



Physico-chemical investigation of variously extracted medicinally useful materials from the rhizomes of *Alpinia calcarata* Rosc. of Kumaun Region, India

Durvesh K Tyagi¹✉ and Nikhil Kumar²

Received: 05.01.2013

Accepted: 27.03.2013

Abstract

Extractions of medicinally useful materials from the rhizome of *Alpinia calcarata* Rosc. separately through solvents of decreasing polarities, viz., water, ethanol, diethyl ether and petroleum ether are also carried out. In the rhizome of *A. calcarata* the water extract has maximum yield. Odours vary in differently extracted materials. Diethyl ether and petroleum ether extracted materials show a sufficient degree of unsaturation. All of the solvent extracted materials are dextro rotatory. Specific gravities, refractive indices, acid, saponification and iodine values of these variously extracted materials are also reported. Tests for the presence of specific natural products indicate the presence of steroids and flavonoids in most of the materials. Some of them possess carbohydrates also.

Keywords: *Alpinia calcarata*, Zingiberaceae, medicinal plants

Introduction

The plant *Alpinia calcarata* Rosc., (Syn. *Alpinia bracteata* Rosc., *Renealmia calcarata* Haw) also belongs to Zingiberaceae family. It is called *Toroni* in Oriya and *Kattchenuin* in Malayalam (Pullaiah, 2006). *A. calcarata* Rosc. is a slender, rhizomatous herb, 60-120 cm in height, often cultivated in gardens in eastern and southern India for its white flowers (The Wealth of India, 1985). Recently the efficacy of essential oil of the plant and its major constituent, 1,8-cineole, as protectants of cowpea against *Callosobruchus maculatus* has been reported (Abeywickrama, 2006). Presence of two bis-labdanic diterpenoids from the rhizomes has been reported by Kong et al. (2004) in a Chinese sample. Looking to the variety of uses, a detailed study of physico-chemical properties of the various solvent extracted materials and essential oils from the rhizomes of these plants and determination of natural product groups seem to be important.

Material and Methods

Authenticated rhizomes of *Alpinia calcarata* were procured from Pantnagar and authenticity verified

Author's Address

¹S.P.R.C. P.G. College Rohalki Kishanpur, Haridwar
E-mail : dhruvtyagi83@gmail.com

²Department of Applied Chemistry, B. S. M College of Engineering, Roorkee

from F.R.I. Dehradun. Specimens have been deposited in the herbarium of Plant Medicine Section of the Chemistry Department of the University under the registry no. 19/15 and available for inspection. The procured rhizomes were washed with lukewarm water and dried in shade.

Extraction through solvents

Extraction through water

100 g of the crushed rhizome were boiled with doubly distilled water for 1 h. The extract was filtered and water was evaporated. 15.4 g dark brown solid material was obtained from *A. calcarata*.

Extraction through ethanol

100 g crushed material was kept in a sufficient quantity of ethanol in a Soxhlet extractor for 72 h. Dark brown decoctions in case of *A. calcarata* were collected. A fresh quantity of ethanol was added again to the same material and kept for another 72 h. Process was repeated till the extract became colourless. All the extracted solutions of a plant material were mixed and ethanol separated by vacuum distillation. 5.25 g dark brown solid was obtained.



Extraction through diethyl ether

Similar procedure, as for ethanol, was carried out. 3.56 g yellowish brown viscous oil was obtained.

Extraction through petroleum ether

Similar procedure, as for ethanol, was carried out. 1.68 g yellowish light brown viscous oil was obtained.

Study of Properties

The specific gravity, refractive index, pH and optical rotation were determined and presence of various possible families of natural product compounds were tested. Acid, saponification and iodine values were determined for essential oil, and also for the various extracted materials using.

Table 1: Results of the analysis of materials obtained by extractions through solvents of different polarities

Properties	Material extracted through			
	Petroleum ether	Diethyl ether	Ethanol	Water
Colour of decoction	Yellow	Yellow	Dark brown	Dark red
Colour of extracts	Yellowish light brown	Yellowish brown	Dark brown	Dark brown
State	Viscous oil	Viscous oil	Solid	Solid
Odour	Spicy	Sweet	Spicy	Sharp spicy
Yield (% w/w)	1.68	3.56	5.25	15.40
pH	5.60	6.60	4.80	5.70
Refractive index (0.025% solution)	1.34	1.33	1.36	1.33
Specific gravity (30°/30°)	0.8662	0.8937	-	-
Optical rotation(25°C) (0.025% solution)	3°28'	2°36'	4°02'	4°05'
Acid value	35.62	31.37	35.37	19.24
Saponification value	168.6	164.2	182.2	83.26
Iodine value	63.32	52.61	15.49	16.36

Table 2: Results of the analysis of the extracted materials for different specific natural products

Specific natural products	Petroleum ether	Diethylether	Ethanol	Water
Carbohydrates				
<i>Molisch test</i> Alkaloids	-ve	-ve	+ve	+ve
<i>Mayer's test</i> Steroids	-ve	-ve	-ve	-ve
<i>Salkowski reaction</i> Carotenoids	+ve	+ve	+ve	-ve
<i>Sulphuric acid test</i>	-ve	-ve	-ve	-ve
Flavonoids Proteins	-ve	+ve	+ve	-ve
<i>Xanthoproteic test</i>	-ve	-ve	-ve	-ve
<i>Biuret test</i>	-ve	-ve	-ve	-ve



the methods described by Garratt (1964), Guenther (1963) and in monographs of I.S.I. (1984). The presence of various possible specific natural products alkaloids, proteins, flavonoids, carbohydrates and carotenoids were tested by usual methods.

Results and Discussion

Yields and physico-chemical properties of extracted materials are described in Table 1, while the results of the presence of specific natural products are summarized in Table 2. Also, all the three oils give positive tests for the presence of aldehydic, ketonic, alcoholic and ester groups. High yield of the material in *A. calcarata* water extract indicates a high proportion of water and hot water soluble substances in the rhizome. These substances seem to be certain aldehydes, carboxylic acids and carbohydrates. Next yield is in ethanol. Besides certain aldehydic compounds and certain steroids and carbohydrates, the ethanol extract contains the flavonoids also. Yield in diethyl ether is slightly less than that in alcohol. However, a comparatively high saponification value indicates the presence of

more of low molecular weight compounds. No carbohydrates and flavonoids are present.

References

- Abeywickrama K, Adhikari AACK, Paranagama P and Ganage CSP, 2006, The efficacy of essential oil of *Alpinia calcarata* (Rosc.) and its major constituent, 1,8-cineole, as protectants of cowpea against *Callosobruchus maculatus* (F.) (Coleoptera: bruchidae), *Canad J Plant Sc*, 86(3): 821-827.
- Garratt DC, 1964, Vol. III, *The Quantitative Analysis of Drugs*, Chapman Hall International, London.
- Guenther E, 1963, *The Essential Oils*, Vol. II., D. Van Nostrand Company, U. S. A.
- I S: 548, 1984, *Indian Standards Institution*, Part-1, New Delhi.
- Pullaiah T, 2006, *Encyclopedia of World Medicinal Plants*, Regency Publications, Vol. 1., New Delhi, p. 124.
- Kong L, Qin M and Niwa M, 2004, Two new bis-labdanic diterpenoids from *Alpinia calcarata*, *Acta Bot Sin*, 46(2), 159-164.
- The Wealth of India, 1985, *A Dictionary of Indian Raw Materials & Industrial Products*, Vol.1:A, CSIR, New Delhi, p. 198.

