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The Composition of Essential Oil from *Cymbopogon* Species of the Great Indian Thar Desert

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The essential oils of *Cymbopogon* species of the Indian Thar desert, viz. *Cymbopogon jwarancusa* (Jones) Schult., *Cymbopogon jwarancusa* (Jones) Schult. subspecies *olivieri* (Boiss) Soenarko and *Cymbopogon schoenanthus* (Linn.) Spreng have attracted attention because of piperitone (60–70%), citral (upto 60%) and sesquiterpene oxygenated compounds (50%) as the major chemical constituents in their oils, respectively, are discussed with other concerned *Cymbopogon* species of India. These chemical observations are one of the useful parameters for selection of drought resistant strains and chemotypes and their genetic improvement and standardisation of agronomic practices which can make the plant economically important under arid and semi-arid environments of India.

Essential oils are used in wide variety of consumer goods such as detergents, soaps, toilet products, cosmetics, pharmaceuticals, perfumes, confectionary food products, soft and hard drinks and also in insecticides. The essential oils consist of hydrocarbons, esters, aldehydes, acids, terpenes, lactones, alcohols, ketones, etc.

Essential oil yielding grasses of India belong mostly to the tribe Andropogoneae of which *Cymbopogon* forms an important genus. In the present communication, information pertaining to essential oils of *Cymbopogon* species of the Indian Thar desert, viz. *Cymbopogon jwarancusa, Cymbopogon jwarancusa* subspecies *olivieri* and *Cymbopogon schoenanthus*, and their important chemical constituents, is presented and compared with allied species.

Results and Discussion

The volatile oil content of *C. jwarncusa, C. jwarancusa,* subspecies *olivieri* and *C. schoenanthus* were 1.00, 0.80 and 0.80% (fr.wt. basis, w/w) respectively. Piperitone (60–70%) was the major constituent of essential oil of *C. jwarancusa* as has been previously reported[1], except Dev *et al.*[2] who reported isomeric *p*-menthanols in their samples. The sesquiterpenoids identified in *C. jwarancusa* oil are elemol (6.48%), eudesmol (2%) and *p*-eudesmol (2.03%). The essential oil of *C. jwarancusa* of Indian Thar desert is practically similar to those of a Pakistani oil of *C. jwarancusa* which contains 64% piperitone as the chief chemical constituent[3]. *C. jwarancusa* was also collected in the cold desert of the Himalayas which also contains piperitone (70%) as the major chemical constituent[4]. *Cymbopogon stracheyi* was collected from Kumaun hills, the piperitone and car-2-ene make-up over 77% of the essential oil[5]. *C. jwarancusa* was also collected from the Shankracharya hills of Kashmir which gave 22% piperitone as the major chemical constituent[6]. Thus the quality of *C. jwarancusa* essential oil of the Thar desert is comparatively better due to high percentage of piperitone (60–70%).

The four major compounds found in the oil of *C. jwarancusa* subspecies *olivieri* were geranial (25%), neral (18%), geraniol (16%) and

geranyl acetate (7%). This aromatic grass of the Indian Thar desert shows high percentage of gernial and neral as compared to other citral yielding cultivar of *Cymbopogon* species[7]. It is possible to select better through mass selection of plants when they are raised through seeds.

C. schoenathus oil is characterised by the presence of a methylketones series of 2-nonanone (2%), 2-undecanone (15%) and 2-tridecanone (3%). The other major constituents of the oil were limonene (20%), camphene (7%) and a group of oxygenated sesquiterpenes of which elemol (4%), α-cadinol (3%) and murolol (2%) were most abundant. Further work on these aspects is in progress.

This study highlighted the importance of *Cymbopogon* species from the Indian Thar desert of Rajasthan because of its high essential oil content and *d*-piperitone content. These chemical observations might be helpful in identification of drought-resistant strains and chemotypes of *Cymbopogon* species as reported by some workers. Following genetic improvement and standardisation of agronomic practices, the plant can become economically important for area of the Thar desert. Before this, the policy adapted should include the proper use of the natural resources of the Thar desert as per our needs and also to increase the regeneration of aromatic plants, suffering from ecological imbalances which may cause their extinction. So it is high time now to evolve strategy to save this species from vageries of harsh climatic condition in the Thar desert.

Experimental

The fresh leaves of *Cymbopogon* species were collected from different localities, viz. *Cymbopogon jwarancusa* from Bikaner, *C. jwarancusa* subspecies *olivieri* from Jodhpur and *C. schoenanthus* from Jaisalmer of the Great Indian Thar desert after the monsoon season. The essential oils of *Cymbopogon* species were extracted by hydrodistillation method using a Clevenger apparatus. The essential oils were dried over anhydrous sodium sulphate and used for analysis.

The oils were subjected to column chromatographic separation according to their polarity. The non-polar fractions were eluted with n-pentane and the oxygenated fractions with freshly distilled Et_2O and Et_2O-MeOH. Solvents were removed from the fractions under reduced pressure and analysed by GC and GC/MS. The chromatographic conditions were infector 300°, detector 290°, column over temperature maintained at 40° for 5 min then increased to 280° at the rate of 4°/min. Helium was the carrier gas. The identification of individual components of the essential oils and the fractions obtained by chromatographic separations, was achieved by GC/MS analysis.

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References

1. A. K. SHAHI and D. N. SEN, *Curr. Agric.*, 1989, **13**, 99.
2. V. DEV, D. MELANDER, J. T. YEE, C. S. MATHELE, A B. MELRANI, S. K. PANT and A. B. BOTTINI, "Flavours and Fragrances", Elsevier, Amsterdam, 1988
3. T. SAHEED, P. J. SANDRA and M. J. E. VERZELE, *Phytochemistry*, 1987, **17**, 1433.
4. M. L. MAHESHWARI, K. P. S. CHANDEL and M. J. CHIEN, "Flavours and Fragrances", Elsevier, Amsterdam, 1988.
5. C. S. MATHELA and A. K. PANT, *Indian Perfumer*, **32**, 40.
6. R. K. THAPPA, S. G. AGARWAL, K L. DHAR and C K ATAL, *Indian Perfumer*, **23**, 14.
7. B. L. RAO, S N. SOBTIM, Y. K. SARIN and B. L KAUL, "Newer Trends in Essential Oil and Flavours", Tata Mc-Graw-Hill, New Delhi, 1993.