

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

**By**

**Mohammed Ali Ahmed Al-hudaiji**

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

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## **APPROVAL SHEET**

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**Title of Thesis:** Compatibility Between Rhizobial Strains And Some Legume Varieties And It's Effect On Plant Growth

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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 195 and 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<sup>-1</sup>. 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. Uninoculated 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<sup>-1</sup> 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<sup>-1</sup>. 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  $^{15}N$ -labeled 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* inoculation formed 13 nodules /plant with nodule dry weight of 105.6 mg plant<sup>-1</sup> 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<sup>-1</sup> and those received 50 kg N. fed<sup>-1</sup>, Results indicating that inoculation compensate some of the N-mineral fertilizer.

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





## *DEDICATION*

*I dedicate this thesis affectionately  
to the following:*

*My parents.*

*My wife.*

*My Brothers.*

*My sisters.*

*My daughter.*



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# CONTENTS

Title	Page No
<b>INTRODUCTION</b>	1
<b>REVIEW OF LITERATURE</b>	4
1. Agronomic and economic importance of Chickpea.	4
2. Biological nitrogen fixation	5
3. Nitrogenase	8
4. The N <sub>2</sub> fixing bacteria with emphasis <i>rhizobium</i>	9
5. Specificity in legume- <i>Rhizobium</i> symbiosis	11
6. Mesorhizobia-legumes symbiosis specificity	12
7. Taxonomy of rhizobia	14
8. <i>Mesorhizobium</i> Genus	16
9. Rhizobia- legumes interaction	18
10. Determination of biological nitrogen fixation using <sup>15</sup> N isotope dilution technique	19
<b>11. The nutritional and ecological factors that affect BNF</b>	21
a. Soil mineral nitrogen and phosphorus	21
b. Soil acidity	22
c. Carbon and energy sources	24
d. Competition between rhizobia	25
e. Temperature stress	25
f. Salt stress	26
g. Soil water content (moisture)	28
<b>MATERIALS AND METHODS</b>	30
1. Soil used	30
2. Seeds	31
3. Bacterial strains	31
4. Media	31
5. Yeast extract mannitol agar medium	32
6. Bacterial cultures	32
7. Rhizobial inocula preparation	32
8. Fertilizer application	32
9. Physical and chemical determinations of soil.	33
Total nitrogen (N) in plants	34
Plant phosphorus	35



10. The dry weight of the vegetative portion and nodules of the plant	35
11. Experimental	36
12. <b>Layout of the work:</b>	37
a. The first experiment	37
b. The second experiment	37
13. Parameters	40
14. Statistical analysis	41
<b>RESULTS AND DISCUSSION</b>	42
1. Nodulation and growth of chickpea as affected by compatibility between rhizobial strains and plant genotype	42
a. Number of root-nodules of different varieties of chickpea plants.	42
b. Nodule dry weights.	45
c. Dry weights of the vegetative portion of chickpea plants	46
d. Nitrogen (%) and plant N- content of chickpea plants	49
e. Phosphorus % and P-content of chickpea as affected by rhizobial inocula strain and plant genotype	55
2. Quantification of N <sub>2</sub> -fixation by chickpea <i>Mezorhizobium</i> symbiosis using <sup>15</sup> N-dilution technique.	63
a. Effect of organic and mineral N- fertilizer application on nodulation of inoculated chickpea plants	63
b. Growth parameters	64
c. Nitrogen use efficiency %NUE	74
<b>CONCLUSION</b>	76
<b>SUMMARY</b>	77
<b>REFERENCES</b>	83
<b>Arabic Summary</b>	