



Tropentag, October 5-7, 2011, Bonn

“Development on the margin”

Effects of Genistein on Nodulation, Nitrogen Fixation and Physiological Attributes of Soybean under Salt Stress

ARIA DOLATABADIAN¹, SEYED ALI MOHAMMAD MODARRES SANAVY¹, FAEZEH GHANATI², PETER GRESSHOFF³

¹Tarbiat Modares University, Dept. of Agronomy, Iran

²Tarbiat Modares University, Dept. of Biology, Iran

³University of Queensland, ARC Centre for Integrative Legume Research, Australia

Abstract

Legumes are highly important food, feed and biofuel crops, that can enter into a symbiotic relationship with specific soil bacteria called rhizobia. This interaction results in conversion of atmospheric nitrogen into useable forms of nitrogen, thus reducing/replacing fertiliser demand. Isoflavones, such as genistein in soybean play important roles in plant-microbe interactions, c.f., the legume root nodule symbiosis. Therefore, we evaluated the role of exogenous genistein in the *Bradyrhizobium* inoculation medium on nodulation, nitrogen fixation and some physiological attributes of soybean grown under salt stress. Soybean seeds (L17) were sown into plastic pots filled up with autoclaved perlite and vermiculite. The pots were placed into a growth cabinet (L/D=16/8 h, T=28/25°C), and watered with full strength of Broughton and Dilworth solution. *Bradyrhizobium japonicum* (CB1809) was cultured in liquid YMB culture, after 24 h genistein was added into YEB to reach final concentration of 10 µM. The five days old plants were inoculated with a liquid YMB and watered with B&D solution containing 8 mM KNO₃ and 0, 25, 50 and 100 mM NaCl. Four weeks after inoculation, maximum photochemical efficiency of PSII (F_v/F_m), photosynthetic rate, stomatal conductance and transpiration rate were measured. Number of nodules and nitrogenase activity (GC method) was assayed. Fresh leaves were frozen in liquid N₂ for antioxidant enzyme activity assay. There was a significant difference between presence or absence genistein on nodule number and nitrogenase activity. Genistein increased nodule number and nitrogenase activity in each level of salinity compared with control. Moreover, genistein enhanced maximum photochemical efficiency, photosynthetic rate, stomatal conductance and transpiration rate while catalase, superoxide dismutase and peroxidase activity in leaves and roots were not affected by genistein but salt stress induced large and significant changes on both photosynthetic parameters and antioxidant enzyme activity. The former was suppressed and latter was amplified. There was significant decrease in nodule number and nitrogenase activity because of salt stress. According to these results it can be deduced that, genistein application into rhizobia inoculant improves plant growth through improved nodulation and nitrogen fixation in both normal and salt stress conditions.

Keywords: Antioxidant enzymes, genistein, nitrogen fixation, salt stress, soybean

Contact Address: Aria Dolatabadian, Tarbiat Modares University, Dept. of Agronomy, Tehran, Iran, e-mail: aria.dolat2000@yahoo.com