EFFECTS OF PLANT GROWTH PROMOTING MICROORGANISMS ON WHEAT PLANT GROWTH AND AMINO ACID CONTENT

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This study was conducted on aridisols, a soil ordo widely exists in Eastern Anatolia Region. The trial was conducted in 45 pots with an experimental design of 9 x 5 factorial, 1 plant (wheat), control and 8 microorganisms (*Bacillus megaterium* M3, *Bacillus subtilis* Osu-142, *Bacillus pumilus* C26, *Paenibacillus polymxa*, *Azospirillum brasilense* Sp-245, *Burkholderia cepacia* BA-7, *Burkholderia cepacia* F + AMP, *Raoutella terrigena*). Each treatment was five replicate. Plant and soil samples were taken at the end of the growing period (90 days). Some soil enzymes such as acid and alkaline phosphate, urease and dehydrogenase, amino acid exhausted from soil and plant roots, and plant macro and micronutrients elements were determined. The results obtained have shown that amino acids, plant and soil enzymes exhausted from root parts significantly affected the wheat plant growing. The highest wheat dry matter was obtained by *Bacillus subtilis* Osu-142 PGPR application. But application of PGPR decreased amino acid exhausted from plant roots. The lowest amino acid exhausted obtained *Paenibacillus polymxa* PGPR. Positive correlations were determined between the PGPR and wheat plant nutrition and dry matter. On the contrary, exhausted amino acids had negative correlations with PGPR application. The plant enzymes such as catalase (CAT), peroxidase (POD), super oxide dismutase (SOD) were increased by PGPR application and the highest values were obtained by application *Paenibacillus polymxa* PGPR.

Keywords: PGPR, Wheat, Plant enzymes.

INTRODUCTION

Wheat, on the world among the plants cultivated crop in the field is the first place, while of great importance in human nutrition is cultivated plants (Anonymous, 2005). The rapid

increase in world population, and vegetable products in a sufficient increase in lack of hunger, the problem becomes more apparent. This is a problem in eliminating grains and cereals for wheat has a very important role.

Plant growth regulation (PGPR) of the mechanisms involved has not been revealed, although the existing literature within the framework of direct and/or indirect describes two groups. Direct mechanisms, biological nitrogen fixation, auxins, gibberalin effects of plant hormones, such as the production of ACC deaminase enzyme activity through the synthesis of ethylene prevention, environmental stress reduction, bacteria-plant adaptation in the relationship, inorganic phosphorus solubility and increasing the organic phosphorus compounds of the mineralization, siderophor through the manufacture of iron to meet the increasing and some other trace elements to provide a rate increase, vitamin synthesis, root permeability, the effect of increasing their. PGPR have effects of indirectly with antibiotic production diseases biocontrol agents to reduce the role they play as the various organic compounds in the soil washing blocker ksenobiyotik break down the plant for the protection (Elsheikh and Elzidany 1997; Rodriguez and Fraga 1999).

MATERIALS and METHODS

Used in the experiment soil samples, in the examination of specimens calciorthid soil great group of aridisol is located at the Erzurum, Turkey. The plant material as bread wheat (*Triticum aestivum* L. spp.) varieties were used.

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RESULTS and DISCUSSION

Trial some of the soil chemical analysis results are given in Table 1.

Table 1. Used in the experiment soil samples belonging to some of the chemical analysis results (n=5)

		Mean
pH	(1:2.5)	7,76±0,05
$CaCO_3$		25,66±1,25
Organic matter	%	2,219±0,30
Total Nitrogen		0,0011±0,0002
NH_4-N		9,50±0,4
NO_3-N	mg kg^{-1}	10,4±0,5
P		12,10±1,1
CEC		33,19±1,4
K		2,71±0,1
Ca	cmol kg^{-1}	12,42±1,4
Mg		2,89±0,02
Na		1,01±0,05
Fe		3,33±0,02
Cu		1,85±0,01
Mn	mg kg^{-1}	5,28±0,10
Zn		1,24±0,02
B		0,32±0,01

