

Geranyl Acetate Esterase and Regulates the Level of Geraniol in Lemongrass (*Cymbopogon flexuosus* Nees ex Steud.) Mutant cv. GRL-1 Leaves

Deepak Ganjewala^{a,b,*} and Rajesh Luthra^{a,c}

^a Central Institute of Medicinal and Aromatic Plants (CIMAP), Kukrail Picnic Spot Road, P.O. CIMAP, Lucknow-226 105, U.P., India

^b Present address: School of Biotechnology, Chemical and Biomedical Engineering, VIT University, Vellore-632 014, Tamil Nadu, India. E-mail: deepakganjawala73@yahoo.com

^c Present address: Human Resource and Development Group, CSIR Complex, Library Avenue, Pusa, New Delhi-110 012, India

* Author for correspondence and reprint requests

Z. Naturforsch. **64c**, 251–259 (2009); received August 25/September 21, 2008

Essential oil isolated from lemongrass (*Cymbopogon flexuosus*) mutant cv. GRL-1 leaves is mainly composed of geraniol (G) and geranyl acetate (GA). The proportion of G and GA markedly fluctuates during leaf development. The proportions of GA and G in the essential oil recorded at day 10 after leaf emergence were ~59% and ~33% respectively. However, the level of GA went down from ~59 to ~3% whereas the level of G rose from ~33 to ~91% during the leaf growth period from day 10 to day 50. However, the decline in the level of GA was most pronounced in the early (day 10 to day 30) stage of leaf growth. The trend of changes in the proportion of GA and G has clearly indicated the role of an esterase that must be involved in the conversion of GA to G during leaf development. We isolated an esterase from leaves of different ages that converts GA into G and has been given the name geranyl acetate esterase (GAE). The GAE activity markedly varied during the leaf development cycle; it was closely correlated with the monoterpene (GA and G) composition throughout leaf development. GAE appeared as several isoenzymes but only three (GAE-I, GAE-II, and GAE-III) of them had significant GA cleaving activity. The GAE isoenzymes pattern was greatly influenced by the leaf developmental stages and so their GA cleaving activities. Like the GAE activity, GAE isoenzyme patterns were also found to be consistent with the monoterpene (GA and G) composition. GAE had an optimum pH at 8.5 and temperature at 30 °C. Besides GAE, a compound with phosphatase activity capable of hydrolyzing geranyl diphosphate (GPP) to produce geraniol has also been isolated.

Key words: Geraniol-Rich Lemongrass (GRL-1), Geraniol, Geranyl Acetate, Geranyl Acetate Esterase