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The Effect of Microbiology Fertilization on the Nitrogen Fixation of Wheat Plant

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ABSTRACT

Background : Many of the microbes used as biological fertilizers to supply the plant with various nutrients excrete, during its growth and reproduction, substances called plant growth regulators or plant growth promoters such as gibberellins and similar materials that are excreted by some microbes in the rhizosphere such as Azotobacter, Arthrobacter, Mucor and some algae and exogenous mycorrhizae and there Other substances excreted by microbes called auxins, such as indole acetic acid (IAA), are excreted by the external mycorrhiza (also excreted by cytokinin). Some types of cytokinin rhizobia are excreted, meaning that these microbes, when used as biological fertilizers, play two important roles, one of which is the supply of nutrients to plants. The other is the secretion of plant growth regulators**.**

Methodology: The treatments under study were divided into three: the first was the bacterial suspension mixed with the seeds of the wheat plant, the second was added to the watering water, where it was watered for only one time, and the last was without addition, where the seeds were planted and watered with water that does not contain microorganisms. It was called the treatment of mixing microorganisms with seeds F1 and the treatment of adding microorganisms with irrigation water F2 and the last was control. As for the microorganisms under study, two types were chosen *Pseudomonas spp, Acinetobacter spp*.

Result: effect of fertilizing with Pseudomonas bacteria on the proportion of nitrogen in the wheat plant, where the percentage of nitrogen in the treatment F1 was the treatment in which the bacterial suspension was added to the seeds that were planted. The percentage of nitrogen in the seeds after harvesting was 4.4% and in the vegetative part 3.6% compared with Control, where the proportion of nitrogen in the seeds reached 1.2% and in the vegetative part 2.5%. This indicates that the F1 treatment was better compared to the rest of the treatments.

Keywords: Microbiology fertilization, nitrogen fixation, wheat plant

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INTRODUCTION

Biofertilizers: It is a microbe or a group of microbes that work to provide one or more nutrients necessary for plant growth, by which all or part of the chemical fertilizers that contain the required element can be dispensed with.[1] Biofertilizers include many microorganisms that differ according to the purpose for which this fertilizer is used.[2] Symbiotic biofertilizers are produced from micro-organisms that live cooperatively with the roots of plants, and these microbes supply plants with some nutrients while taking their nutritional needs, especially the source of carbon from the plant, meaning that mutualism exchange takes place between two different organisms that live with each other, that is to ensure each other and release They are symbiotic.[3] A symbiotic Biofertilizer This type of biological fertilizer is characterized by the fact that the microorganisms used in its production live free in the soil and get their nutritional needs from the soil.[4] The secretions of some root plants may encourage the bioactivity of these organisms and thus increase their efficiency as a biological fertilizer.[5] Examples of microbes used in this type of fertilizer include Azotobacter, Azospirillum, Phosphate dissolving bacteria, Blue green algae, and Bacteria. Mineral.[6] It is noticed that many of the microbes used as biological fertilizers to supply the plant with various nutrients excrete, during its growth and reproduction, substances called plant growth regulators or plant growth promoters such as gibberellins and similar materials that are excreted by some microbes in the rhizosphere such as Azotobacter, Arthrobacter, Mucor and some algae and mycorrhizae.[7,8] There are other substances excreted by microbes called auxins such as indole acetic acid (IAA), and it is secreted by the external mycorrhiza (also excreted by cytokinin) and some types of cytokinin are secreted, meaning that these microbes when used as biological fertilizers, they play two important roles, one of which is the supply of plants. Nutrients and the other excretion of plant growth regulators.[9,10]

MATERIAL AND METHODS

Soil characteristics

The soil under study was characterized as sandy, where the proportion of sand was 75% and clay 35%. An extract of saturated paste was obtained for different soils for the purpose of estimating some chemical properties. The electrical conductivity (EC) and the pH of the total nitrogen were estimated by the Kildahl method [11,12]

Treatments

The treatments under study were divided into three: the first was the bacterial suspension mixed with the seeds of the wheat plant, the second was added to the watering water, where it was watered for only one time, and the last was without addition, where the seeds were planted and watered with water that does not contain microorganisms. It was called the treatment of mixing microorganisms with seeds F1 and the treatment of adding microorganisms with irrigation water F2 and the last was control. As for the microorganisms under study,

two types were chosen *Pseudomonas spp. ,Acinetobacter spp*.

