtedly be used as the equivalent of it. It yielded 20 per cent. of a terpene-like liquid, most of which distilled between 155° and 160° .

6. *Pseudotsuga Taxifolia*.—The hardened natural exudation collected in Mendocino Co. On distillation, it yielded about 9 per cent. of a terpene-like liquid. On redistilling, the larger part passed over between 157° and 160° the remainder between 160° and 165° .

In the following table are tabulated the results obtained from an examination of the distillates referred to above. Corrections for varying barometric pressure, etc., have not been applied since the small amounts of liquid obtained (from 8 to 20 cm.) did not permit of a satisfactory purification of the samples. A comparison of the figures there reported with the numbers representing the normal constants of heptane on the one hand, and of the various terpenes on the other, gives sufficient evidence of the fact that both *P. Jeffreyi* and *P. Sabiniana* yield normal heptane, while the other species mentioned yield terpenes

similar to those obtained from other coniferous trees. The exact character of the terpenes present can not be determined from the data presented.

Sample No.	Boiling-point.	Sp. gr. at 15°.	Index of refraction at 15°.	Specific rotation.	Vapor-density.	Iodine absorption.
1	96°-97°	0.6863	1.3905	0	..	0
2	96°-97°	0.6840	1.3887	+2'	..	0
3	97°	0.6860	1.3902	+3'	3.54	0
4	158°-160°	0.8640	1.4765	-15° 23'	..	high
5	155°-160°	0.8578	1.4738	-7° 9'	..	very high
6	157°-160°	0.8583	1.4754	-41° 12'	..	high

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ON THE HEAT OF COMBUSTION AS A FACTOR IN THE ANALYTICAL EXAMINATION OF OILS; AND THE HEATS OF COMBUSTION OF SOME COMMERCIAL OILS.¹

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INTRODUCTION.

THE accuracy, the rapidity of manipulation, and the moderate cost of the bomb calorimeters now in use, have made it practicable for chemists to employ the determination of heat of combustion (or calorific power) not only for the valuation of fuels, but as an aid to, or check upon, the chemical analysis of other organic materials. The comparison of the values actually determined by the calorimeter with those calculated for the constituents found by analysis has been used for some years as a check upon the accuracy of the analyses of foods and physiological products, especially by Atwater and his associates at Middletown, Conn., and by Wiley and Bigelow in the U. S. Department of Agriculture.

It is evident that this method of checking the results of proximate analysis can be applied in any case in which the calorific values of the determined constituents are accurately known. The determination of heat of combustion may also give direct

¹ A considerable part of the work here recorded was carried out in the laboratories of Wesleyan University for the privileges of which, as well as for the use of the bomb calorimeter employed, we are greatly indebted to Prof. W. O. Atwater.