جامعه عين شمس
كلية البنات للآداب و العلوم و التربية
قسم النبات

تأثير العلاقة التكافلية بين البقوليات – الريزوبيا و الكمبوست على خصوبة التربة من خلال الدورة الزراعية

رسالة مقدمة من الطالبة

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EFFECT OF LEGUME-*RHIZOBIUM* SYMBIOSIS AND COMPOST ON SOIL FERTILITY THROUGH CROP ROTATION SYSTEM

A Thesis
Submitted to Botany Department
Women's College, Ain Shams University

For

The Degree of Ph. D. in Science (Microbiology)

By

Soaad Yousef Serry El-Sayed

B.Sc. Microbiology, Women's College, Ain Shams Univ., 1998
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2013

ABSTRACT

Three rhizobial strains (ARC-201,202 and 203) were investigated in an *in vitro* experiment to evaluate their efficiency to some environmental limiting factors (pH, salinity, temperature and nitrogen concentration). The growth response was evaluated using plate count technique. A plant infection technique experiment was done to evaluate the symbiotic performance of the tested rhizobial strains to nodulate two *Pisum sativum* varieties (master pea and little marvel). Result revealed that ARC-201and 202 strains performed good results with master pea variety.

Accordingly, field experiments were conducted at Ismailia Agricultural Experiments Research Station, El-Ismailia Governorate during the two successive seasons November 2008 to February 2009 and June 2009 to September 2009 to accommodate two rotation cycles (pea/maize – potato/maize). Addition of biofertilizers (*Rhizobium* and plant growth promoting rhizobacteria) and organic fertilizer (compost) were also investigated to study their integrated effects on improving of nutrients availability, chemical and biological activity of the tested sandy soil.

The two rotation cycles were established to investigate the effect of inclusion legume crops(pea) in the rotation compared to heavy feeder crops (potato), on plant growth and yield of the subsequent crop (maize), as well as soil organic matter level, microbial biomass and soil enzymes and microbial activities of the soil. Results demonstrated that the pea/corn rotation has been

shown to improve the investigated growth parameters, yield response and NPK accumulation significantly relative to potato/corn rotation. Significant soil fertility improvement was also observed. Balanced fertilization using both organic and chemical fertilizers in such legume rotation system was reported to reduce fertilizer N requirement.

Maximum values of all the investigated parameters were obtained when 120 and 90 kg N/fed were applied in combination with the enriched compost in the pea/corn rotation. At the end of the experiments the results also showed a significant improvement in chemical properties (organic C, total N and available P and K) and biological properties (total microbial count, CO_2 evolution and dehydrogenases activity) of the soil.

Key words: Compost, PGPR, *Rhizobium*, pea productivity and legume crop rotation, inorganic fertilizer, maize productivity, strain selection.

Dedication

After God almighty, there are several people to whom I owe a great deal of gratitude and thanks

My dearest parents

Without them this work would never have been started.

My beloved husband

Who patiently supported this work

My daughters and son

For them this work has been done

My sisters and brother

Without them this work would never have been done

My closely friend

Dr. Hend M. El-Egami

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This is the time for a last and personal words .This is the time to say ,

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LIST OF ABBREVIATIONS

ATPase	Adenosine Triphosphatase
BNF	Biological Nitrogen Fixattion
CFU	Colony Forming Units
FYM	Farm Yard Manure
IAA	Indole Acetic Acid
NA	Nutrient Agar
OM	Organic Matter
PGPB	Plant Growth Promoting Bacteria
PGPR	Plant Growth Promoting Rhizobacteria
Tg	Teragram
TPF	Triphenyl formazane
TTC	Tetrazolium Chloride
YEM	Yeast Extract Mannitol