Estimation of nitrogen

The plant samples were collected for the purposes of the analyzes, where the crop was harvested, the whole plants were separated into their main components, the wet weight was obtained, and then dried at a temperature of 65 ° C for a period of more than 72 hours after ensuring the completion of drying, after which they were weighed again to obtain the dry weight of the material Dry, all parts were ground and total nitrogen applied by wet digestion method Kildahl method [13,14]

RESULT AND DISCUSSION

Table 1. The effect of fertilizing with pseudomonas on the percentage of nitrogen in the wheat plant

Descriptive Statistics				
Dependent Variable: Percentage of Fixed Nitrogen				
treatment	plants parts	Mean	Std. Deviation	N
F1	seeds	4.400	.1581	5
	Vegetative part	3.600	.1581	5
	Total	4.000	.4472	10
F2	seeds	3.160	.0548	5
	Vegetative part	2.640	.1673	5
	Total	2.900	.2981	10
control	seeds	1.280	.0837	5
	Vegetative part	1.380	.0837	5
	Total	1.330	.0949	10
Total	seeds	2.947	1.3314	15
	Vegetative part	2.540	.9500	15
	Total	2.743	1.1551	30

After the modern approach to biological control to protect plants of economic and medical importance from pollutants of all kinds, it was found that a number of bacterial species such as spp. antibiotic ally active substances for substances secreted by pyoverdines that have a tendency to bind to iron as it becomes unavailable for exploitation by fungal or bacterial pathogens. Some studies also indicated that Pseudomonas bacteria have an indirect role in the life of plants by reducing the effect of growth inhibitors and the development of biological control factors, and this positively affects the process of plant growth because the use of microorganisms in the application of biological fields is one of the most prominent achievements in the fields of various biotechnologies. Indeed, it achieved many successes for using some bacterial isolates as fertilizers. Table 1 shows the effect of fertilizing with Pseudomonas bacteria on the proportion of nitrogen in the wheat plant, where the percentage of nitrogen in the treatment F1 was the treatment in which the bacterial suspension was added to the seeds that were planted. The percentage of nitrogen in the seeds after harvesting was 4.4% and in the vegetative part 3.6% compared with Control, where the proportion of nitrogen in the seeds reached 1.2% and in the vegetative part 2.5%. This indicates that the F1 treatment was better compared to the rest of the treatments.

Table 2. ANOVA table of effect of fertilizing with pseudomonas on the percentage of nitrogen in the wheat plant

Tests of Between-Subjects Effects					
Dependent Variable: Percentage of Fixed Nitrogen					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	38.314[a]	5	7.663	483.962	.000
Intercept	225.776	1	225.776	14259.558	.000
treatments	36.013	2	18.006	1137.242	.000
parts	1.240	1	1.240	78.337	.000
treatments * parts	1.061	2	.530	33.495	.000
Error	.380	24	.016		
Total	264.470	30			
Corrected Total	38.694	29			
a. R Squared = .990 (Adjusted R Squared = .988)					

Table 2: Analysis of the variance of the effect of fertilization with pseudomonas bacteria on nitrogen content in the wheat plant, where the study showed that there are significant differences between the F1 treatment in which the wheat seeds were contaminated with this bacteria with the control. There are also significant differences with the F2 treatment in which the irrigation water was contaminated with this bacteria with control. . The F1 treatment gave the highest significant differences in seeds compared with the F2 treatment and the control. Thus, the F1 treatment is the best in increasing the proportion of nitrogen.

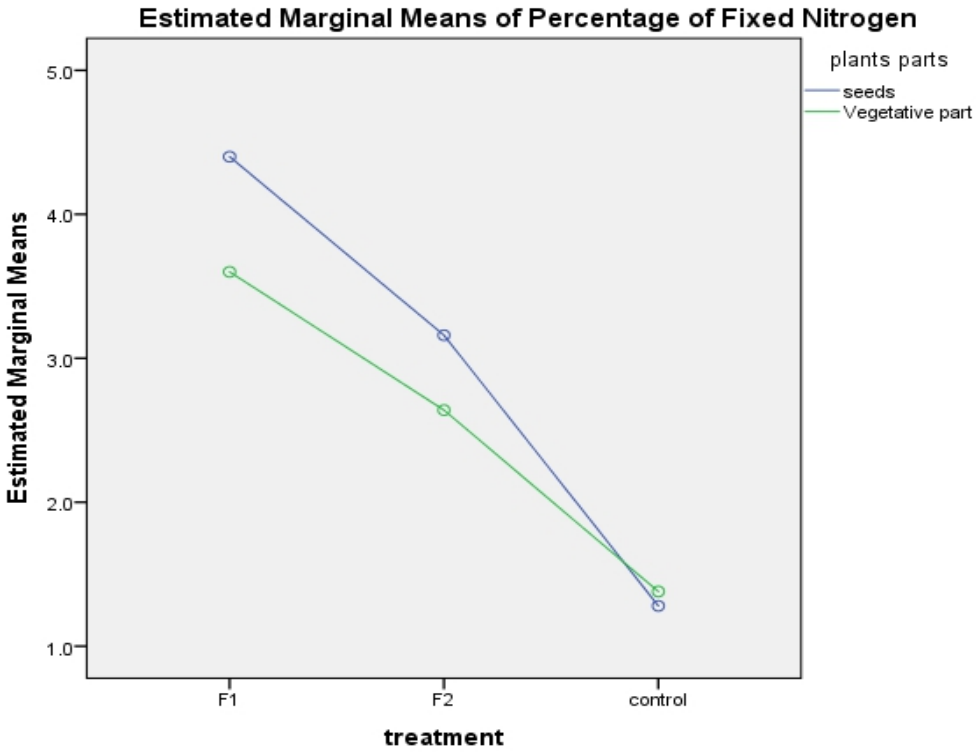

Figure 1. effect of fertilizing with pseudomonas on the percentage of nitrogen in the wheat plant

