

## Tannin Interactions with Legume-rhizobial N<sub>2</sub> Fixing Symbiosis

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**Abstract:** Effects of tannic acid on rhizobial performance and legume-rhizobial N<sub>2</sub> fixing symbiosis were examined using soybean as the test plant. Two strains, *Bradyrhizobium elkanii* SEMIA 5019 and *B. japonicum* TAL 102 were grown in continuous culture media with different concentrations of tannic acid for 28 days to produce tannic acid-affected rhizobia. Soybean inoculated by the affected rhizobia in gravel pots was evaluated for plant growth, nodulation and N accumulation after 40 days. Two other sets of soybean plants inoculated by unaffected, normal rhizobia were treated with tannic acid separately at planting or two weeks after planting. This was to examine the effect of soil solution tannic acid on the symbiosis. Plant growth, nodulation and N accumulation of soybean were reduced when the rhizobial strains were affected mainly by >0.2 mM tannic acid. This was conspicuous in *B. japonicum* TAL 102. Tannic acid was responsible for biochemical changes of the rhizobial proteins, thus resulting in their alterations, especially in *B. japonicum* TAL 102. When grown in culture media with 0.4 mM tannic acid, an increased shoot N accumulation was observed in inoculated soybean. It is concluded from this study that soil tannins have both favorable as well as unfavorable effects on the legume-rhizobial N<sub>2</sub> fixing symbiosis. They reduce rhizobial performance by direct interactions whereas they enhance N<sub>2</sub> fixing activity possibly by removing soil mineral N in the proximity of legume root system at planting.

**Key words:** *Bradyrhizobium elkanii*, *Bradyrhizobium japonicum*, N<sub>2</sub> fixing symbiosis, Tannin, Soybean

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