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NOTE

Physico-chemical investigation of the essential oils and extracts of the rhizomes of *Alpinia officinarum* Hance and berries of *Juniperus communis* Linn.

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Abstract : The present paper reports isolation of essential oils from the rhizomes of *Alpinia officinarum* and berries of *Juniperus communis*. The specific gravities, specific rotation, acid values, ester number before and after acetylation, acetyl values and iodine values of the oils are also reported.

Keywords : *Alpinia officinarum*, *Languas officinarum*, *Juniperus communis*, lesser galangal, Chinese ginger, Juniper berries.

The plant *Alpinia officinarum* Hance, syn. *Languas officinarum* (Lesser galangal or Chinese ginger), known as *Chhota kolanjana* in Hindi, belongs to the family Zingiberaceae. Native of China, the plant is cultivated in India in the plains of West Bengal, Assam and in Eastern Himalayas[1]. The rhizome is reported to be a very effective herb that acts mainly on the digestive system, also relieves pain, lowers fevers and controls bacterial and fungal infections[2]. A component galangin is considered a chemopreventive agent[3] and Natarajan and Vembu[4] have reported effect of *Alpinia officinarum* on dermatophytoses. Recently isolation and structural elucidation of some glycosides from the rhizomes have been studied[5]. Very recently some antioxidative components from rhizomes are isolated and characterised by Ly *et al.*[6].

Juniper berries are the fruits of *Juniperus communis* (Cupressaceae). Known as *Haubera* in Hindi, the plant is a dense, more or less procumbent shrub, found in Himalayas from Kumaon westwards at altitudes of 5000-14000 ft[7]. Dating as far back as 1550 BC, a remedy to treat tapeworm by Juniper berries was found on papyrus from ancient Egypt. In many parts, the berries are burned in temples as part of purification ceremonies[8]. Hypoglycaemic activity of berries is also reported[9]. They are even antifungal, emmenagogue and insect repellent.

Looking to the wide and diversified applications of the two materials and since both are native and yield essential oils, we carried out the isolation of essential oils and the fixed oils from the two plant materials and undertook the study of their meaningful physical and chemical properties to work out specification standards. Earlier such useful studies have been carried out for seeds of *Embelia ribes*[10] and seeds of *Nelumbo nucifera* and *Strychnos potatorum*[11]

Results and discussion

Yields and physical properties of the essential oils and extracted materials are given in Table 1 while the presence of specific natural products are summarized in Table 2.

Both plants, i.e. the rhizomes of *Alpinia officinarum* and berries of *Juniperus communis* on hydrodistillation yield essential oils. The dextro rotation of Indian Juniper oil is an important observation. Oil obtained from the berries is usually found to be laevo rotatory[12]. Only the Norwegian sample is reported to be dextro rotatory (+33° to 41°). In India only the fruits obtained from Hoshiarpur (Punjab) market are reported[13] to be dextro rotatory (+20.8°). Lesser galangal oil has comparatively higher saponification, acetyl and hydroxyl values. Iodine value of this oil is high, indicating enough unsaturation. Certain steroids and sterols are present in it while they are absent in juniper oil. Because of sharp characteristic odour and solubility in alcohol, the two essential oils can be used in perfumery, not much free acids are present as pointed out by low acid value. The acetyl value indicates the presence of various adventitious alcoholic substances. Other substances found to be present in the isolated essential oils are certain aldehydes and the furfural. Test for presence of flavonoids is also positive.

Table 1. Results of the analysis of the essential oil and extracted materials obtained through petroleum ether, diethyl ether and ethanol

Properties	Essential oil	Extraction through		
	A. officinarum/ *J. communis*	Petroleum ether *A. officinarum*/ *J. communis*	Diethyl ether *A. officinarum*/ *J. communis*	Ethanol *A. officinarum*/ *J. communis*
Colour of decoction		Light yellow/ Light greenish yellow	Reddish brown/ Green	Reddish brown/ Greenish brown
Colour of extracted material	Greenish yellow/ Colourless transparent	Yellowish brown/ Yellowish green	Dark brown/ Dark green	Dark'reddish brown/ Dark green
State	Liquid/ Liquid	Viscous oily liquid/ Viscous oily liquid	Highly viscous oily/ Highly viscous oily	Semisolid/ Semisolid
Odour	Eucalyptus-cardamom-ginger type/Characteristic sharp appealing	Characteristic sharp/ Characteristic sharp	Characteristic sharp/ Characteristic sharp	Characteristic sharp/ Characteristic sharp
Yield (% w/w)	0.83/2.21	2.26/6.12	5.95/9.70	16.04/14.12
Specific gravity (20°/20°)	0.9220/0.8213	1.03/0.9716	1.094/0.9931	-
Refractive index	$1.454_{(18°)}$/ $1.455_{(20°)}$	$1.341_{(18°)}$/ $1.488_{(20°)}$ (1% ethanolic soln.)	$1.350_{(18°)}$/ $1.478_{(20°)}$ (1% ethanolic soln.)	$1.364_{(20°)}$/ $1.492_{(20°)}$ (1% ethanolic soln.)
Optical rotation (20°)	+9°45′/+10.0°	-	-	-
Acid value	4.49/5.43	42.64/73.7	60.59/77.5	83.03/88.42
Saponification value	22.44/10.24	114.8/107.0	143.1/98.6	204.8/122.6
Saponification value after acetylation	65.45/28.33	151.03/171.8	191.4/122.9	270.6/192.3
Acetyl value	43.74/18.22	39.58/70.4	54.15/26.2	77.77/32.43
Hydroxyl value	45.23/18.47	40.63/74.34	56.44/26.73	82.60/30.28
Iodine value	65.40/34.6	77.46/59.4	71.32/69.7	23.85/26.32

