

## The application of Barvar 2- biological phosphate fertilizer in wheat cultivation a step to organic agriculture (green) and reduction of environmental pollution

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**Abstract:** According to Miller (1991) any change in climate, soil, water and food having adverse effect on environment, human activities and other animals is called pollution. Soil is an important part of environment as a geochemical resource for pollution and it is a natural buffer controlling the transfer of elements and chemical matter to atmosphere, hydrosphere and creatures. Today, excess use of chemical fertilizers is one of the environment pollution factors including soil. Some elements including chromium, lead, vanadium and arsenic significantly are increased in soil. The plants can have considerable amount of heavy metals in their tissue and the plants can transfer the heavy metals from soil to water and human being and other live creatures. Some of the studies showed that excess use of chemical fertilizers cause different kinds of cancer in human being. Based on environmental and health pollution created of using chemical fertilizers, producing and consuming bio-fertilizers is the most important approach in soil improvement. Today, sustainable agriculture is important and one of the approaches is to choose bio-agriculture (organic). In organic agriculture instead of using chemical fertilizers, bio-fertilizers, compost, organic and farm yard manure are used. The current study was carried out in applied scientific center of Hamedan. In two sequential planting period of wheat, instead of using phosphorus chemical fertilizer, the equal bio-fertilizer-Barvar-2 Phosphate was used. Finally, sample plot experiment was compared with control plot in terms of grain protein percent and product performance and the results of the test were analyzed by Sas software. The comparison of the means based on Duncan's test showed significant difference in increasing the performance and increasing grain protein due to the use of mentioned bio-fertilizers.

[Masumeh Ghanbari, Ahmad Janjan. **The application of Barvar 2- biological phosphate fertilizer in wheat cultivation a step to organic agriculture (green) and reduction of environmental pollution.** *Life Sci J* 2013;10(1):487-490]. (ISSN: 1097-8135). <http://www.lifesciencesite.com>. 77

**Keywords:** Environment health, Organic agriculture, Biological fertilizers, Soil pollution

### 1. Introduction

Polluting matter is the one that shouldn't be in the existing location and it has strong concentration more than natural concentration as it has adverse effect on the live creatures (Erfanmanesh and Afyuni, 2002). According to Miller (1991) any change in climate, soil, water and food having adverse effect on environment, human activities and other animals is called pollution. Pollution is done in two ways: natural pollution that is done based on balance and reaction in spontaneous reactions and in this pollution, decay is done and it leads into improvement of environment. The second type is the pollution of human being activities created due to the development of the cities, living in suburbs, the growth of industries and technology of various polluting factors in terms of physical, chemical and biological forms on environment. The pollution is mostly created by emptying industrial waste, fuel, urban wastewater and sludge of sewage purification as fertilizers and excess use of fertilizers and agriculture pesticides and its adverse effects can be observed not only on human being and animals, it creates extensive changes on ecosystems (Hayz, 1990).

Increasing activities of human being on the earth caused that the function of soil as prevalent part of earth shell is disturbed and this is called pollution (Baybordi, 1993). Soil pollution is misbehavior of soil as a part of environment along with its pollution with special combinations namely due to human being activities. The control of soil pollution is the duty of experts of different fields including soil experts, biologists, microbiologists, toxic experts, ecologists and environment experts. Based on the role of soil in growing the plant and comfort of animals' life and the complicated system accepting all kinds of pollutants and materials, soil chemical pollution was reviewed in 1978 by Shoval about the excess use of herbicides and chemical fertilizers (Ali Asqarzadeh, 1997).

### Biological agriculture and its benefits?

Excess use of chemical fertilizers has adverse effect on public health and environment. In recent years, by destruction of natural ecosystems, the necessity of planning for sustainable balance is emphasized. In other words, environmental damages and the related problems of illogical use of natural

resources, namely soil due to new agriculture operation (water, environment pollution or soil erosion) led into the development of sustainable agriculture. Sustainable agriculture is an economical agriculture along with the minimum environment pollution and destruction as providing required food and agriculture materials. Most of the environmental changes are occurred in long-term and as in organic agriculture, it is acted as ecosystem, it doesn't have any adverse effect on environment. In Organic agriculture of soil, the minimum plow, biological fertilizers, suitable plant period, covering plants, etc are applied. Based on health and environmental pollution of applying chemical fertilizers, the application of biological fertilizers is considered as one of the most important approaches in organic agriculture.

