

Antimicrobial Activity and Chemical Composition of *Melaleuca genistifolia* Leaf Essential Oil from the Northern Plains of India

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Biological and chemical investigations were carried out to evaluate the antimicrobial potential of *Melaleuca genistifolia* leaf oil for herbal medicines. The disk diffusion and micro broth dilution methods were used for the evaluation of the antimicrobial activity of the essential oil and its major constituent, methyl eugenol against the five selected bacterial and five fungal strains. The oil was active against all the tested bacterial and fungal strains. The oil was highly active against *Staphylococcus epidermidis* and significantly active against *S. aureus*, *Sporothrix schenckii* and *Trichophyton rubrum*, while methyl eugenol was significantly active against *Enterococcus faecalis*, *Streptococcus mutans* and *Escherichia coli*. GC and GC-MS analysis of the oil resulted in the identification of twenty two constituents representing 99.4% of the oil. The chemo type identified had a high methyl eugenol (88.1%) content. The essential oil could be of use for the future development of antimicrobial herbal products.

Keywords: *Melaleuca genistifolia*, Myrtaceae, antibacterial, antifungal, essential oil composition, methyl eugenol.

Melaleuca genistifolia Sm. [syn. *M. decora* (Salib Britten)] is a native of Queensland and New South Wales, Australia. The species was introduced about 50 years ago to the National Botanical Research Institute (NBRI), Lucknow, India through seeds obtained from Coimbra, Portugal for ornamental and environmental (hygienic) purposes. The plant is a small tree or shrub, leaves scattered, linear, and lanceolate. It is used as an ornamental tree in porticos, lawns and gardens. Since its leaves are spongy and highly scented, they are widely used in India for the decoration of bouquets. The leaves are persistent and hence can be preserved after dehydration for use in floriculture.

Although the essential oil composition and antibacterial and antifungal properties of various *Melaleuca* species from different origins have been studied [1a-1f], to the best of our knowledge, no work on the antimicrobial properties and chemical composition of *M. genistifolia* has been carried out.

The volatile oil was obtained by conventional hydro distillation of *M. genistifolia* leaves in a Clevenger-type apparatus, which yielded 0.36% oil (v/w), on a fresh weight basis. GC and GC/MS analysis of *M. genistifolia* oil showed that it contained methyl eugenol as a major constituent. There are some reports on the antimicrobial potential of methyl eugenol and methyl eugenol rich essential oils [1g-1l], which prompted us to carry out an antimicrobial evaluation and detailed GC and GC/MS analysis of *M. genistifolia* oil. The antibacterial potential of the leaf oil and its major constituent, methyl eugenol (**1**), were evaluated against a set of human pathogenic bacterial strains and the results are given in Table 1, which show that the essential oil and methyl eugenol had different MICs for different bacteria. The oil was highly active against *S. epidermidis* and significantly active against *S. aureus*. On the other hand, methyl eugenol was active against all the tested bacteria, but significantly active against *E. faecalis*, *S. mutans* and *E. coli*.