High yields in ethanol extract indicate a high proportion of ethanol soluble substances in rhizomes of *A. officinarum* and seeds of *J. communis*. These substances seem to be certain aldehydes, furfural, steroids, flavonoids etc.

Extractions of the rhizomes of *A. officinarum* and berries of *J. communis* through the nonpolar solvent petroleum ether and the slightly polar solvent diethyl ether yield oily materials. Both extracts seem to possess some fatty oils and their specific gravities are higher than the obtained essential oils. These oily materials have high iodine value in the case of *A. officinarum* and moderate in the case of *J. communis*, indicating the presence of sufficient amount of unsaturated fatty esters.

Experimental

Authenticated rhizomes of *A. officinarum* were procured from Kolkata and berries of *J. communis* from Dehradun. A specimen of each has been deposited in the herbarium of plant medicine section of the chemistry department of the university under the registry nos. 12/15 and 07/15 and available for inspection. The procured rhizomes and berries were washed with lukewarm water and dried in shade.

Essential oils were isolated by hydrodistillation using Clevenger apparatus. Respectively 0.90 mL (0.83 g) and 2.677 mL (2.21 g) of essential oils were obtained from *A. officinarum* and *J. communis*. For solvent extracted materials, 100 g crushed material, in both cases, was kept in a sufficient quantity (500 mL) of petroleum ether in a Soxhlet extractor for 48 h at room temperature (27 °C). Respectively the brown and green coloured extracts

Table 2. Results of the analysis of the essential oil and extracted materials for different functional groups and specific natural products

Properties	Essential oil	Extraction through		
	A. officinarum/ *J. communis*	Petroleum ether *A. officinarum*/ *J. communis*	Diethyl ether *A. officinarum*/ *J. communis*	Ethanol *A. officinarum*/ *J. communis*
Functional group :				
Ketonic	-ve/-ve	-ve/-ve	-ve/-ve	-ve/-ve
Aldehydic	+ve/+ve	+ve/+ve	+ve/+ve	+ve/+ve
Phenolic	+ve/+ve	-ve/-ve	-ve/-ve	-ve/-ve
Carboxylic	-ve/-ve	-ve/-ve	-ve/-ve	-ve/-ve
Alcoholic	+ve/+ve	+ve/+ve	+ve/+ve	+ve/+ve
Specific natural products :				
Proteins				
Xanthoproteic test	-ve/-ve	-ve/-ve	-ve/-ve	-ve/-ve
Biuret test	-ve/-ve	-ve/-ve	-ve/-ve	-ve/-ve
Alkaloids				
Mayer's test	-ve/-ve	-ve/-ve	-ve/-ve	-ve/-ve
Carbohydrates				
Molisch's test	-ve/-ve	-ve/-ve	-ve/-ve	-ve/-ve
Carotenoids				
Sulphuric acid test	-ve/-ve	-ve/-ve	-ve/-ve	-ve/-ve
Flavonoids	+ve/+ve	+ve/+ve	+ve/+ve	+ve/+ve
Steroids and sterols				
Salkowski reaction	+ve/-ve	+ve/+ve	+ve/+ve	+ve/+ve
Furfural	+ve/+ve	+ve/+ve	+ve/+ve	+ve/+ve

were obtained from the rhizomes of *A. officinarum* and berries of *J. communis*. In each case fresh quantity of petroleum ether was added again to the same material and kept for another 48 h. For both materials the process was repeated till the extract became colourless. All the extracted solutions obtained from *A. officinarum* were mixed and petroleum ether separated by vacuum distillation, yielding 2.26 g yellowish brown viscous oily liquid material. Similar procedure for *J. communis* yielded 6.12 g of yellowish green viscous liquid material. Similar procedure, as for petroleum ether, was carried out for obtaining diethyl ether and ethanol extracted materials. 5.95 g dark brown highly viscous liquid from rhizome of *A. officinarum* and 9.70 g dark green highly viscous oily liquid from seeds of *J. communis* were obtained as ether extracted materials. Respectively 16.04 g dark reddish brown and 14.12 g dark brown semi solid materials were obtained from *A. officinarum* and *J. communis* as ethanol extractd materials.

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