### Biological fertilizers

Biological fertilizers are consisting of useful microorganisms as bacteria, fungi, Actinomyces, etc exist variously in soil but using a biological fertilizer increases the number of special microorganisms in soil as temporarily. The mentioned microorganisms as normal fertilizers improve the soil tissue, more fertility of plant and providing food including phosphorous for a special plant. It is defined that despite chemical fertilizers, these fertilizers are not a part of required materials of the plant and help providing the required materials of the plant from soil and they have the function of normal fertilizers. One of the biological fertilizers is barvar 2- Biological fertilizers. Barvar 2- biological phosphate fertilizer is consisting of some bacteria that by secretion of organic acids and phosphatase enzyme release phosphate of mineral and organic compound.

In the past decade, biological agriculture is developed considerably and it is a fast growing industry in most of the countries. Phosphate bio-fertilizers besides saving and reducing the consumption of phosphate chemical fertilizer, absorbs more phosphor by the plants and increasing its growth and increases the resistance of the plant to disease. In addition, consuming this generation of the fertilizers decreases environmental pollution. Barvar 2- biological phosphate fertilizer is a good substitute for phosphate chemical fertilizers. 50% reduction of the consumption of phosphate chemical fertilizers not only leads into economical saving, it leads into the reduction of soil and water pollution for excessive accumulation of phosphorus and heavy metals as cadmium and Bor. The reduction of transportation costs is one of the features of Barvar 2- biological phosphate fertilizer. As its 100g is efficient averagely as 100 kg chemical fertilizer. By improving soil useful animals and organic

matters fermentation, soil tissue is improved and soil is improved and more nutrients are fed into the soil. Thus, soil erosion is reduced and soil biological variety is increased. In most of agricultural regions, water is contaminated due to excess use of fertilizers and due to less use of these materials in organic agriculture, water is not contaminated. In alkali soil with shortage of zinc, using Barvar 2- biological fertilizer leads into acidity of rhizosphere, it also easily absorbs zinc.

### Features of Barvar-2 phosphate biofertilizers

Reduction of environmental pollution, 2) Climate fitness, 3) reduced consumption of phosphate chemical fertilizer, 4) Significant yield increase, 5) Inexpensive shipping, 6) Low diseases, 7) Compatibility with other chemical, 8) High Pi solubilizing competency, 9) Colony formation rhizosphere, 10) Genetic stability, 11) Long shelf time, 12) Simple application methods.

### 2. Materials and methods

The current study was conducted in Applied scientific University of Hamedan. 12 Plots 1000 m were considered as treatment and control.

Control plot was planting wheat without using phosphorus fertilizer in three replications.

Treatment plot was including planting wheat and using  
a) Phosphorus chemical fertilizers (Triple superphosphate) based on soil test in three replications.  
b) Barvar 2- biological phosphate fertilizer in three replications

c) A combination of chemical phosphorus fertilizer+ biological phosphorus fertilizer in three replications it can be said that except phosphorus fertilizer source, other agriculture operations were done similarly in treatment and control plots.

Tillage operation was including plow, disc and tillers in both plots. The wheat kind was Alvand (dominant plantation of the region) as 200 kg per hectare. The plantation was done by grain drill.

Barvar 2- biological phosphate fertilizer was used by grain drill as the required seed for plots were wet by water and then it was mixed with the required amount of Barvar 2- biological phosphate fertilizer. For easy plantation, the seeds were dried in the shadow and the plantation operation was done. Chemical phosphorus fertilizer was added to the soil before plantation. At the end of plantation, seeds weight, seeds protein, the number of cluster in square meter, the number of seeds in the cluster and the weight of thousands seeds in control and treatment plots were measured and the results were analyzed by Sas software.

It can be said that the experimental design was a randomized complete block and before the test, some

of the physical and chemical features of the soil were measured as shown in Table 1.

