Rhizobium symbiosis contribution to short-term salt stress tolerance in alfalfa (*Medicago sativa* L.)

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Salt stress negatively affects alfalfa (*Medicago sativa* L.) production and biological nitrogen fixation. We investigated whether rhizobium symbiosis has an effect on host plant tolerance to salt stress. We determined the survival rate, oxidative damage level, activities of antioxidant enzymes, and contents of osmotic solutes in the leaf and root of 4 month-old alfalfa with active nodules, inactive nodules or without nodules, and under short-term salt stress. Alfalfa with active nodules showed higher survival rate. Higher survival rate was associated with reduced lipid peroxidation, higher activities of superoxide dismutase (SOD), catalase (CAT), peroxidase (POD), and ascorbate peroxidase (APX) as well as higher concentrations of reduced glutathione (GSH) and soluble sugar, especially in roots under salt stress. Variance analysis indicated nodulation affected the activities of SOD, CAT, POD, and APX along with concentrations of GSH, soluble sugar, and soluble protein. Inoculation also resulted in higher basal levels of superoxide anion radical ($O_2^{\cdot-}$) without salt stress. Rhizobium symbiosis had a positive effect on alfalfa salt tolerance by improving the activity of antioxidant enzymes and osmotic adjustment capacity.