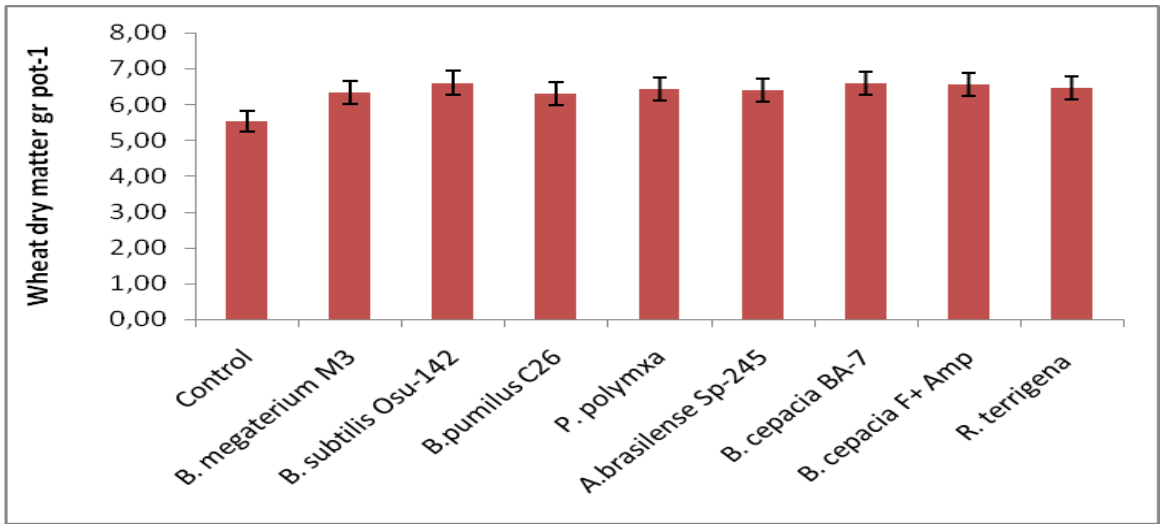
In the experiment, the microbiological properties of soil samples in order to examine the soil samples taken on the result of the analysis, 162 x 10^6 bacteria, the amount of total C of 8.90 mg C m2 h^{-1}, and the total amount of CO_2 32,63 mg CO_2 m^2 h^{-1} was determined as (Table 2).

Table 2. Used in the experiment soil samples belonging to some of the microbiological analysis results (n=5)

	Mean

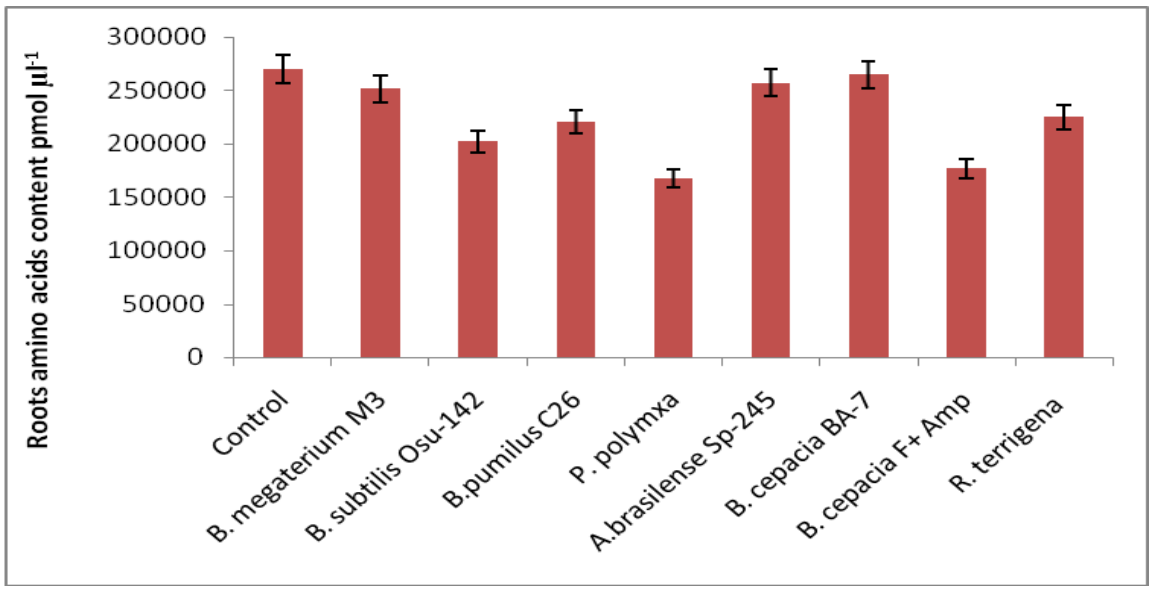
Initial Bacteria Count ($x10^6$)	162,00±3,60
Initial Fungal Count ($x10^4$)	185,00±4,20
Soil C amount (mg C m^2 h^{-1})	8,90±1,22
Soil CO_2 amount (mg CO_2 m^2 h^{-1})	32,63±2,60
the number of soil microorganisms (10^6)	179±4,42

