ABSTRACT

Jasmines are cultivated for their fragrant flowers and have commercial application in cosmetic and perfumery industries. In the present study, an attempt was made to study the temporal variations in floral scent volatiles composition including emitted, free endogenous and glycosyl-linked volatile compounds from two summer-blooming *Jasminum* species namely, *Jasminum auriculatum* and *J. grandiflorum*, and the two winter-blooming species namely, *J. multiflorum* and *J. malabaricum.* The floral scent emission from the summer-blooming species exhibited nocturnal maxima pattern, while emission of volatiles from the winter-blooming species peaked at noon. The free endogenous volatile concentrations in all the species were low when corresponding emitted concentrations were high, and vice-versa. Enzymatic hydrolysis of petal extracts revealed that several volatile compounds containing hydroxyl group are synthesized and stored in the flowers as water-soluble glycosides; these compounds were shown to accumulate in higher amounts in flowers some time before emission started. These results suggest the linkage amongst the temporal patterns of free-endogenous and glycosyl-linked volatile compounds with the emitted volatiles in summer- and winter-blooming *Jasminum* spp.

Further, the physiology of scent volatiles synthesis and emission in *J. auriculatum* at different stages of floral maturation were also assessed under *in situ* condition. Maximum scent emission was observed when the flowers start unfurling and become fully open. The *in vitro* activities of a few key pathway enzymes and levels of transcript accumulation for several candidate genes involved in the biosynthesis of scent volatiles correlated well with the fragrance emission patterns. Upon identification of the appropriate flower maturation stage where maximum scent formation and emission occurred, studies were undertaken at that stage under controlled conditions, to evaluate the influence of varying air temperatures on scent volatiles synthesis and emission. Four different air temperature conditions, viz. 20°C, 25°C, 30°C and 35°C, were set for the present study. It was observed that the accumulation and emission of floral volatiles were higher at the median temperatures of 25°C and 30°C, while the contents were much lower at the set boundary temperatures (20°C and 35°C). Further, it was observed that under varying temperature conditions, the activities of volatile producing pathway enzymes, as well as expression levels of several scent-related genes correlated well with their respective volatile contents. Analysis of non-volatile metabolite contents from flowers grown under different air temperatures suggest a significant perturbation in primary metabolites as well. The knowledge base created through such studies shall be helpful in improving the yield of floral scent production from such horticulturally important plants in controlled-environment cultivation systems.

Keywords: *Jasminum*, floral scent, free endogenous volatiles, glycosyl-linked volatile compounds, temporal emission, floral maturation stages, air temperature conditions, enzyme activity, scent-related gene expression, primary metabolites.