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CHARACTERSTICS AND NATURAL PRODUCT INVESTIGATIONS OF ESSENTIAL OIL FROM THE RHIZOMES OF *ALPINIA CALCARATA ROSC.*

DURVESH K. TYAGI*

Department of Chemistry S. P. R. C. (P.G.) College, Hardwar, India

ABSTRACT

Essential oils or ethereal oil is defined as the volatile odoriferous oil obtained stem distillation of plants. Volatility and the plant origin are the characteristic properties of essential oils. These are found in special cells, glands or ducts located in different parts of a plant such as the leaves, barks, roots, flowers and fruits. Essential oil isolated from the rhizomes of *Alpinia calcarata* Rosc. by hydrodistillation has a yield of 0.18 percent by weight. Light yellow oil has Characteristic sharp odour; specific gravity 0.8806; optical rotations -4°51′. The acid and saponification values are also determined and reported.

KEYWORDS: ***Alpinia calcarata, Zingiberaceae*** **and Essential oil**

DURVESH K. TYAGI
Department of Chemistry S. P. R. C. (P.G.) College, Hardwar, India

Corresponding author

INTRODUCTION

The plant *Alpinia calcarata* Rosc., (Syn. *Alpinia bracteata* Rosc., *Renealmia calcarata* Haw) also belongs to Zingiberacea family. It is called *Toroni* in Oriya and *Kattchenu* in Malyalam[1]. *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[2]. 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[3]. Presence of two bis-labdanic diterpenoids from the rhizomes has been reported by Kong et al.[4] in a Chinese sample. Looking to the variety of uses, a detailed study of physico-chemical properties of essential oil from the rhizomes of the plants and determination of natural product groups seem to be important. Such studies have been reported earlier for the seeds of *Embelia ribes*[5], *Strychnos potatorum* and *Nelumbo nucifira*[6], rhizomes of *Alpinia officinarum*[7] and seed oils of some *Litsea* species[8], etc.

MATERIALS AND METHODS

Authenticated rhizomes of *Alpinia calcarata* were procured from Pantnagar and authenticity verified from F.R.I. Dehradun. Specimens have been deposited in the herbarium of Plant Medicine Section of the Chemistry Department of the University. The procured rhizomes were washed with luke warm water and dried in shade.

Isolation of essential oil

The isolation of essential oil was carried out by hydrodistillation using a Clevenger apparatus. 100 g crushed rhizome was placed in a round bottom, short necked flask of one lit re capacity. 600 mL distilled water was added to the flask and proper essential oil trap and condenser were attached; enough water was added to fill the trap. Placing the flask in an electric heater, the temperature was adjusted so that condensation of about one drop per second was obtained. The distillation was continued until no further increase of the essential oil was observed. After the complete distillation, the oil was permitted to stand undisturbed, and then extracted with anhydrous sodium sulphate to remove any aqueous part. 0.2 mL (0.18g) of essential oil was obtained from *A. calcarata* rhizomes. Oil was stored in dark coloured air tight bottles under refrigeration.

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 the methods described by Garratt[9], Guenther[10] and in monographs of I.S.I.[11]. 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 the essential oils are given in Table 1, while the results of the presence of specific natural products are summarized in Table 2. Also, the oil gives positive tests for the presence of aldehydic, ketonic, alcoholic and ester groups. The rhizomes of *Alpinia calcarata* on hydrodistillation yield essential oil. Because of the sharp, characteristic odour, its solubility in alcohol and no side effects, the essential oil can be used in perfumery. *A. calcarata* is laevo rotatory, indicating their possible biologically different activities. The high iodine value, however, indicates a high degree of unsaturation. Low acid value and the pH value of higher than 5.0 indicate that not much free acids are present in the oils and, thus, support it's use in perfumery. Extracted materials from these plants give positive tests for the presence of ketonic, aldehydic, ester and alcoholic groups that seem to be because of the oxygenated terpenes in the essential oil. Tewari et al.[12] have identified the constituents of the essential oils by GC-MS, and their reports confirm the presence of such compounds. In general, the esters are most

balancing of all the chemical families of essential oils. They are relaxing and soothing and many have antifungal properties[13]. As the aroma-therapy is picking up, the use of these oils either alone or as a mixture with other suitable essential oils, cannot be denied.

Table 1
Results of the analysis of the essential oil

Properties	Essential oil
Colour of oil	Light yellow
State	Transparent liquid
Odour	Characteristic sharp
Yield (%, w/w)	0.18
pH	5.7
Refractive index	1.47
Specific gravity (30°/30°)	0.8806
Optical rotation (25°C) (0.01% solution)	-4°51′
Acid value	8.5
Saponification value	96.0
Iodine value	36.80

Table 2
Results of the analysis of the essential oil for specific natural products

Functional groups	
Aldehydic	
Tollen's test	+ve
Alkaline $KMnO_4$ test	+ve
Schiff's reagent	+ve
Phenolic	+ve
Carboxylic	-ve
Ketonic	+ve
Unsaturation	
Bromine water test	+ve
Fehling solution	+ve
Specific natural products	
Proteins	
Xanthoproteic test	-ve
Biuret test	-ve
Alkaloids	
Mayer's test	-ve
Carbohydrates	
Molisch test	- ve
Carotenoids	
Sulphuric acid test	-ve
Flavonoids	
Shinoda's test	-ve
Pew' test	-ve
Steroids	
Salkowski reaction	-ve

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