

ABSTRACT

COMPETITION STUDIES WITH NON-NODULATING MUTANTS OF COWPEA RHIZOBIA

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Competitive interactions between two non-nodulating mutants (MS1 and Sm^D) and four nodulating cowpea rhizobia strains varied from no suppression in some instances in vermiculite at the 1:1 inoculum ratio to 27.8% suppression (JRW3:MS1) and between 31 and 72% suppression at the 10:1 ratio (MS1:JRP31) on cowpeas. In non-sterile soils, suppression of nodulation was more pronounced than that in vermiculite with total suppression of nodulation of Nod⁺ (IRC256) by Nod⁻ (Sm^D, non-isogenic strains). Shoot dry weight generally showed no particular trend, while nodule weight related quite well to nodule numbers.

This study showed that the proportions of competing strain as well as total rhizobial numbers influenced competitiveness. When Nod⁻ strain was used to inoculate soils containing indigenous rhizobia nodule suppression

increased from 0% at an inoculum rate of 10^3 Nod⁻ cells/ml to 76.7% at 10^{10} cells/ml. Competition in broth and supernatant studies revealed that suppression was not being effected by production of antagonistic compounds. Attachment studies however, showed more firm attachment of Nod⁻ than Nod⁺ and indicated this as the possible means by which Nod⁻ exerts its suppressive action. Further, the competitive interaction between Nod⁺ and Nod⁻ strains was significantly altered by pre-exposure of cowpea seedlings. Pre-exposure of cowpea seedlings to Nod⁻ for 6, 24, 48, and 72 hrs even at a 1:1 ratio resulted in nodule suppression of 25 - 42% with increased suppression of 31 - 63% from 0 - 72 hrs at the 10:1 ratio (Nod⁻ and Nod⁺). Reversal of inoculum order with Nod⁺ applied first resulted in normal nodulation of Nod⁺ from the 24 hr treatment. This suggests that the critical period for nodulation success was 24 hrs when Nod⁻ was supplied ten times greater than Nod⁺ in the inoculum.