

HESP—A New Essential Oil From the Acid Hydrolysate of Spent Sandal Heartwood

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In India, *Santalum album* L. is mainly exploited for its scented heartwood and the fragrant essential oil obtained from it. Sandalwood oil, which is the most important Indian essential oil of extensive perfumery use, is obtained from the heartwood in 2.5-6.5% yield depending on the age of the wood and its color.¹ Previous studies have shown that the oil was found to contain 90% α - and β -santalol, 6% hydrocarbons (α -santalene, β -santalene and epi- β -santalene),² aldehydes (tricycloekasantalal, exo-norbicycloekasantalal and teresantalal), ketones, phenols, acids and heterocyclic compounds.³⁻⁵

In the present study, the utilization of the spent (exhausted) sandalwood powder from steam distillation as a source of an acid hydrolysate oil is examined. It has been found that hy-

drolysis of the non-volatile portion of an acetone extract of the spent sandalwood powder with methanolic hydrochloric acid followed by steam distillation gave rise to a new essential oil (1.2% yield) which we have called HESP, the acronym for hydrolyzed exhausted sandalwood powder.

Experimental

Five hundred grams of sandal heartwood powder was distilled for 18 hours and 3.5% of sandalwood oil was obtained. The spent powder from distillation was air-dried and then, once dry, was soxhlet extracted (hot) with 1 liter of acetone for 6 hours. After removal of the acetone, the extract was distilled for 10 hours to remove any traces of sandalwood oil. Next the residual extract was extracted with ethyl acetate and then the solvent

Table I. Comparative Physicochemical Properties of HESP Oil and Sandalwood Oil

Property	HESP Oil	Sandalwood Oil
Appearance	A yellow mobile liquid	A pale yellow viscous liquid
Aroma	Strong and medicinal	Woody, sweet, tenacious
Refractive Index (26°C)	1.509	1.504
Specific Gravity (26°C)	0.994	0.971
Optical Rotation (26°C)	-12°C 48 ¹	-18° 10 ¹
Acid Value	2.1-2.3	1.9-2.2
Ester Value	53-55	13.5-16
Ester Value after Acetylation	138-140	210-215
Solubility 69% Aqueous Ethanol (30°C)	Insoluble even at 1:10 vols	1:5 vols

was stripped from the soluble portion to leave a dark-red viscous liquid of non-volatile material in 4.5% yield. To 10 g of this red viscous extract, 20 ml of methanol and 10 ml of concentrated hydrochloric acid was added and the mixture was refluxed for 3 hours. Finally, after evaporation of the solvent, the residue was steam distilled for 18 hours and the strongly scented HESP oil was obtained in 1.2% yield on diethyl ether extraction of the distillate. It was found that on silica gel chromatography, the acetone extract of the spent heartwood powder gave a sandal note possessing fraction in the benzene elute and a purely non sandal note fraction; the latter, upon acid hydrolysis, gave HESP oil in a somewhat lower yield.

The physico-chemical properties of HESP oil were determined. A comparison between the properties of HESP oil and a commercial sandalwood oil can be seen in Table I. Finally, a gas chromatographic profile of HESP oil revealed that it was very different from the typical sandalwood oil of commerce.

Discussion

Marked differences in the physicochemical properties of HESP oil and sandalwood oil (as shown in Table I) suggest that the oil obtained from acid hydrolysis of exhausted sandal heartwood is totally new to the field of sandalwood chemistry. The method adopted for the release of oil from spent sandalwood powder is both simple and of potential economic significance because it is an effective way to utilize a material which is currently only used as a binder in the manufacture of incense (joss) sticks. The annual availability of spent heartwood powder is approaching 4000 tonnes which shows the potential importance of HESP oil.

Further studies on HESP oil are currently underway. In particular, its pharmacological action and chemical composition are topics of independent scientific investigations.

References

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