COMPATIBILITY BETWEEN RHIZOBIAL STRAINS AND SOME LEGUME VARIETIES AND IT'S EFFECT ON PLANT GROWTH

By

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B. Sc., Agric. Sci., (Soil and Water), Fac. Agric., Sana'a Univ., Yemen, 2007

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APPROVAL SHEET

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Name of Candidate: Mohammed Ali Ahmed Al-hudaiji **Degree:** M.Sc.
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Dr. Hatem H. Abo Taleb
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ABSTRACT

The main objective of the work was to evaluate the benefits from inoculation of some varieties of chickpea with specific rhizobia and evaluating the amount of N_2- fixed using ^{15}N-dilution technique. Two pot experiments were conducted using 3 local chickpea varieties, Giza 2, Giza 195and Giza 531 and 3 of *Mesorhizobium ceciri* namely, ICARDA 36, NIFTAL 1148 and ARC-Nubaria. In the first experiment seeds of the 3 chickpea varieties were inoculated with either single or mixed strain inocula of *Mesorhizobium ceciri* and sown in pots filled with a sandy soil from Ismaelia and arranged in a completely randomized design then fertilized with ammonium sulfate at a rate of 20 kg N.fed^{-1}. Data showed that nodules not formed on non-inoculated plants in the sandy soil whether N fertilized or not. In contrast all plants positively responded to *Mesorhizobium ceciri* inoculation with different densities of nodule numbers depending upon the N fertilizer rates and plant age. Rhizobial strain ICARDA 36 (S1) was the most compatible with the both Giza 2 and Giza 531 cultivars and equal to S2 (NIFTAL 1148) with the variety Giza 195 and this occurred when 20 kg N fertilizer was applied with inoculation. The obtained results suggested that competition between *Mesorhizobium* strains might be the main reason for the mixture to give lower number than the single strain application. Unioculated and unfertilized chickpea plants, of the 3 chickpea varieties gave the lowest dry weights at the 3 growth stages compared to any other treated plants. In contrast, applying 50 kg N. fed^{-1} produced significantly higher chickpea dry weights than those inoculated with strains of *Mesorhizobium ceciri* and compared with the recommended 50 Kg dose N without inoculation supplied with 20 kg N. fed^{-1}. The second experiment aimed to estimate the contribution of rhizobia to plant N uptake of chickpea (Giza 195) as influenced by inoculation with two strains of *Mesorhizobium ceciri* (ICARDA 36 and NIFTAL 1148) fertilized with mineral ^{15}N-labled fertilizer or organic N in barley residues using ^{15}N isotope dilution technique. Nodules were formed only on roots of inoculated chickpea plants; either received mineral or organic fertilizer. *Mesorhizobium ceciri* inoulation formed 13 nodules /plant with nodule dry weight of 105.6 mg plant^{-1} after 120 days from sowing. Application of low dose of N gave the highest nodule number compared to the other fertilizer rates at the two growth periods. Inoculation resulted in significant increase in both dry weight and plant N content. No differences in all parameters were recorded between inoculated plants fertilized with 20 kg N. fed^{-1} and those received 50 kg N. fed^{-1}, Results indicating that inoculation compensate some of the N-mineral fertilizer.

Key words: Compatibility, Chickpea, *Mesorhizobium ceciri* strains, Rhizobial inoculation, Nitrogen fixation, ^{15}N-isotpe.

DEDICATION

I dedicate this thesis affectionately

to the following:

My parents.

My wife.

My Brothers.

My sisters.

My daughter.

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