Effects of PGPR on Wheat Plant Dry Matter



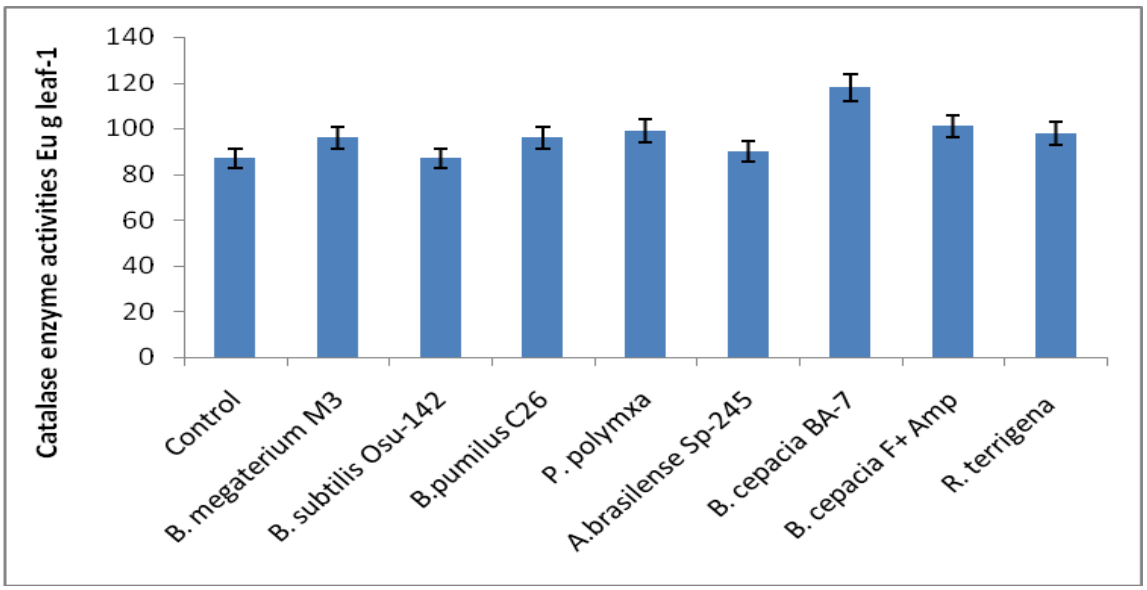
Graph 1. Effects of PGPR on wheat plant dry matter

The Root Rhizosphere Region of Amounts Total Amino Acids By The Wheat Plant Roots

