

EFFECT OF SOIL AMENDMENT WITH SEWAGE SLUDGE ON SURVIVAL OF *BRADYRHIZOBIUM JAPONICUM*, NODULATION AND SYMBIOTIC N₂-FIXATION OF SOYBEAN PLANTS GROWN ON CALCAREOUS LOAMY SOIL

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ABSTRACT

The effect of sewage sludge on survival of bradyrhizobia in calcareous loamy soil of Saudi Arabia was studied in the laboratory. The impact of sludge amendment and inoculation with bradyrhizobia strains of different effectiveness on the nodulation and the N₂-fixation in different soybean cultivars was also investigated in the greenhouse. Microelements uptake by the plants due to sludge amendments was also determined. The results showed that application of sewage sludge at different rates (1-4%) to a loamy soil increased significantly the *Bradyrhizobium japonicum* population during the 70 days incubation with the peak of growth after 20-30 days from incubation. No harmful effect had been recorded when 4% sewage sludge was applied to the soil comparing with the control. Application of sewage sludge in a moderate rates (80-120 ton ha⁻¹) to loamy soil planted with soybean and inoculated with different bradyrhizobial strains enhanced nodule formation and symbiotic N₂-fixation assessed by acetylene reduction assay, dry matter and nitrogen contents of the plants. High rates of sludge application (160 ton ha⁻¹) deleteriously affected nodulation and N₂-fixation in soybean plants. Microelements concentration of plants increased significantly with increasing rates of sewage sludge. The concentration of microelements in shoots of soybean plants which received moderate rates of sludge were below foliar levels usually indicative of toxicity. No significant differences between the 2 soybean cultivars concerning the effect of sewage sludge on the nodulation and the symbiotic N₂-fixation.

Key words: Soybean cultivars, sludge-amendment, N₂-fixation

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