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ABSTRACT

DETECTION OF METABOLITES IN SHOOT, ROOT, AND ROOT EXUDATES OF SOYBEAN UNDER DIFFERENT POTASSIUM STATUS

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Potassium (K) is an essential macronutrient for plant growth and development. Comprehensive effect of potassium status on metabolites of soybean are unknown. The objective of this study was to clarify the effect of the potassium concentration on growth of different soybean cultivars and to detect metabolites of soybean under different potassium status using a metabolites profiling technique. Two soybean cultivars (*Glycine max* cv. Satonohohoemi and *Glycine max* cv. Tachinagaha) were grown hydroponically in growth chamber condition (16/8 h day/night regime at 27^{o}C) under low K (6 mg K L^{-}1), normal K (60 mg K L^{-}1) and high K (120 mg K L^{-1}) concentrations. Agronomic parameters, shoot extracts, root extracts, and root exudates were measured and collected from 7 and 14 days after transplanting (DAT). Further, the metabolites were determined by capillary electrophoresis/time-of flight mass spectrometry (CE-TOF/MS). A significant decrease of plant biomass in low-K concentration appeared at 7 DAT in Tachinagaha. Shoot and root K-contents were higher in low K-tolerant than low K-sensitive cultivars at 7 and 14 DAT and hence shoot and root dry matter in low K-tolerant cultivar were higher. Satonohohoemi had 206, 166, and 45 metabolites identified in shoot, root, and root exudates, respectively. Furthermore 206, 171, and 39 metabolites of Tachinagaha were identified in shoot, root, and root exudates, respectively. Only 23-27% metabolites in the root extracts were detected in the root exudates of both cultivars. As a consequence there were different responses in metabolic pathways such as glycolysis, TCA cycle, amino acid and polyamines metabolism under low-K and high-K concentrations. These findings indicate that low-K and high-K concentrations mostly affect shoot and root than root exudates metabolites in soybean plant.

Keywords: potassium, soybean, metabolites, cultivar, CE-TOF/MS