The Study of Azotobacter-chroococum Inoculation on Yield and Post Harvest Quality of Wheat (*Triticum aestivum*)

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ABSTRACT

In order to evaluation of the effect of Azotobacter-chroococum on two varieties of wheat grown under field conditions, an experiment was carried out in Agricultural Research Station of Shahrood University of Technology during 2004-2006. results showed that wheat yield was affected when cultivars inoculated. Inoculation resulted in improving post harvest seed germination and nitrogen content of the seed.

Keywords: Inoculation, wheat, yield, germination

INTRODUCTION

Positive interactions between free-living nitrogenfixing rhizosphere bacteria belonging to the genera Azotobacter and Azopirillum and a variety of field grown crops have been frequently re+corded(Okon, 1985; Pandey and Kumar, 1989). The beneficial effects on plant growth are not only through nitrogen fixed in the rhizosphere, but are also related to the ability of these bacteria to synthesize antibiotics and growth- promoting substances including phytohormones, siderophores and the ability to solubilize phosphates (Brown and Walker, 1970; Harper and Lynch, 1979; Okon and Kapulnik, 1986; Fallik et al., 1989; Pandey and Kumar, 1990. Application of beneficial microbes in agricultural practices started 60 years ago and there is now increasing evidence that these beneficial microbial populations can also enhance plant resistance to adverse environmental stresses, e.g. water and nutrient deficiency and heavy metal contamination (Shen 1997). A group of bacteria are now referred to plant growth-promoting rhizobacteria (PGPR), which participate in many key ecosystem processes such as those involved in the biological control of plant pathogens, nutient cycling and seedling establishment, and therefore deserve particular attention for agricultural or forestry purposes (Weller and Thomashow, 1993; Glick, 1995; Elo et al., 2000). PGPR may colonize the rhizosphere, the surface of the root, or even superficial intercellular spaces of plants (McCully, 2001). It has been revealed that the effect of nitrogen fixation induced by nitrogen fixers is not only signification for legumes, but also non-legumes (Doeberiner and Pedrosa, 1987). Phosphate (P) - and potassium (K) - solubilizing bacteria may enhance mineral uptake by plants through solubilizing insoluble P and releasing K from silicate in soil (Goldstein and Liu, 1987). Some successful examples of inoculation with PGPR have been achieved both in laboratory and field trials. It has been reported that wheat yield increased up to 30% with Azotobacter inoculation and up to 43% with Bacillus inoculation (Kloepper et al., 1991). Soil microorganisms are important components in the natural soil subecosystem because not only can they contribute to nutrient availability in the soil, but also bind

soil particales into stsble aggregates, which improve soil structure and reduce erosion potential (Shetty et al., 1994).

Azotobacter sp. Is free-leaving aerobic bacteria dominantly found in soils. A large number of experiments have been performed to investigate the effects of inoculation of cereals with Azotobacter sp. Results of these studies showed that in many cases grain, yield and N concentration in plants increased by inoculation with Azotobacter sp. (De Freitas, 2000; Kumar et al., 2001 a, b; Emtiazi et al., 2004) A. chroococcum is the most prevalent species found but other species described including A. agilis, A. vinelandii, A. beijerinckii, A. insignis, A. macrocytogenes and A. paspali (FAO,1982). Cereal plants inoculated with A. chroococcum increased number of root hairs, tillering ratio, dry matter concentration, N uptake or yields of wheat (Haahtela et al., 1988; Ishac et al., 1986; Rai and Gaur, 1988). Several studies have shown that A. chroococcum as soil inoculant is not only effective in N fixation but also has other properties such as production of growth hormones (Remus et al., 2000), production of fungicidal substances (Lakshminarayana, 1993), siderophore production (Suneja et al., 1994) and the property to solubilize phosphate (Kumar and Narula, 1999; Narula et al., 2000).

MATERIALS and METHODS

Pure culture of A. chroococcum used for inoculation. Wheat seed were placed in bacteria suspension for 30 min before sowing and then transferred to soil. The soil was clay loam. Experiment was carried out as Factorial based on Randomized complete Block Design with four replications. Firs factor included 2 cultivars of wheat (Pishtaz and) and second factor included inoculated and un inoculated of wheat cultivars. Seeds were hand sown on 2* 8 mt plots so as to give 450 seeds/ m^2 . Plants in plots were harvested 220 days after sowing. At the end of the experiments plants were collected from plots. Studied plant parameters were grain yield, straw yield N concentration in grain and straw. Statistical analysis.

RESULTS

Analysis of variance (mean of square) results showed in table (1). As showed in table (1), Grain yield Biological yield, Harvest index, plant height, Number of spike per m, Number of seed per spike traits was different between cultivars and Inoculation and non inoculation factor significantly affected cultivars traits.

Table 1.Analysis of Variance

S.O.V	Grain yield	Number of spike/m^2	Biological yield	Plant height	Harvest ndex
Cultivars (A)	ns	**	ns	ns	ns
Inoculation (B)	**	ns	*	**	**
(A*B)	**	*	*	*	*

*, ** Significant at 5 and 1%
ns : Non significant

Interaction between cultivars and Inoculation was significant for grain yield (Fig 1) and grain yield increased when cultivars inoculated.

