IOSR Journal of Applied Chemistry (IOSR-JAC)
e-ISSN: 2278-5736.Volume 9, Issue 8 Ver. I (Aug. 2016), PP 110-112
www.iosrjournals.org

Study on Physico Chemical Properties of Cymbopogon Citratus (DC. ex Nees) Essential Oil

Man Mohan Singh Jassal
Department of Chemistry
D.A.V. (P.G.) College, Dehradun, Uttarakhand

ABSTRACT
Cymbopogon, better known as lemongrass, is a genus of Asian, African, Australian, and tropical island plants in the grass family. Some species (particularly Cymbopogon citratus) are commonly cultivated as culinary and medicinal herbs because of their scent, resembling that of lemons (Citrus limon). Lemongrass oil is used as a pesticide and a preservative. Research shows that lemongrass oil has antifungal properties. Despite its ability to repel some insects, such as mosquitoes, its oil is commonly used as a "lure" to attract honey bees. Because of this, lemongrass oil can be used as a lure when trapping swarms or attempting to draw the attention of hived bees." Looking at the importance of essential oil extracted from lemon grass present study was undertaken to study variation in physicochemical properties of Cymbopogon citratus (DC. ex Nees) essential oil extracted from different location of Uttarakhand. Collection of plant material from different locations was carried out &extraction of essential oil was extracted using hydro distillation technique and studied for its physico-chemical properties.
Lemon grass leaves from Dehradun had the significant effect on the essential oil content (2.40%) and on dry weight basis. While lemon grass leaves from mussoorie and rishikesh afforded oil at percentage of 2.10% and 2.12%. Eighteen major components were identified in the essential oil which represented 99.29-84.41% of the oil component. The major components of the essential oils were Geranial (14.72,31.53, 39.86 and 37.24%), Neral (34.52,30.08,34.98 and 31.28%) and Myrcene (15.69,16.61, 14.49 and 15.42%) in oils extracted from lemongrass leaves collected from Dehradun, Tehri garhwal, Nanital & Pithoragarh respectively. The quality of lemongrass is generally determined by its citral content. Comparison of the results showed that different locations had no variations in the major components of the essential oil, but had a significant effect on their percentages.
Keywords- *Lemon grass, Physico chemical Property, GCMS, Hydrodistillation*

I. INTRODUCTION

Cymbopogon commonly known as lemon grass represents an important genus of about 120 species that grows in tropical and subtropical regions around the world. On account of their diverse uses in pharmaceutical, cosmetics, food and flavor, and agriculture industries. Cymbopogon grasses are cultivated on large scale, especially in tropics and subtropics[1]. Cymbopogon citrates (lemon grass) a well known specie possesses strong lemony odour due to its high content of the aldehyde citral, which has two geometric isomers, geranial (citral -a) and neral (citral-b)[2] .As a medicinal plant, lemongrass has been considered a carminative and insect repellent. It is used in herbal teas and other non alcoholic beverages in baked goods, and in confections. Essential oil from lemongrass is widely used as a fragrance in perfumes and cosmetics, such as soaps and creams. Citral, extracted from the oil, is used in flavoring soft drinks in scenting soaps and detergents, as a fragrance in perfumes and cosmetics, and as a mask for disagreeable odors in several industrial products. Citral is also used in the synthesis of ionones used in perfumes and cosmetics. Source of lemongrass oil used to flavor teas, ice cream, candy, pastries, desserts and chewing gum. Also used in cosmetics and perfumes. Quick growing clumps can be used instead of the classic lemongrass (Thai) in culinary dishes.. Lemongrass oil revitalizes the body and relieves the symptoms of jetlag, clears headaches and helps to combat nervous exhaustion and stress-related condition citral, exhibited high antibacterial activity[3,4] anticonvulsant activity, antiviral activity[5], antifungal activity[6,7], sedative as well as motor relaxant effects.[8] Lemongrass is sour, cooling and astringent. Therefore, it combats heat and tightens tissues of the body[9]. Looking at wide variety of activity associated with citral main component of *Cymbopogon citratus* (DC. ex Nees) The present work aims to study the variation in chemical composition and physicochemical characteristics of the volatile oil extracts of *Cymbopogon citratus*(lemon grass)growing in different location of Uttarakhand.

II. Materials and Methods

The fresh leaves of *Cymbopogon citratus* were collected from different locations of Uttarakhand namely, Dehradun, Tehri Garhwal, Nanital & Pithoragarh (growing season).

Extraction Procedure

Fresh and dried leaves of *Cymbopogon citratus* (DC. ex Nees) (100 gm) were subjected to hydro-distillation for three hours using Clevenger apparatus. The extracted essential oils were dried using anhydrous sodium sulphate and stored in sealed vials at low temperature (2 ^{0}C) before analysis.

Physico-Chemical Properties of Essential Oil

Physical parameters of the essential oils extracted from leaves of *Cymbopogon citratus* (DC. ex Nees) were determined using the methods described by[10,11] AFNOR.These parameters are the density, refractive index, rotatory power and acid Index.