Table 3. effect of fertilizing with *Acinetobacter* on the percentage of nitrogen in the wheat plant

Descriptive Statistics				
Dependent Variable: Percentage of Fixed Nitrogen				
treatment	plants parts	Mean	Std. Deviation	N
F1	seeds	3.160	.0548	5
	Vegetative part	2.720	.1643	5
	Total	2.940	.2591	10
F2	seeds	2.260	.1517	5
	Vegetative part	1.620	.1924	5
	Total	1.940	.3748	10
control	seeds	1.220	.1924	5
	Vegetative part	1.380	.0837	5
	Total	1.300	.1633	10
Total	seeds	2.213	.8314	15
	Vegetative part	1.907	.6204	15
	Total	2.060	.7375	30

Acinetobacter is gram negative bacteria . Some of them are satisfactory and some of them are free to live in the waters of ponds and swamps. They play a major role that fixes nitrogen, as well as in killing all forms of bacteria, fungi and viruses that pathogen the plant. Table 3 illustrates the effect of fertilization with *Acinetobacter* bacteria on the nitrogen ratio of the wheat plant, where the F1 treatment recorded the highest nitrogen content in the seeds of wheat after harvesting, as the percentage of nitrogen in the seeds reached 3.1% and in the vegetative part 2.7% compared with the control, where the percentage of nitrogen in the seeds was 1.2%. The vegetative part is 1.3%, and the F2 treatment recorded a lower nitrogen level, where the percentage of nitrogen in the seeds reached 2.2% and its percentage in the vegetative part was 1.6%.

Table 4. ANOVA table of effect of fertilizing with *Acinetobacter* on the percentage of nitrogen in the wheat plant

Tests of Between-Subjects Effects					
Dependent Variable: Percentage of Fixed Nitrogen					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	15.236[a]	5	3.047	136.442	.000
Intercept	127.308	1	127.308	5700.358	.000

treatments	13.664	2	6.832	305.910	.000
parts	.705	1	.705	31.582	.000
treatments * parts	.867	2	.433	19.403	.000
Error	.536	24	.022		
Total	143.080	30			
Corrected Total	15.772	29			
a. R Squared = .966 (Adjusted R Squared = .959)					

Table 4 shows the analysis of variance of the effect of fertilization with *Acinetobacter* bacteria on the nitrogen ratio in the wheat plant that there are significant differences between the treatments and control, as it was found that there is a significant difference between the F1 treatment (adding bacteria with seeds) and the control, as well as there was a significant difference between the S2 treatment (adding bacteria). With irrigation water) and control, there is no significant difference between the F1 and F2 treatment, but the F1 treatment was the best in increasing the nitrogen level in the plant.

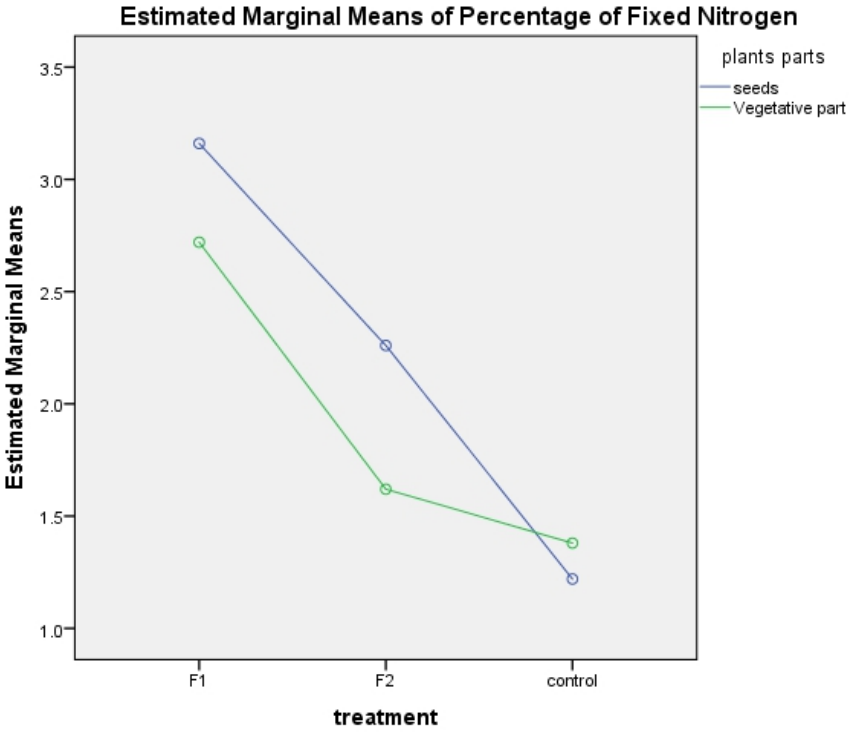

Figure 2. effect of fertilizing with *Acinetobacter* on the percentage of nitrogen in the wheat plant

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