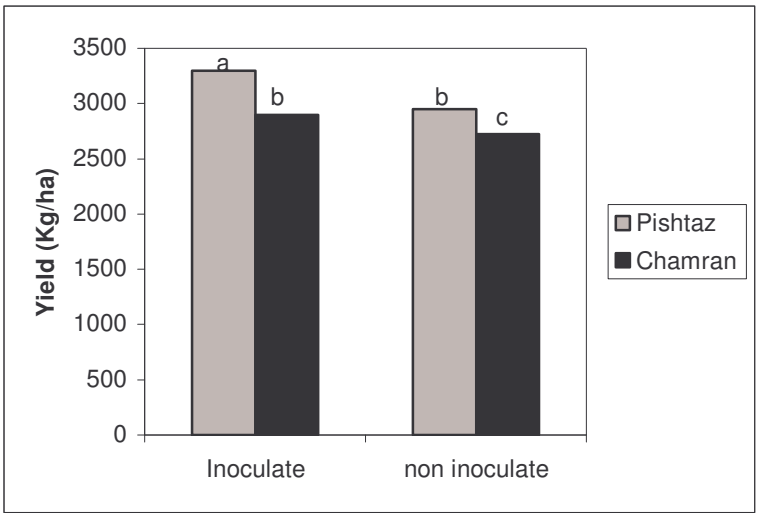

Figure 1. Interaction between cultivars and inoculation on grain yield

Number of spike per m^2 significantly affected by inoculation factor and this trait increased when cultivars Inoculated (Fig 2). Biological yield between cultivars was different and was affected by inoculate factor (Fig 3).

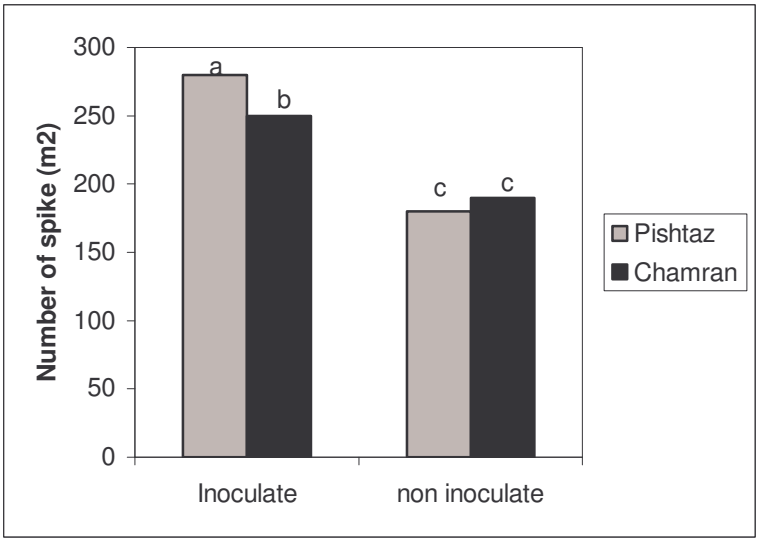

Figure 2: Interaction between cultivars and inoculation on Number of spike per m^2

Biological yield between cultivars was different and was affected by inoculate factor (Fig 3).

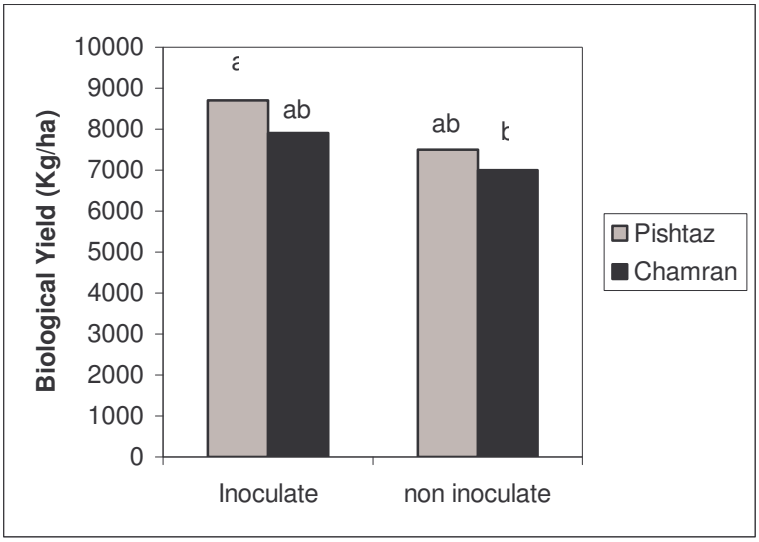

Figure 3: Interaction between cultivars and inoculation on biological yield

Interaction between cultivars and inoculation factors was significant and plant height increased when cultivars Inoculated (fig 4).

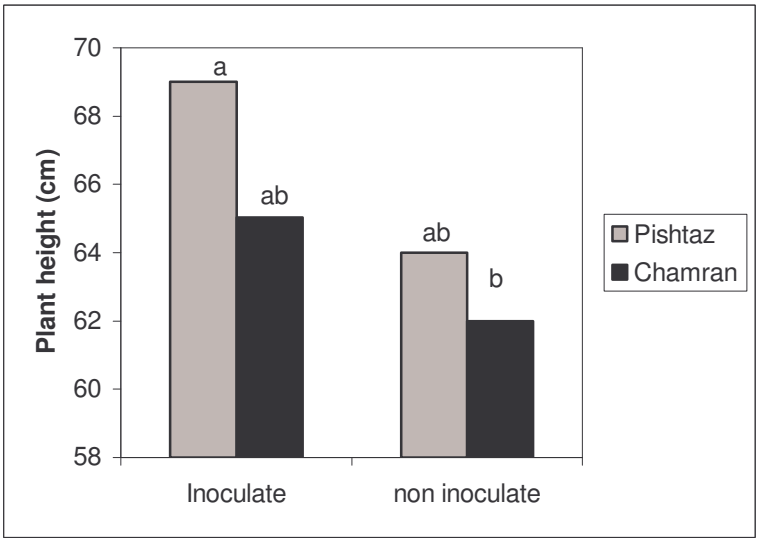

Figure 4: Interaction between cultivars and inoculation on plant height

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