Density at 20°C

The density measure was carried out using a mettler toledo precision balance.

Refractive index at 20°C

The refractive index was determined by means of the refractometer Carl Zeiss Jena 234678.

Rotatory power at 20°C

The measurement was made by Carl Zeisspolarimeter 128291.

Acid index Ia

The material used to determine the acid index was constituted by phenolphthalein, neutralized ethanol, potassium hydroxide (0.05N)and a graduated burette. The index acid calculation was done using the following formula

Ia = 5.61xV / m.

V = Volume in mL of the ethanolic solution of potassium hydroxide, m = Mass measured in gram of essential oil charged.

Gas chromatography

GC analyses were performed, using a HP 6890 GC gas chromatograph equipped with a fused capillary column (30 m · 320 lm i.d., film thickness 0.25 lm) coated with 5% Phenyl Methyl Siloxane (HP-5). Oven temperature was held at 50 ^{0}C for 2 min and then programmed to 240^0 C at a rate of 8 C/min. Detector (FID) temperature was 280 ^{0}C and injector temperature was 240^0 C; Nitrogen was used as carrier gas with a linear velocity of 30 ml/min. The percentages of compounds were calculated by the area normalization method.

Gas chromatography–mass spectroscopy

GC–MS analyses were carried out using a Varian 240 GC–MS system equipped with a VF-5 fused capillary column (30 m · 0.25 mm i.d., film thickness 0.25 lm); oven temperature was 50–180 ^{0}C at a rate of 5 _C/min, transfer line temperature 250 ^{0}C, carrier gas was helium with a flow rate of 1 ml/min, spilt ratio 1:20, ionization energy 70 eV, and mass range 35–390 a.m.u. The compounds assayed by GC in the different essential oils were identified by comparing their retention indices with those of reference compounds in the literature and confirmed by GC-MS by comparison of their mass spectra with those of reference substances

III. RESULTS AND DISCUSSION

The table 1 shows the values of the four physico-chemical factors measured. In the table II are presented the results of chromatographic analysis of essential oils extracted from leaves of *Cymbopogon citratus* (DC. ex Nees) growing in different locations of Uttarakhand India.

Table 1 :
Physico-Chemical Properties Of Essential Oil of Cymbopogon *citratus* (DC. ex Nees)

S.No.	Sample	Yield (%)	Density	Refractive Index (at 20°C)	Rotary power (at20°C)	Ia (mg de KOH/g)
1	Dehradun	2.40	0.943	1.4839	- 44.8	2.596
2	Tehri garhwal	2.12	0.940	1.4835	- 44.87	2.562
3	Nanital	2.10	0.941	1.4842	- 44.84	2.597
4	Pithoragarh	2.34	0.899	1.4845	- 44.88	3.ooo

Table 2 :
Chemical Composition of Essential oil of of **Cymbopogon *citratus* (DC. ex Nees) From Different Locations of Uttarakhand**

No.	Compounds	RT	Dehradun	Tehri	Nanital	Pithoragarh
1	Myrcene	9.15	15.69	16.16	14.49	15.42
2	Limonene	9.78	0.41	0.42	0.43	0.40
3	E,E-cosmene	10.37	0.20	0.23	0.21	1.26
4	Z-b-Ocimene	10.60	0.97	traces	0.17	0.22
5	E-b-Ocimene	10.94	0.41	0.28	0.26	0.27
6	a-Terpinolene	12.87	1.02	1.09	1.09	1.06
7	Citronellal	13.16	0.60	2.06	2.03	3.01

8	Cis-Verbenol	14.10	0.15	0.15	0.15	0.18
9	Linalool	14.66	1.03	2.06	2.03	2.44
10	Cis- Carverol	15.25	1.18	1.49	1.35	1.47
11	Atrimesol	15.41	0.26	0.15	T	0.19
12	Nerol	16.15	0.17	0.27	0.22	0.29
13	Neral	17.15	34.52	30.08	34.98	31.28
14	Geraniol	17.44	0.53	0.86	0.95	1.31
15	Geranial	18.01	14.72	31.53	39.86	37.24
16	Carveol	18.48	0.18	0.65	0.38	0.73
17	Geranyl acetate	21.38	0.51	0.7	0.49	0.67
18	Caryophellene	22.66	0.28	0.23	0.20	0.21

