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Eucalyptus camaldulensis Leaves Attacked by the Gall Wasp Leptocybe invasa: A Phyto-Volatile Constituents Study

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Abstract : Eucalyptus camaldulensis is one on the most well-known species of the genus Eucalyptus in the Middle east, its importance relay on the high production of its unique volatile constituents which exhibits many medicinal and pharmacological activities. The gall-forming wasp (Leptocybe invasa) has recently come into sight as the main pest attacking E. camaldulensis and causing severe injury. The wasp lays its eggs in the petiole and midrib of leaves and stems of young shoots of E. camaldulensis, which leads to gall formation. Gall formation by L. invasa damages growing shoot and leaves of Eucalyptus, resulting in abscission of leaves and drying. AIM: This study is an attempt to investigate the effect of the gall wasp (Leptocybe invasa) attack on the volatile constitutes of E. camaldulensis. This could help in the control of this wasp through stimulating plant defenses or production of a new allelochemicals or insecticide. The study of volatile constitutes of Eucalyptus before and after attack by the wasp can help the re-use and recycle of the infected Eucalyptus trees for new pharmacological and medicinal activities. Methodology: The fresh gall wasp-attacked and healthy leaves (100 g each) were cut and immediately subjected to hydrodistillation using Clevenger-type apparatus for 3 hours. The volatile fractions isolated were analyzed using Gas chromatography/mass spectrometry (GC/MS). Kovat's retention indices (RI) were calculated with respect to a set of co-injected standard hydrocarbons (C10-C28). Compounds were identified by comparing their spectral data and retention indices with Wiley Registry of Mass Spectral Data 10th edition (April 2013), NIST 11 Mass Spectral Library (NIST11/2011/EPA/NIH) and literature data. Results: Fifty-nine components representing 89.13 and 88.60% of the total volatile fraction content respectively were quantitatively analyzed. Twenty-six major compounds at an average concentration greater than 0.1 ± 0.02% have been used for the statistical comparison. From those major components, twenty-one were found in both the attacked and healthy Eucalyptus leaves' fractions in different concentration and five components, mono terpene p-Mentha-2-4(8) diene and the sesquiterpenes δ-elemene, β-elemene, E-caryophyllene and Bicyclogermacrene, were unique and only produced in the attacked-leaves' fraction. CONCLUSION: Newly produced components or those commonly found in the volatile fraction and changed in concentration could represent a part of the plant defense mechanisms or might be an element of the plant allelopathic and communication mechanisms. Identification of the components of the gall wasp-damaged leaves can help in their recycling for different physiological, pharmacological and medicinal uses.

Keywords : Eucalyptus camaldulensis, eucalyptus recycling, gall wasp, Leptocybe invasa, plant defense mechanisms, Terpene fraction
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