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Research article

EFFECT OF PHOSPHORUS FERTILIZER ON PLANT HEIGHT, SEED WEIGHT AND NUMBER OF NODES IN SOYBEAN

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ABSTRACT: Soybean has the highest amount of proteins among the legumes. The application of fertilizers is one of the primary methods for improving the availability of soil nutrients to plants. Fertilizing can change rates of plant growth, maturity time, size of plant parts, and phytochemical content of plants. Phosphorus deficiency can limit nodulation by legumes and P fertilizer application can overcome the deficiency. The experiment was conducted at the miandoroud sari (in Iran). Factor A included bacterium azospirillum (A1: insemination; A2: No insemination), factor B included Phosphate fertil 2 (B1: insemination, B2: No insemination) and factor c included phosphorus fertilizer (C1: No insemination, C2: 50kg). Analysis of variance shows that Azospirillium brasilense has a significant effect on Plant height and seed weight per plant at 1% level.

Key words: Soybean, bacterium azospirillum, Phosphate fertil 2

INTRODUCTION

Soybean has the highest amount of proteins among the legumes [27]. Its dietary composition is reported to be the best in the legume family containing vitamins [27] good for diabetics [1], for the dieting [8] and protects against some types of cancer including breast cancer, lung cancer, prostate cancer and liver carcinoma [27]. The application of fertilizers is one of the primary methods for improving the availability of soil nutrients to plants. Fertilizing can change rates of plant growth, maturity time, size of plant parts, phytochemical content of plants [20] and seed capabilities. High-input practices such as heavy use of chemical fertilizers have created a variety of economic, environmental, ecological and social problems. Furthermore, the increasing costs of chemical inputs have left farmers helpless, resulting to decreasing seed quality of certain crops and resulting in the fall of commodity prices and consequently reducing farm income [18, 26]. P solubilizers are bio-fertilizers that solubilize the phosphorus in soil and make it available to plants. They can improve growth, yield as well as the productivity of the crop [13, 28]. Phosphorus is an important plant nutrient involved in several energy transformation and biochemical reactions including biological nitrogen fixation. Phosphatic fertilizers have low efficiency of utilization due to chemical fixation in soil [20] and poor solubility of native soil phosphorus, sometimes there is a buildup of insoluble phosphorus as a result of chemical phosphorus application [7]. Root development, stalk and stem strength, flower and seed formation, crop maturity and production, crop quality, and resistance to plant diseases are the attributes associated with phosphorus nutrition. Although microbial inoculants are in use for improving soil fertility during the last century, however, a meager work has been reported on P solubilization compared to nitrogen fixation. Soil P dynamics is characterized by physicochemical (sorption-desorption) and biological (immobilization-mineralization) processes. P is needed in relatively large amounts by legumes for growth and nitrogen fixation and has been reported to promote leaf area, biomass, yield, nodule number, nodule mass, etc., in a number of legumes [3, 17]. Phosphorus deficiency can limit nodulation by legumes and P fertilizer application can overcome the deficiency [4].

The use of fertilizer is considered to be one of the most important factors to increase crop yield. Phosphorous has been shown to be an essential element and its application has been shown to be important for growth, development and yield of soybean [16]. Fageria et al. [9] had earlier reported that large quantity of P fertilizer may be required for successful soybean production. Phosphorus deficiency has been shown to be an important fertility problem limiting legume production in the tropics [12]. Under low P status, P fertilizer application to legume and its management are important in attaining high yields in soybean. P is not only essential for plant growth; its availability has been noted to affect the functioning of the biological nitrogen fixation system [5, 19]. Bio-fertilizers can help meet the demands of sustainable, productive agriculture at low cost. Rhizobial inoculants have been applied to legume crops for over 120 years as bio-fertilizers, and inoculants carrying plant-growth-promoting rhizobacteria (PGPR) have been used in agriculture for over half a century [2, 14, 21, 22]. For rhizobial inoculants, a molecular dialogue between the host plant and the bacterium results in root nodulation and nitrogen fixation, involving plant flavonoids and bacterial nodulation (Nod) factors, identified as lipochitooligosaccharides (LCOs) [11, 14, 15, 25]; however, the roles of other molecules, such as those related to type-III secretion systems and exopolysaccharides (EPSs) [6, 10, 24] have also been emphasized.