Cymbopogon citratus (DC. ex Nees) leaves were collected from different locations varied quantities of essential oil (Table I).The results indicated that lemongrass leaves from Dehradun had the highest essential oil content (2.40%) on dry weight basis while, lemongrass leaves Mussoorie and Rishikesh afforded oil at percentages of 2.10% and 2.12%, respectively with no significant difference between their physico chemical properties i.e refractive index, rotary power, density and acid value well in agreement with lieterature.The quality of lemongrass is generally determined by its Citral (Geranial and Neral) content. Eighteen components were identified in the essential oil of leaves of **Cymbopogon** citratus (DC. ex Nees) of different locations, which represented 99.29–88.41% of the oil components. The chemical constituents of oils are presented in Table 1 and Table 2. The components are listed in order of their retention time (RT) on the VF-5 column. The major components of the essential oils were **Geranial** (14.72,31.53**, 39.86** and 37.24%), **Neral** (34.52,30.08,**34.98** 34.52and 31.28%) and **Myrcene** (15.69,**16.61,** 14.49 and 15.42%) in oils extracted from lemongrass leaves collected from Dehradun, Tehri Garhwal, Nanital & Pithoragarh respectively.The proportions of Geranial and Neral in the essential oil of Tehri lemon grass leaves were more pronounced than those in the other three areas while, Myrcene content was higher in Nanital area . This variation in composition could be due to climatic and soil conditions of the different locations.

IV. Conclusion

Lemongrass oil revitalizes the body and relieves the symptoms of jetlag, clears headaches and helps to combat nervous exhaustion and stress-related condition citral, exhibited high biological activity[12,13]. Variation in chemical composition of essential oil from different locations was observed according to the place of collection of plant species in terms of their percentage content. In general, essential oil collected from Tehri predominated in Citral content of the oil one of very important factor for assessing biological activity associated with the essential oil. Thus essential oil of sample collected from Tehri locality can be regarded as better quality of essential oil in comparison to other oil samples.

References

[1]. Akhila, A. (2010). *Essential Oil Bearing Plants.* The genus Cymbopogon. Edited by: Anand Akhila. Boca Raton, FL: CRC Press Taylor & Francis Group.

[2]. Shah, G., Shri, R., Panchal, V., Sharma, N., Singh, B., Mann, A .S.(2011) Scientific basis for the therapeutic use of Cymbopogon citratus, stapf (Lemongrass). *J. Adv Pharm Technol. Res.* 2 (1): 3-8.

[3]. Inouye, S., Takizawa, T., Yamaguchi ,H. (2001) . Antibacterial activity of essential oils and their major constituents against respiratory tract pathogens by gaseous contact. *Journal of Antimicrobial Chemotherapy*. 47:565-573.

[4]. Inouye, S., Uchida, K., Nishiyama, Y., Hasumi, Y., Yamaguchi, H.,Abe,S. (2007).Combined effect of heat, essential oils and salt on the Fungicidal Activity against Trichophyton mentagrophytes in Foot bath. *Jpn. J. Med. Mycol.* 8: 27-36,

[5]. Minami, M., Kita. M., Nakaya, T., Yamamoto, T., Kuriyama, H,. Imanishi, J.(2003). The Inhibitory Effect of Essential Oils on Herpes Simplex Virus Type-1 Replication In Vitro. *Microbiol. Immunol.*47(9): 681-684,

[6]. da Silva, C. ,d B, Guterres, S .S., Weisheimer, V., Schapoval, E. E S. (2008). Antifungal Activity of the Lemongrass oil and Citral against *Candida* spp. *The Brazilian Journal of Infectious Diseases*. 12(1):63-66.

[7]. Selvi, V. S., Govindaraju, G., Basker, A.(2011). Antifungal Activity and Phytochemical Analysis of Cymbopogon citratus, Sauropus androgynus and Spillanthes acmella Plants. *World Journal of Fungal and Plant Biology*. 2(1):06-10,

[8]. do Vale, T. G., Furtado, E C., Santos, J. G. Jr., Viana, G. S. B.(2002). Central effects of citral, myrcene and limonene, constituents of essential oil chemotypes from *Lippia alba* (Mill.) N.E. Brown. Phytomedicine: *International Journal of Phytotherapy and Phytopharmacology*. 1(12): 23-25

[9]. Wood, M. (2008). The Earthwise Herbal: A complete guide to old world medicinal plants. Berkeley, CA: North Atlantic Books.

[10]. Nyamador, W.S., Ketoh, G.K., Amévoin, K.,Nuto ,Y., Koumaglo, H.K., Glitho ,I.A.(2010). Variationin the susceptibility of two Callosobruchusspecies to essential oils, *Journal of Stored Products Research*. 46: 48-51.

[11]. Ketoh, G.K., Koumaglo, H.K., Glitho, I.A.,Huignard, J.(2006). Comparative effects of Cymbopogon schoenanthus essential oil and piperitone on Callosobruchus maculatus development, *Fitoterapia* 77: 506–510.

[12]. Costa G., Grangeia H., Figueirinha A., Figueiredo I.V. And Batista M.T. (2016) Influence of harvest date and material quality on polyphenoliccontent and antioxidant activity of Cymbopogon citratus infusion. *Industrial Crops and Products*, 83:738-745

[13]. Fadli M., Pagès J.M., Mezrioui N.E., Abbad A. And Hassani L. (2016) Artemisia herba-alba Asso and Cymbopogon citratus (DC.) Stapf essential oils and their capability to restore antibiotics efficacy. *Industrial Crops and Products*, 89:399-404.