

## Essential Oil Profile of Wild and Cultivated Accession of *Cymbopogon schoenanthus* (L.) from Uttarakhand Region

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### Abstract

The chemical composition of the essential oils of *Cymbopogon schoenanthus* (L.) was investigated by GC and GC/MS study. Cis-sabinene hydrate was found as the major component which varies from 30.1-31.6% in wild and cultivated plants whereas trans-sabinene was found to be second highest constituent which was 17.1% in wild sample and 14.5% in cultivated oil sample. Results reveals that chemical composition of *Cymbopogon schoenanthus* wild and cultivated oil has similar composition but both of them varied quantitatively especially in case of cis-piperitol. Data set indicates that species cultivated in tarai and plain region of Uttarakhand can be used for trapping sabinene hydrate which is present in very good amount in both the samples.

**Keywords:** *Cymbopogon schoenanthus* (L.); Wild; Cultivated; Essential oil; GC; GC/MS

### Introduction

The genus of *Cymbopogon* species are distributed worldwide through countries which are located within or around the tropical and subtropical bands. Most of the species of this genus are found in their motherland (Asia) [1]. Several species of the genus are known for economically important chemicals such as essential oil obtained from a number of species used as such in perfumery and highly valued novel molecules are used in flavoring and pharmaceutical industry. Due to its pleasant aroma and taste, it is also used to prepare aromatic "tea" that is much appreciated and largely consumed in North Africa [2]. Besides the culinary use of herb, it is also a popular folk medicine [3]. In the South of Tunisia, this plant is used for the treatment of rheumatism and to diminish fever. The plant is particularly appreciated for its medicinal action in North Africa and it is also used for the anorexia. The infusions are taken as a diuretic, it cures intestinal troubles and, in the form of decoction, it acts against food poisoning and also helps in the digestion [4]. Some of the *Cymbopogon* species are cultivated in commercial scale like *C. nardus*, *C. witerianus*, *C. martini* and *C. flexuosus* [5], it was found that no systematic study has been reported so far in *C. schoenanthus* cultivated in Doon valley compared with its original accession.

### Materials and Methods

#### Collection of plant material

Aerial parts of *C. schoenanthus* were collected from Raiwala near Haridwar Uttarakhand, North Himalaya region in the month of July 2013 and planted in University demonstration site. Voucher specimen has been kept in the herbarium of Doon University dually by Botanical Survey of India, Dehradun, Dr. DK Shrivatava for further reference.

#### Extraction of oil

Shade dry aerial parts were subjected to hydro distillation in Clevenger apparatus for 6 hours to extract oil; obtained oil was dried over anhydrous sodium sulphate and stored in a refrigerator till further analysis. The essential oil content was determined as percentage on shade dry weight basis as average of three independent extractions to minimize error. The combined oil was used for further analysis.

### GC

Analysis by GC was performed by using Agilent (model 6890) gas chromatograph equipped with a FID detector and a HP-5 fused silica column (30 m × 0.32 mm × 0.25 μm film thickness). Nitrogen was used as a carrier gas during analysis. The injector and detector temperature were maintained at 210°C and 230°C respectively. The column oven temperature was programmed from 60°C to 220°C with an increase in rate of 3°C/min.

### GC/MS

Analysis was carried out on a Perkin Elmer mass spectrometer coupled to a Perkin Elmer Claurus 500 gas chromatograph with a 60 m × 0.32 mm × 0.25 μm film thickness column of Rtx-5. Helium was used as the carrier gas (flow rate 1 ml/min). The mass range was scanned from 40-600 Daltons. The oven temperature programme range was 60°C to 220°C with an increase in rate of 3°C/min. Other conditions were the same as described in GC.

### Identification of components

The identity of the constituents of the oil was established on the basis of GC retention indices, by comparing their 70 eV mass spectra with those reported in literature [6] and by computer matching with NIST and Wiley libraries, as well as. Where possible, co-injection was done with authentic standard compounds available in our laboratory.

### Results and Discussion

The essential oil content in cultivated sample was found to be higher (2.05%) than that in wild sample (1.80%). The chemical composition of both the samples is presented in Table 1. A total of 10 components were identified in both the samples where proportion

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RI	Components	Raiwala (Wild)	Doon University, Dehradun (Cultivated)
		(%)	(%)
	p-cymene	4.5	4.3
	$\alpha$ -terpinolene	11	7.9
	Limonene	3.2	3.8
	Cis-sabinene hydrate	30.1	31.6
	Trans-sabinene hydrate	17.1	14.5
	$\alpha$ terpineol	1.2	1.1
	Piperitone	2.7	3.7
	Cis-piperitol	9.6	18.5
	Trans-piperitol	8.5	7.2
	Eucarvone	1	1.7
	<b>Total Identified</b>	<b>88.9</b>	<b>94.3</b>

RI=Retention indices on HP -5 capillary column; Percentage of components (Average of three analyzed replicates).

**Table 1:** Essential oil composition of *Cymbopogon schoenanthus*.

of monoterpenes was higher than that of sesquiterpenes. Results of chemical identification advocates three monoterpenes as principal components whereas highest concentration was shared by cis-sabinene followed by trans isomer and cis-piperitol. The concentration of major component that is, cis-sabinene hydrate was found to be 30.1 and 31.6% while second major component was trans-sabinene which was found to be 17.1% in wild sample and 14.5% in cultivated sample. Cis-piperitol was detected as the third major component in cultivated sample (18.5%), but its concentration was found to be just half in wild sample. Other components were  $\alpha$ -terpinolene, piperitone and limonene. Earlier reports of samples originated from Burkina reported piperitone (42.0%) and elemol as major components [7]. Whereas Brazil oil sample reported geraniol (62.5%) and geranial (12.5%) as major components [8]. Main chemical compound of *Cymbopogon schoenanthus* is piperitone (42.0%), from Burkina [9,10]. In three different locations in Tunisia oil, major components were limonene (10.5-27.3%),  $\beta$ -phellandrene (8.2-16.3%),  $\alpha$ -terpinene (4.3-21.2%) and  $\alpha$ -terpineol (6.8-11.0%) [5]. However, samples from Indian Thar Desert reported 2-undecanone (14.68%) and limonene (19.54%) as major components [11]. These reports disagree with our present investigation. This variation is due to difference genetic make up, microclimatic and environmental condition of the places where the species are grown. It is further reported that sabinene hydrate and its acetate are responsible for the spicy flavor [12]. It is present in good amount in our investigated oil. cis-piperitol,  $\alpha$ -terpinolene, and limonene are used in various industrial applications. *C. schoenanthus* essential oil is active against

termites [13] and against the brushed *Callosobruchus maculatus*, which is a major pest of stored grains [10]. *C. schoenanthus* essential oil could be an interesting candidate for its application in gastrointestinal nematodes control blend with other aroma chemicals. Therefore, oil of *C. schoenanthus* cultivated in lower like foothills of the region and plain topography of Uttarakhand state could be a better option for flavor, pharmaceutical and aromatic industry for trapping its potential components which are desired for industry.

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