

Phenolic compound analysis in transgenic *Codonopsis lanceolata* overexpressing γ -TMT gene.

College of agriculture and Life Science, Kangwon National University*,
KonKuk University, Seoul 143-701, Korea

Bimal Kumar Ghimire, Eun Young Kang, Su-Hyun Seo, Eun Hye Kim, Amal Kumar Ghimeray, Ill Min Chung, Kweon Heo, Chang Yeon Yu*

Objectives

The objectives of this work was to investigate and quantify phenolic compounds existing in leaf and roots of control and transgenic *Codonopsis lanceolata* treated with various herbicides stress. Also, aim was to study the effect of herbicides treatment on total phenolic compound in the plant.

Material and Methods

Seedlings of transgenic lines and nontransformed plants of *Codonopsis lanceolata*. The herbicides applied to the plants are as follows: Glyphosate, Diphenyl ether, Triazine. Sample (2g) were grinded and mixed with 2 ml of 0.1 N HCl and 10 mL of acetonitrile (ACN), filtered through a Whateman No. 42 filter. The dried samples were redissolved in 10 mL of 80 %. HPLC analysis was carried out on a product from Shimadzu company, using pump model LC-10AD VP, detector model SPD-M10A VP (Photo Diode Array detector) and YMC-Pack ODS-AM-303. The mobile phase consists of solvent A (0.1 % glacial acetic acid in distilled water) and solvent B (0.1% glacial acetic acid in acetonitrile). The solvent flow rate was 1 mL min⁻¹, and the wavelength of the Photo Diode Array detector (PDA) was 280 nm. The injection volume was 20 ul. The plotting standard concentrations were 10, 50, and 100 ppm.

Result

Total concentration of phenolic compounds in glyphosate treated non-transformed and transgenic leaves were 3833.09 and 2463.82 to 12072.76 ug/g respectively; to that of roots were 1522.39 and 587.18 to 2408.19 ug/g respectively. The average content of Quercetin acid was highest in leaf and root extract of both control and transgenic plants. However, total concentration of phenolic compounds in triazine treated non-transformed and transgenic leaves were 9606.65 and 11606.73 to 20510.02 ug/g respectively; to that of roots were 2098.67 and 1320.39 to 6749.74 ug/g respectively. The average content of Chlorogenic acid was highest in leaf and root extract of both control and transgenic plants.

Corresponding author: Chang Yeon Yu E-mail : Cyyu@kangwon.ac.kr Tel : +82-33-250-6411

In addition, total concentration of phenolic compounds in Diphenyl ether treated non-transformed and transgenic leaves were 20075.70 and 14413.22 to 23716.30 ug/g respectively; to that of roots were 1887.93 and 1462.61 to 2693.87 ug/g respectively. The average content of p-Hydroxybenzoic acid was highest in leaf of both control and transgenic plants. Despite the similar type of phenolic acids and flavonoid group obtained in this study, quantitative differences observed between control and herbicides treated plant. All tested herbicides increased the concentration of (+) Catechin, Benzoic acid, Gallic acid, p-Hydroxybenzoic acid, Protocatechuic, Veratric acid, Vanillin. On the other hand, all the tested herbicides induced a significant reduction of concentration of t-Cinnamic acid.

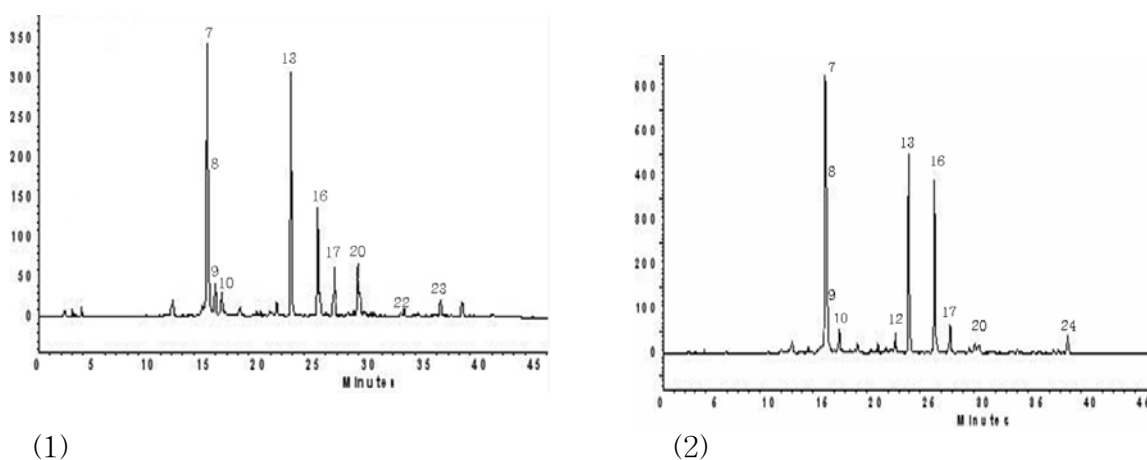


Figure 1 HPLC analysis of phenolic acids and flavonoids in leaf of *Codonopsis lanceolata*. (1) Control plant (2) Plant treated with herbicide (triazine).

(7: Ferulic acid 8: Gallic acid 9: Gentisic acid 10: Homogentisic acid 12: Protocatechuic acid 13: Pyrogallol 16: 5-Sulfosalicylic acid 17: Syringic 20: Veratric acid 23: Kaempferol 24: Myricetin)