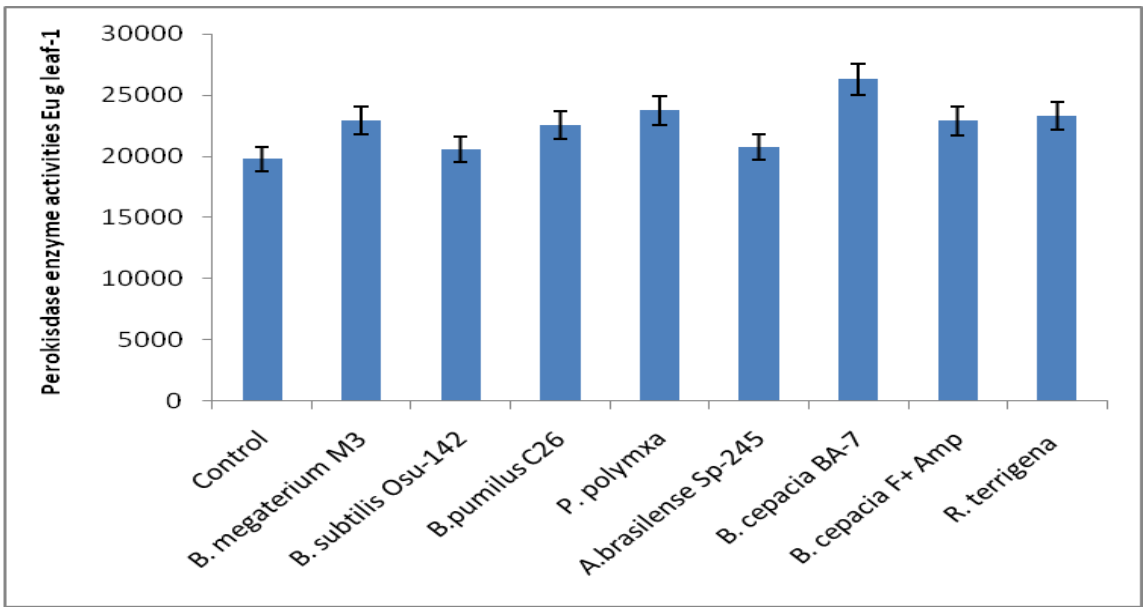


Graph 2. Effects of PGPR on total amino acids content by exhausted wheat plant roots

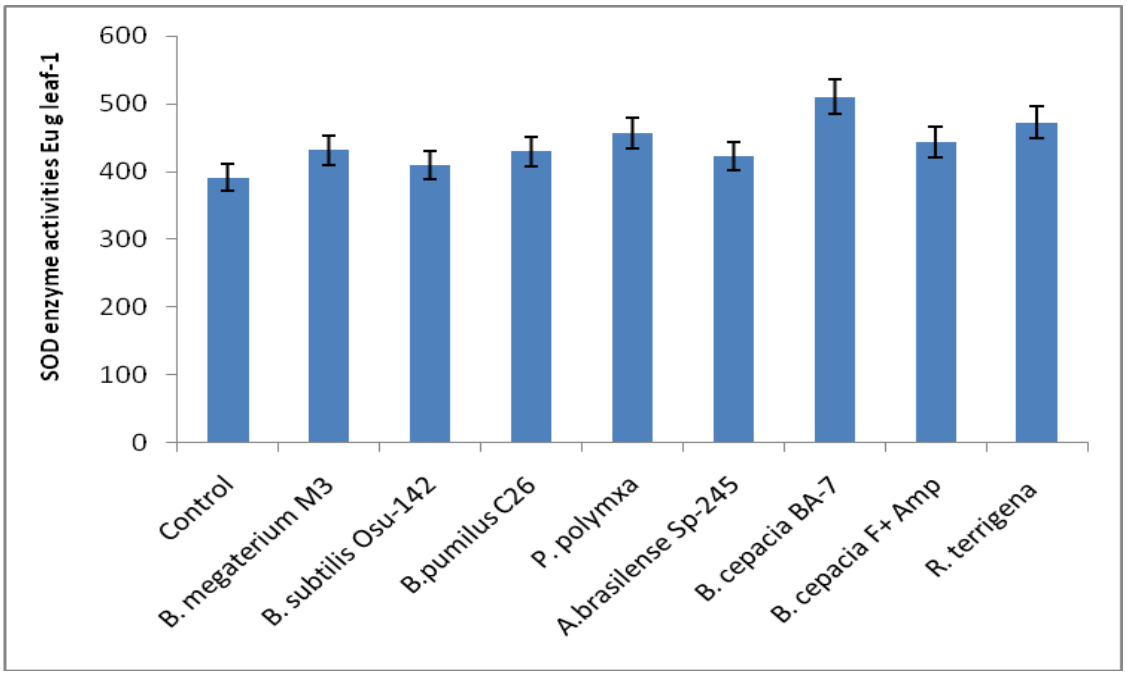
Effects of PGPR on Enzyme Activities of Wheat Plant



Graph 3. Effects of PGPR on catalase enzyme acitivites (CAT)



Graph 4. Effects of PGPR on peroksidase enzyme acitivites (POD)



Graph 5. Effects of PGPR on superoksid dismutase enzyme acitivites (SOD)

CONCLUSİONS

In this study,the high lime content of wheat grown in soils bitkisininverim in order to improve different features Pgpr. Applied to different pgpr of wheat plants of the plant effect on weight compared with the control group, the weight of the plant *B. subtilis* Osu-142 with the application of PGPR control application according to the 19% increase was determined.

Applied to different pgpr of the most effective identified as *P. polymxa* PGPR of the case of the application of soil by roots, root rhizosphere region of the amino acid secreted in the amount of a 34 % decrease in the rate was determined.

Application of *P. polymxa* significantly increased plant enzymes that CAT, POD and SOD to control groups as CAT 16%, POD, SOD 21% respectively.

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