HAWS and HEB—Two New Essential Oils from Spent Agarwood and Bursera Husk

By K. H. Shankaranarayana, K. Parthasarathi and S. N. Rai, Sandal Research Centre, Bangalore, India

The trunk of *Aquilaria agallocha* Roxb yields the pathological product, agarwood (aloewood), a strong aromatic resinous wood formed in the tree after infection by a fungus. Agar oil, obtained by steam distillation of agarwood powder, is a precious perfume fixative valued much by European perfumers for mixing with their best grade scents. This oil is composed of sesquiterpenic furanoids (dihydroagarofuran, alpha- and beta-agarofuran) and alcohols (agarospirol, agarol).[1-4]

Linaloe oil (Indian lavender) is distilled chiefly from the dried husks of the fruit (berries) of *Bursera penicillata*. Linaloe oil which is produced in India is commonly used by the soap and cosmetic industry.[5-6]

Recently we reported that the hydrolysis of the non-steam volatile portion of the acetone extract of the spent sandalwood (*Santalum album* L.) powder with methanolic hydrochloric acid, followed by steam distillation, provides a new essential oil, HESP, which is demonstrating in our pharmacological studies quite distinctive and valuable drug features.[7] Following the same technique, we have now isolated two more new essential oils, one from the spent agarwood in a yield of 0.3% and the other from the spent *Bursera* husk in a yield of 0.6%. Named, respectively, HAWS and HEB, the acronym for Hydrolysed Agarwood Spent and Hydrolysed Exhausted Bursera, they possess characteristics totally different from those of agar and linaloe oils. The earlier method, which was developed for higher recovery of sandalwood oil from concretes by incorporation of polyethylene glycol 200, was found to be equally applicable in the case of agarwood.[8] It was found that the acetone extract of agarwood power upon steam distillation in the presence of polyethylene glycol 200, yields 25% more agar oil than that obtained conventionally from a direct steam distillation process. In the present article, we describe the process of isolation of HAWS and HEB oils along with their physicochemical properties.

Experimental

HAWS

First, 1000 gms agarwood powder was soxhlet extracted (hot) with 2 liters of acetone for 10 hours. After distilling off the solvent, the dark resinous concrete was treated with 20 ml polyethylene glycol 200 and 200 ml water. On steam distillation of the mixture for 20 hours an oil in yield of 0.95% was obtained. From the residual solution, water was completely removed by distillation under reduced pressure. The residual material was then subjected to hot refluxing for 4 hours with 30 ml methanol and 15 ml concentrated hydrochloric acid. Finally after

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Table I. Comparative Physicochemical Properties of HAWS, Agar, HEB and Linaloe Oils

Property	HAWS	Agar	HEB	Linaloe
Appearance	Pinkish yellow, thick liquid	Golden yellow, thick liquid	Golden yellow, mobile liquid	Pale yellow, mobile liquid
Aroma	Intensive sweet, Medicinal	Strong pleasant Balsamic	Mild, pleasant Herbal	Sweet, fragrant, Floral
Refractive Index (28° C)	1.522	1.512	1.465	1.456
Specific Gravity (28° C)	0.972	0.996	0.909	0.887
Optical Rotation (28° C)	-10°50'	-17°10'	-3°40'	-5°50'
Solubility in 70% Ethanol (28° C)	1 in 1 vol.	1 in 1.5 vol.	Insoluble even at 1:10 vol.	1 in 2.9 vol.
Acid value	8.6	6.9	3.4	0.9
Ester value	12.3	23.9	92	219

evaporation of the solvent, the residue was steam distilled for 20 hours and the pinkish yellow highly scented HAWS oil was obtained in 0.3% yield on diethyl ether extraction of the distillate.

HEB

When 500 gms of *Bursera* husk (dried outer pericarp of the berries) was distilled for 30 hours, 13% of linaloe oil was obtained. The spent husk was air dried and the soxhlet extracted with one liter of acetone for 10 hours. After removal of the solvent, the brownish black semisolid mass was treated with 20 ml methanol and 10 ml hydrochloric acid, and the mixture was refluxed for 3 hours. The solvent was evaporated and the residue was steam distilled for 30 hours to yield 0.6% of pleasant HEB oil.

The physicochemical properties of HAWS and HEB oils were determined. A comparison between the properties of HAWS and agar, and HEB and linaloe oils can be seen in Table I. The gas chromatographic pattern was also found to be quite different for each oil.

Discussion

Noteworthy differences in the physicochemical properties of HAWS and agar oil, and HEB and linaloe oil, suggest that the oils HAWS and HEB obtained from the acid hydrolysate of the acetone extract of spent agarwood and *Bursera* husk are quite new. Thus, the original method developed for the release of HESP oil from exhausted sandalwood powder proves to be equally applicable for releasing new essential oil from the spent agarwood and spent *Bursera* husk. The methodology described above provides scope for further exploration of novel and commercially significant odorous products. These products are found in the spent essential oil-free materials derived from a multitude of aromatic species, by use of a simple hydrolysis process involving methanol and hydrochloric acid.

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Address correspondence to K. H. Shankaranarayana, Sandal Research Centre, Malleswaram, Bangalore-560003, India.

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