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ORIGINAL ARTICLE

# Use of N2-fixing Bacteria Azotobacter, Azosprilium in Optimizing of Using Nitrogen in Sustainable Wheat Cropping

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## ABSTRACT

sustainable agriculture is a produce system which heisted chemical fertilizers, pesticides and chemical plant regulator's, according to this system and in order to protection soil fertility, water and food safety the experts suggested to use legumes, plant remainders, green fertilizers and biological nutrition with micro organisms. Today, azosprillium and azotobacter, bacteria (for biological nitrogen fixation in cereals) is being used very commonly. in this research is tried to study the utilization of these two micro organisms with different nitrogen levels and their interactions in wheat, in order to achieve the best results with minimum nitrogen usage.factorial experiment in completely randomized block design in 3 replication was used in which 4 levels of N (0,60,120 and 180 kgn/ha) were applied and for each microorganisms 2 levels (one with and without using) in form of seed inoculation was utilized. in order to study the potential of azospirillum and azotobacter in biological nitrogen fixation, acetylene reduction assay method was used. results showed that, using azospirillium and azotobacter, has positive and significant effect in most characters, however ,by increasing the nitrogen levels, biological nitrogen fixation by azospirillum and azotobacter redused rapidly but at the rate of 60 to 120 kgn/ha showed a moderate stability in ARA.also there were no negative or antagonistic interactions between two microorganisms thus with utilization of these two microorganisms can be suggested to use maximum 120 kg n /ha, without observing any negative effects.

***Key words:*** sustainable agriculture,azotobacter,azosprillium.wheat

## Introduction

Organic agriculture is one of the ways that can produce high quality crops. Most of the studies, in this area have been shown that consecutive uses of chemical fertilizer causes soil erosion and lower crops quality [10]. Because of high environmentally adaptation and reducing the need of fertilizer consumption biostimulators, not only decrease the negative effects of chemical fertilizer but also increase yield with regarding to sustainable agriculture. In addition, the use of biostimulators in condition of environmental stress can decrease effects of stress and enhance soil water holding capacity, root growth and yield Biological fertilizers are not exclusively limited to materials which is coming from animal and plant extera fertilizers.but production which is recived from the microorganism activities that are with nitrogen stabilized connection and other nutrient that are activated in soil consist of [4] some of this microorganisms are similar to life-free and some of them are like azotobacter and azospirilum such as symbiosis can biological nitrogen fixation[6]. in fact, azotobacter and azospirilum are part of aerobic bacteria that stabilizing nitrogen that are hetrotroph and depended to energy which are made by plant survival analysis[1]. to day this kind of bacteria have gather attention due to the fixing abilities of nitrogen that are symbiosis with significant from crops such as cerials and also the

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production of plant growth regulators such as a biological fertilizers [5] these kind of bacteria are also under attention,because they have potential to increase the scale of plant growth due to the geographic expansion with variety of species and some of them due to the hormony with environmental rolls are under consideration [6] this bacteria were involoved to nitrogen fixation in auxin synthesis, vitamins growth stimulus material, antibiotic of untifungus in plant.[2,3] the fallowing experiment is done to the effect of microorganisms on the wheat plant in order to subside the consumption of nitrogen chemical fertilizers to use the equal of manure to receive the best designforhaving sustainable agricultural goals is data availability. Frequently, missing data have to be generated on the basis of assumptions, including pedotransfer functions. It is essential to devise a method for hazard zonation, which can be applied in a data-poor environment.