**Table 1- Soil characteristics**

Soil texture	K(mg/kg)	P(mg/kg)	%N	%OC	Ec(ds/m)	pH
CLEY	400	6.5	0.08	0.72	0.56	7.1

### 3. Results and discussion

After the harvest, seeds weight and seeds protein, the number of clusters per m<sup>2</sup>, the number of seeds in cluster and 1000 seed weight in treatment and control plants were measured. It can be said that in bread baking, the seeds protein is of great importance. The results of variance analysis and comparison of the abilities of various fertilizer treatments on the yield and yield components are shown in Tables 2&3.

**Table 2- Variance analysis of the effect of phosphorus fertilizer treatments on wheat yield components and wheat yield**

Parameter	Change source	Degree of freedom	Squares sum	Average squares	F	P
Yield	Treatment	3	1056091.66	35203.55	114.48	**0.0001<
	Error	8	24600			
	Total	11	1080691.66			
Seed protein percent	Treatment	3	29.04250000	9.68083333	414.89	**0.0001<
	Error	8	0.18666667			
	Total	11	29.2291667			
The number of cluster per m <sup>2</sup>	Treatment	3	29057.5833	9685.1186	45.49	**0.0001<
	Error	8	1703.3333			
	Total	11	30760.9166			
The number of seeds in cluster	Treatment	3	58.250000	19.4166666	33.29	**0.0001<
	Error	8	4.6666667			
	Total	11	62.91666667			
1000-seed weight	Treatment	3	1078.250000	359.416667	54.59	**0.0001<
	Error	8	52.666667			
	Total	11	1130.916667			

**Table 3- The comparison of the abilities of various fertilizer treatments on wheat yield and yield components**

Treatment	Yield		Seed protein		Cluster per m <sup>2</sup>		Seed in cluster		1000-seed weight	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Control, no fertilizer	c6816.666667	76.3762	d14.00	0.0000	d338.3333	7.6376	d34.66667	0.5773	c53.00	2.6457
Chemical fertilizer	b7146.66667	50.3322	c15.600	0.10000	c382.00	7.21110	c36.66667	0.5773	b61.00	3.00
Barvar-2 biological phosphate fertilizer	a7543.33333	51.3160	b17.1333	0.23094	b414.00	22.5388	b38.3333	0.5773	a72.66667	3.0550
Chemical fertilizer+ Barvar-2 biological phosphate fertilizer	a7510.00	36.0555	a18.10000	0.1732	d338.33	15.2752	a0.66667	1.1547	a77.00	1.00

\*Similar alphabets in each column show the lack of significant difference at 5%.

The results of Tables 2&3 showed that in terms of the increase of the performance of all fertilizer treatments to control group, was significant difference. The highest increase of yield was observed in

biological fertilizer and combination of biological fertilizer with chemical fertilizer. According to the statistical analysis, the seed protein percent in treatments of using fertilizer showed considerable

difference at 5% compared to control group (No fertilizer) and the highest seed protein percent increase was observed in combinational treatment of biological fertilizer with chemical fertilizer. One of the yield components is the number of clusters per m<sup>2</sup> effective in increasing yield. The highest number of cluster per m<sup>2</sup> in treatment is using Barvar 2- biological phosphate fertilizer showing significant difference at 5% with other treatments. Wheat cluster filling is measured by the highest number of seed in cluster in treatment. As is shown in tables 2&3, the highest number of seeds in cluster is observed in combinational treatment of biological and chemical fertilizer. It shows significant difference with other treatments at 5%. 1000 seed weight in gram is one of the yield components showing the heaviness of the seeds. According to Tables 2&3, the highest 1000-seed weight was observed in combinational fertilizer treatment.

The important point about the yield and yield components is such that using biological fertilizer in all plots increased the yield and yield component at 5% compared to chemical fertilizer.

It can be said that in Gilan, Azarbayijan, Arak, Kermanshah, Barvar 2- biological phosphate fertilizer was applied in some products including wheat, orange and potato and similar positive results were obtained.

#### Recommendation

It is recommended that based on global approach to healthy and organic agriculture products and cancerous chemical fertilizers and soil contamination and destruction of good characteristics of the soil by chemical fertilizers, the application of

chemical fertilizers is reduced and we can use organic fertilizers. Thus, we can avoid environment pollution including soil, water and health of agricultural products.

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12/6/2012