INCREASING YIELD OF SOME ECONOMIC CROPS UNDER ORGANIC AGRICULTURAL CONDITIONS

By

KHADEGA TALAAT ABD EL-AZEEM

B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Cairo Univ., Egypt, 2003
M.Sc. Agri. Sci. (Agric. Microbiology), Fac. Agric., Cairo Univ., Egypt, 2010

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Name of candidate: Khadega Talaat Abd El-Azem Saleh **Degree:** Ph.D.
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Supervisor: Dr. Aziz Mohamed Aziz Higazy
Dr. Waleed Diaeddeen Saleh
Dr. Atef Abd El-Aziz Hassan Ragab
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ABSTRACT

The objective of this work was to study the support of vegetative growth, productivity and quality of common bean (*Phaseolus vulgaris* L.) cultivar "Polista" and potato (*Solanum tuberosum*) cultivar "Diamount" grown using inocula of bacterial endophyta, alone or with *Rhizobium* sp. (for legume crops). In this study, the field experiment was carried out during the two growing seasons of 2016 and 2017 at the "Bio-Egypt" farm in Qalyubia – Governorate-Egypt.

The examined endophytic bacterial strains isolated and characterized in a previous work were conclusively identified using 16S rDNA gene sequence analysis as *Azotobacter vinelandii* , *Bacillus subtilis* , *Rhizobium phaseoli* and *Azospirillum lipoferum* . These isolates showed ability *in vitro* to produce plant growth promoting substances as ammonia (NH_3), hydrogen cyanide (HCN), as well as the ability to fix nitrogen, dissolve phosphate and poly-β-hydroxybutyrate (PHB) along with their intrinsic antibiotic resistance. Plant growth promoting ability of these bacteria was evaluated in field experiments.

The results showed that the integrated use of biofertilizers increased the plant height, number of stems, total chlorophyll and chemical composition of potato tubers also specific gravity, carbohydrate and protein content and total phenol in potato. When inoculated with *Azotobacter* sp., *Azospirillum* sp., *Bacillus* sp. and compost extract (P16) and *Azotobacter* sp., *Azospirillum* sp. and compost extract (P13), the highest total yield from potato (14.4 – 14.7 ton/fed) was obtained in season 1 and season 2, respectively. On the other hand, inoculation of common bean with *Rhizobium* sp., *Azotobacter* sp., *Azospirillum* sp. and compost extract (Ph14) increased total yield up to (22.85 – 25.38 kg/fed) in the two seasons. Results referred a possible role of the isolated endophytes, as inocula, in improving commonbean and potato growth and productivity.

Key words: Potato, commonbean, organic agriculture, N_2-fixation, *Rhizobium*.

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ARABIC SUMMARY .....

SUMMARY

Common bean (*Phaseolus vulgaris* L.) and potato (*Solanum tuberosum*) are among the most important sources of food. The objectives of the present work were to reach conclusive uses of isolates of bacteria, isolated and reinoculated to encourage growth and productivity. The PGP capacity of the endophytic was challenged *in vivo* in a field trial. The working plan can be summarized as follows:

1. Isolation of rhizobia from the root nodules of common bean plant in addition to isolation of *Azotobacter*, *Azospirillum* and *Bacillus*.

2. Isolates were purified and examined for their cultural, morphological and physiological characteristics.

3. Analysis of 16S ribosomal DNA (rDNA) gene sequencing conclusively affiliated the endophytic bacterial strains to *Azotobacter vinelandii* , *Bacillus subtilis* , *Rhizobium phaseoli* and *Azospirillum lipoferum.*

4. Study the ability of these strains to produce substances that encourage plant growth NH_3, HCN and phosphate dissolving.

5. Study the ability of these strains to fix atmospheric nitrogen and produce poly- β-hydroxybuterate (PHB).

6. Study the effect of bacterial inoculation on improving the growth and productivity of potato and common bean crops.

and 2936.5 ppm total phenol and 2nd season 10.33 for protein and 8307.7.

6. The effect of specific density was significant in both seasons. In the first season (P 15) was the highest comparison to control. While in the second season (P 10) gave the highest percentage.

7. All treatments gave a high percentage of chlorophyll in both seasons and the results showed that the treatment (P 13) gave the highest value in chlorophyll content (69 and 56 in season 1 and season 2, respectively).

8. The effect of the interaction between different treatments on potato yield was similar in both seasons. Accordingly, the effect of the interaction between compost extract, *Azotobacter* sp., and *Azospirillum* sp. was the best treatment that gave the highest yield (14.7 ton/fed in 1st season and 15.5 ton/fed in 2nd season).

Based on the above, we can conclude that the compost extract with bacterial strains can play an important role in improving the productivity of potato and common bean crops. They can replace chemical fertilizers to obtain the maximum productivity of economic crops with high quality and free from chemicals in addition to reducing production costs.