## Materials and methods

This experiments has done in education and research field in pot in field condition at firooz abad Islamic azad university.this experiments was done in three replications whit factorial randomized complet block design the treatment were such as nitrogen fertilizers in four different levels (0.60,120,180 kgNn/ha). inoculation with azotobacterium and azospirilium and non-inoculation with bacterium, with two different levels of consumer and non-consumer (the characteristics of azospirilum and azotobacterium, the number of live scale in each gram(cfu)108, carring time of culture. The scale of consumption is equal to 3000g in hectar). For providing the soil for pot .first the soil sterized with using autoclove in temperature of 121.5 °c and the pressure of 15 PSI. we have done this, because we wanted the soil of pot would be free of factors of fungai and bacteria. Then we sterilized the pots with sterilized alcohol and full the pot with sterilized soil and with nitrogen fertilizers treatment that are taken from urea add up to it. Then phosphor chemical fertilizers increase, based on 300kg/ha with using material KH2PO4 whith we had before and we add to it several times on hectar another.the wheat variety that are used in this research was flat. scale wheat microorganisms before also culture for each treatment was separately weighted and used in time of culture. For having beter inoculation,seed were steeped with suger-water then inoculation was done with bacterium. For evaluation of nitrogen biological fixation, we used the acetylene reducyion activity method. To get the result in the process of spik emergence[9] we started to take samples from plant-root. We quickly cut the roots from their crown and put them inside 300 ml.l glacess of earlen.then with using injection with 50 m whit scale of 1/10 earlen capacity, we evaluated the air inside it and with the same size added acytelein gas into it.after that, we keep the sample for about 72 hours with the temperature of 25 santigrad degree. Then, the scale of acetylene reduction measured by gas chromatograph.

## Results and discussion

The results showed that the bacteria of azotobacter and azospirilium are sensitive to using of a lot of nitrogen. as it is indicated in table- 1.effect of different nitrogen levels on azotobacter and azospirilium on 1 % levels is significant. Means the most acetylene reduction activities (etylen production) in treatment N0 (whithout using nitrogrn) and with scale of 2.82 in an hour is in the plant.and the least of activity scale is related to treatment N180kg/ha with the scale of 2.51.which is the same as the result of Pederson et al., 1978. With using of nitrogen 60 kg/ha ,we absorved a line of decrease of acetylene reduction. The scale of acetylene improvement can be decreased in length whit the application effect of nitrogen gas with 60 kg/ha, this decrease can be seen very fast, this action showes the high sensivity of nitrogen the limitation scale of 60 to 120 kgN/ha the activity of bacteria is balanced. But, whit nitrogen increase whit the rate of 180 kg/ha the reaction decreased again. So we can conclude that with using nitrogen to azotobacter and azospirilium scale of 60 to 120 kg/ha can get very good result.the research results of Hegazi and monib, 1983 showed tht applying nitrogen whit scale of 200kg/ha can decrease the activation of enzyme nitrogenas .but when we used 45 kg/ha nitrogen the inoculation of wheat with azospirilum is more effective. Whit the survey of similarity of pair of scales with acetylene reduction in table-2 the decrease process scale of acetylene can be obvious with having lots of nitrogen, which these results can be the same as the work of other researcher such as.

**Table 1:** variance analysis of effect of nitrogen level and azospirillium on ARA1

| Sov | df | ARA µmol -1 plant -1 |
|---|---|---|
| Replication | 2 | 0.004 |
| Nitrogen (A) | 3 | 0.036** |
| Linear | 1 | 0.091** |
| Quadratic | 1 | 0.001 n.s |
| Cubic | 1 | 0.005* |
| Azosprillium | 1 | 0.003 n.s |
| AB | 3 | 0.002 n.s |
| error | 14 | 0.017 |

n.s , * and ** : Non significant , significant at this %5 and %1 level of probability , respeatively

1) ARA: acetylen reduction activity

**Table 2:** mean comparison for the effect of nitrogen levels and azospirillium on ARA

| Treatments | ARA µmol -1 plant -1 |
|---|---|
| $N_0$ | 2.82 a |
| $N_1$ | 2.59 b |
| $N_2$ | 2.58 b |
| $N_3$ | 2.51 c |
| $I_0$ | 2.65 a |
| $I_1$ | 2.65 a |
| $N_0$ $I_0$ | 2.76 a |
| $N_0$ $I_1$ | 2.74 a |
| $N_1$ $I_0$ | 2.66 a |
| $N_1$ $I_1$ | 2.64 a |
| $N_2$ $I_0$ | 2.60 b |
| $N_0$ $I_1$ | 2.61 b |
| $N_3$ $I_0$ | 2.52 c |
| $N_3$ $I_1$ | 2.40d |

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