

Plant Growth and Yield Enhancement of Soybean by Inoculation with Symbiotic and Nonsymbiotic Bacteria

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Abstract : Microbial inoculants from the group of symbiotic-nitrogen-fixing rhizobia are well known and widely used in production of legumes. On the other hand, nonsymbiotic plant growth promoting rhizobacteria (PGPR) are not commonly used in practice. The objective of this study was to examine the effects of soybean inoculation with symbiotic and nonsymbiotic bacteria on plant growth and seed yield of soybean. Microbiological activity in rhizospheric soil was also determined. The experiment was set up using a randomized block system in filed conditions with the following treatments: control-no inoculation; treatment 1-Bradyrhizobium japonicum; treatment 2-Azotobacter sp.; treatment 3-Bacillus sp..In the flowering stage of growth (FS) the number of nodules per plant (NPP), root length (RL), plant height (PH) and weight (PW) were measured. The number of pod per plant (PPP), number of seeds per pod (SPP) and seed weight per plant (SWP) were recorded at the end of vegetation period (EV). Microbiological analyses of soil included the determination of total number of bacteria (TNB), number of fungi (FNG), actinomycetes (ACT) and azotobacters (AZB) as well as the activity of the dehydrogenase enzyme (DHA). The results showed that bacterial inoculation led to the formation of root nodules regardless of the treatments with statistically no significant difference. Strong nodulation was also present in control treatment. RL and PH were positively influenced by inoculation with Azotobacter sp. and Bacillus sp., respectively. Statistical analyses of the number of PPP, SPP, and SWP showed no significant differences among investigated treatments. High average number of microorganisms were determined in all treatments. Most abundant were TNB (log No 8,010) and ACT (log No 6,055) than FNG and AZB with log No 4,867 and log No 4,025, respectively. The highest DHA activity was measured in the FS of soybean in treatment 3. The application of nonsymbiotic bacteria in soybean production can alleviate initial plant growth and help the plant to better overcome different stress conditions caused by abiotic and biotic factors.

Keywords : bacteria, inoculation, soybean, microbial activity

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