

Chemical Investigation of Some Aromatic Plants of Uttarakhand

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Uttarakhand is well known for possessing rich heritage of important medicinal and aromatic plants. Out of hundreds of important plant species of this area, only few have been domesticated so far. There are many plant species occurring wild in nature, which are yet to be examined for their useful chemical constituents so that the ways for their domestication may be opened. Keeping this in view, a study was undertaken to examine the aroma content of four aromatic plants namely, *Acorus calamus*, *Hedychium spicatum*, *Litsea glutinosa* and *Thymus serpyllum*. Since the chemical composition and the aroma content of aromatic plants greatly fluctuate with the changing habitats and climate, it is important to document the information in the light of these factors. Thus, in the present investigation, the germplasm was collected from the wild habitats viz.-rocky, stony pieces with sparse grasslands of Auli forest area from 1350 msl to 2720 msl height in the month of May.

All the material was collected from wild habitats from Auli forest areas and partially disturbed habitats, where agro-climatic conditions and physiography were different. The altitude of their occurrence varied from 1350 m to 2720 m. The material was collected in the form of rhizomes and live plants.

The plant material collected from forest area were subjected to hydro-distillation using Clevanger's apparatus in the chemistry laboratory at NBPGR, New Delhi. The essential oils so obtained were dried over anhydrous Na_2SO_4 . These dried oils were analysed for their aroma constituents using Gas Liquid Chromatograph (GLC) model Perkin Elmer Auto System equipped with capillary column Carbowax 20M of 50 m length, Flame ionization detector, Okidata 320 M recorder, Digital computer DEC station fed with Turbochrom-3 software and nitrogen as carrier gas. Volatile aroma constituents were identified on the chromatogram by comparing their retention time with authentic compounds.

Acorus calamus: The *A. calamus*, commercially known as sweet flag or Buch, belongs to family Araceae. It is a semi-aquatic perennial herb with creeping rhizomes. It is found growing wild throughout India up to an altitude of 2200 m. This plant material was collected from Ghorsari village at the height of 1700 m in Chamoli district. Rhizomes were somewhat pale to dark brown in colour. Rhizomes yielded 0.26% yellow coloured oil. The oil is aromatic and has spicy odour. In ayurvedic system of medicine, the rhizomes are considered to possess antispasmodic, carminative, anthelmintic properties and are used to cure many disorders such as epilepsy and mental diseases. Both, the dried rhizomes and its essential oil are used as insecticide (Chowdhary *et al.* 1997). Chemical composition of *A. calamus* was studied by GLC. Major components identified were Terpinen-4-ol-4.72%, Geraniol-3.06%, Methyl-isoeugenol-9.43%, β -Asarone-60.49% (Table 1).

Hedychium spicatum: The plant belongs to Zingiberaceae. It is leafy, up to 2 m tall having camphoraceous horizontal rhizome. It grows wild in sub-tropical to temperate areas of Himalayas. A live bulbous herbaceous plant sample was collected in the month of May from Pothivasa village of Rudraprayag district of at an altitude of 2020 m for its chemical analysis. The plant is well known for its therapeutic activity as antiseptic, carminative and bronchodilator (Chauhan, 1999). Because of its camphoraceous odour, this drug is often considered a substitute of *Curcuma zedoaria*.

The rhizome of the plant was subjected to chemical analysis. The oil content of rhizome was recorded as 0.26%. It was further subjected to GLC for aroma constituents. The major constituents found were 1-8 cineole-18.67%, Linalool-5.11%, Terpineol-4-ol-2.29%, α -Terpineol-5.51%, Nerol-6.20%, Eugenyl acetate-3.14%, Eugenol-4.77%, Isoeugenol-8.75% (Table 1).

Litsea glutinosa: It belongs to family Lauraceae and is commonly known as Medal kadi. It is an evergreen shrub or tree up to 25 m in height and 1.5 m in girth. This plant is found throughout in India, ascending up

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Table 1. Chemical analysis of essential oil of aromatic plants collected from Uttarakhand

Plant species	Common Name	Village	Site of collection District	Altitude (m)	Oil yield (%)	Major constituents identified
<i>Hedychium spicatum</i>	Kapur kachari	Pothivasa	Rudraprayag	2020	0.26	1-8 cineole-18.67%, Linalool-5.11%, Terpineol-4-ol-2.29%, α -Terpineol-5.51%, Nerol-6.20%, Eugenyl acetate-3.14%, Eugenol-4.77%, Isoeugenol-8.75%.
<i>Litsea glutinosa</i>	Medal kadi	Dugabitta	Rudraprayag	2330	0.32	Camphor-10.98%, Citronellyl-formate-2.70%, Terpenen-4-ol-4.61%, Methyl chavicol-11.07%, Citral-a-6.18%, Citronellol-7.39%, Geraniol-6.71%, Methyl-iso-eugenol-5.46%, Eugenol-6.69%, Unidentified-12.84%.
<i>Acorus calamus</i>	Buch	Ghorsari	Chamoli	1700	0.26	Terpinen-4-ol-4.72%, Geraniol-3.06%, Methyl-iso-eugenol-9.43%, β -Asarone-60.49%.
<i>Thymus serpyllum</i>	Wild thyme	Auli	Chamoli	2720	0.13	Camphor-1.84%, Linalool-0.85%, Terpineol-4-ol-2.35%, α -Terpineol-0.11%, α -Terpenyl acetate-8.48%, Thymol-18.78%.

to an altitude of 1350 m in the outer Himalayas. This live plant was collected from Duga bitta village of Rudraprayag district at a height of 2330 m. The bark of *L. glutinosa* constitutes the common drug sold in Indian bazars under the name "Maida Lakri" or "Maida Lakadi". It is available in the form of broken quills. It is mucilaginous, feebly balsamic and mildly astringent. It is used in diarrhoea and dysentery. Ground and pasted material is used as an emollient for strain, bruises and rheumatic joints. The bulbous herb yielded 0.32% volatile oil. The GC examination of the oil revealed the presence of 52 compounds, out of which, 19 have been identified. Major components identified were Camphor-10.98%, Terpenen-4-ol-4.61%, Methyl chavicol-11.07%, Citronellol-7.39% and Geraniol-6.71% (Table 1).

Thymus serpyllum: *Thymus serpyllum*, commonly known as, wild thyme is a member of family Habiatae. The plant is found in the Himalaya Region. In Himachal Pradesh, the plant is frequently found in the open rocky slopes. The plant is a variable, aromatic, hairy, prostate

and evergreen perennial herb with spreading habit. It is pungent in taste. The herb possesses anti spasmotic, antiseptic, carminative, anthelmintic and stimulating properties. The oil is used as a flavouring agent in non-alcoholic beverages and medicinal preparations in all systems of medicines.

The plant was collected from Auli village of Chamoli district at an altitude of 2720 m. The chemical analysis of *Thymus serpyllum* herb yielded 0.13 % of aromatic oil. The dried oil was further analysed on GLC for its volatile constituents. Major constituents identified were Camphor-1.84%, Terpinen-4-ol-2.35%, α -Terpineol-0.11%, α -Terpenyl acetate-8.48%, Thymol 18.79%, p-Cymene- 7.17% (Table 1).

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