PHENYLALANINE AMMONIA LYASE GENE EXPRESSION AND ACCUMULATION OF PHENOLIC COMPOUNDS IN SALVIA VIRGATA UNDER ELICITATION OF EXOGENOUS GABA

Zeinab Zarekar, 1 Tayebeh Radjabian, 1, * Seyed AliReza Salami, 2 Daryush Talei 2

1 Department of Biology, Faculty of Basic Sciences, Shahed University, Tehran, Iran
2 Department of Horticultural Sciences, Faculty of Agriculture and Natural Resources, University of Tehran, Karaj, Iran
E-mail: rjhabian@shahed.ac.ir

Pharmaceutical properties of Salvia plants (Labiatae) are mainly due to their secondary metabolites, especially phenolic compounds. For a long time, Salvia species have been used in traditional medicine and nowadays, these plants have attracted many attentions as novel natural treatments for the relief of many diseases such as depression, dementia, obesity, diabetes, heart disease, and cancers. The aim of this study was focused on the elicitation effects of γ-aminobutyric acid (GABA) on PAL gene expression and accumulation of three active phenolic compounds in the leaves of Salvia virgata Jacq. The mature seeds were sterilized and germinated in peat moss pots. Plantlets at six-leaf stage were treated with four concentrations (0, 0.01, 0.1 and 1 μM) of aqueous solution of GABA. Leaf samples were harvested after 0, 12, 24 and 48 h treatment for RNA isolation. Total RNA was isolated from the leaf tissue samples using BIOZOL reagent, cDNA was generated using the iScript cDNA synthesis kit (BIO-RAD) and Real Time PCR was used to investigate the expression profiling of PAL in the samples. The methanolic extracts were analyzed by HPLC method and the concentration of rosmarinic acid (RA), salvianolic acid A (Sal A) and salvianolic acid B (Sal B) was measured in the samples using calibration equations. Real Time PCR analysis revealed that exogenous application of GABA led to up-regulation of PAL expression in the leaf samples, with the maximum value at 0.1 μM concentration of GABA after 12 h of treatment. Data analysis also showed that in S. virgata, the greatest RA (106.3 μg/g DW) and Sal B (433.1 μg/g DW) accumulation was achieved at 0.01 μM GABA, and the highest content of Sal A (8.2 μg/g DW) was reported at 1 μM of GABA, while the maximum gene expression of this enzyme was obtained at 0.1 μM GABA. It was concluded that there was no statistically significant correlation between increase in transcription of PAL gene and the phenolic compounds accumulation in the studied samples. This is the first report on the effect of GABA as an elicitor on PAL enzyme in S. virgata. In conclusion, our findings indicated that PAL is not the only rate-determining enzyme in the biosynthesis pathway of phenolic compounds in Salvia species, and accumulation of these compounds could also be affected by some other factors [1].

References