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The composition, geographical variation and antimicrobial activity of Mentha longifolia subspecies polyadena (Lamiaceae) leaf essential oils

Petkar, Sahir Yusuf

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Conclusions

- *Mentha longifolia* subsp. *polyadena* collected from the southern African region displayed both quantitative and some degree of qualitative variation between natural plant populations. This observation was clearly illustrated by the GC/MS analysis of the essential oils which demonstrated chemical variability in all the samples studied.
- The chemical variation was random and showed no correlation to the geographical distribution of the plant, as demonstrated by the cluster analysis. For example, plants from Potchefstroom in the North-West Province may have close similarity with respect to chemical composition to plants from Clocolan (in the Free State Province).
- Furthermore, the GC/MS analysis of the essential oils identified two distinct major chemotypes, one with high levels of menthofuran and the other with high levels of *cis*-piperitone epoxide and piperitenone oxide. Menthofuran and *cis*-piperitone epoxide rich chemotypes in *Mentha longifolia* subsp. *polyadena* are documented for the first time.
- The solvent extracts displayed greater antimicrobial activity in comparison to the essential oils suggesting that the compounds responsible are more polar metabolites such as the flavonoids. Greater activity was shown in particular amongst the Gram-positive bacteria, against *S. epidermidis* and *B. cereus*, which may cause infections of the skin and the gastro-intestinal tract, respectively. Amongst the Gram-negative pathogens, the solvent extracts showed moderate to

good activity against *Y. enterocolitica* and *M. catarrhalis*, which are involved in infections of the gastro-intestinal tract and respiratory tract, respectively. The solvent extracts from this plant also displayed good to moderate antimicrobial activity against the yeasts, *C. albicans* and *C. neoformans*.

- The cluster analysis displayed strong correlation between the chemical composition of the essential oil samples collected from Lydenberg, Wakkerstroom and Clocolan and hence may account for the similar pattern of antimicrobial activity.
- Some populations that shared similar chemical profiles with respect to the major compounds such as Potchefstroom and Dullstroom however, displayed varying antimicrobial activities suggesting that the presence of trace components, even those as yet unidentified, may possibly influence the biological activity of the essential oil to a significant extent.
- The plant in general displayed moderate to good antibacterial activity, in particular against Gram-positive bacteria, hence this study provides scientific justification for the widespread use of this plant in African traditional medicine in the treatment of respiratory tract disorders, skin infections, and gastrointestinal tract disorders.