MATERIAL AND METHODS

The experiment was conducted at the miandoroud sari (in Iran) which is situated between 21° North latitude and 63° East longitude and at an altitude of 132m above Mean Sea Level. The soil of the experimental site belonging is clay loam. Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics. The field experiment was laid out in randomized complete block design with factorial design with three replications. Factor A included bacterium azospirillum (A1: insemination; A2: No insemination), factor B included Phosphate fertil 2 (B1: insemination, B2: No insemination) and factor c included phosphorus fertilizer (C1: No insemination, C2: 50kg). A week after emergence, seedlings were thinned to maintain two plants per hill. Final thinning was done two weeks after emergence to maintain only one healthy seedling per hill. In this test a soybean cultivar named Sari who had improved cultivars were used. The bacteria clinics, medical plant with bacteria produced organic manure ready to use that set of PGPR PEPR plants of the genus Azotobacter / Azospirillum is. Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5 % probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

Plant height

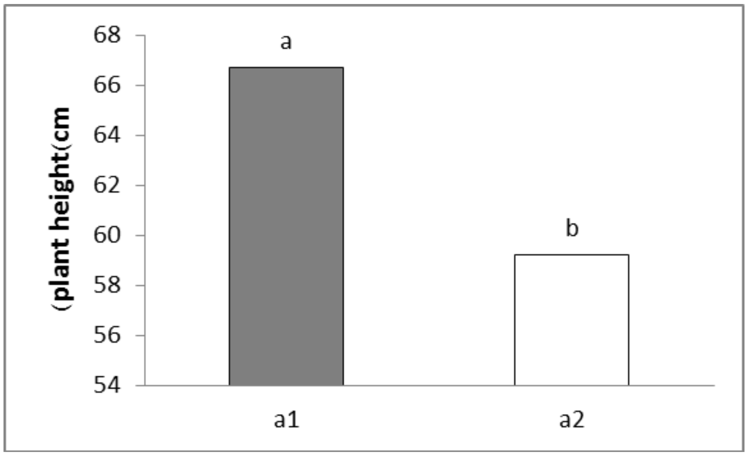
Analysis of variance shows that Azospirillium brasilense has a significant effect on Plant height at 1% level (Table 1) so that comparison shows the highest Plant height 66.700 Inoculation of azospirillum (a1) and the lowest Plant height was no insemination (59.225). At the height azospirillium brasilense inoculated plants significantly increased.

Table 1. Mean squares of biological yield, thousand grain weight and grain yield

S.O.V	df	MS		
		Plant height	Number of nodes	Seed weight per plant
R	2	21.11^{ns}	0.661^{ns}	8.55^{ns}
A	1	335.25^{**}	0.003^{ns}	104.58^{**}
B	1	38.25^{ns}	2.870^{**}	44.01^{*}
C	1	15.20^{ns}	0.010^{ns}	1.65^{ns}
A*B	1	4.42^{ns}	1.760^{*}	67.67^{*}
A*C	1	0.92^{ns}	0.000^{ns}	2.22^{ns}
B*C	1	102.09^{ns}	0.700^{ns}	56.73^{*}
A*B*C	1	47.32^{ns}	0.003^{ns}	38.25^{ns}
Error	14	33.85	0.306	8.77

*, **, ns: significant at $p<0.05$ and $p<0.01$ and non-significant, respectively.

More azospirillium brasilense plant responses to infection have been reported to increase plant height [1, 2]. In this study, phosphate fertilizer, fertilize 2 make soybean height was not significantly affected. Use Azospirillium brasilense bacteria as bio-fertilizer resulted in increased P uptake and thereby improve the growth of several crops, which are contrary to the results of the test with the test.



Number of nodes per plant

In this study Azospirillium brasilense causes a significant effect on the number of nodes is not soybean (table 1). Experiments show that inoculation of pea plants normally have been classified in terms of greenhouse nodes increases the number of nodes is significant [6]. Nodules on soybean roots after inoculation with bacteria Azospirillium brasilense increased by 30 percent [14]. The results were compared with the experiment contradicts the rhizosphere soil may be present in the environment but quite unable to make use of organic residues in soil clay loam. Analysis of variance showed that the phosphate fertilized 2 at 1% caused a significant effect on the number of nodes is soybean (Fig-1).

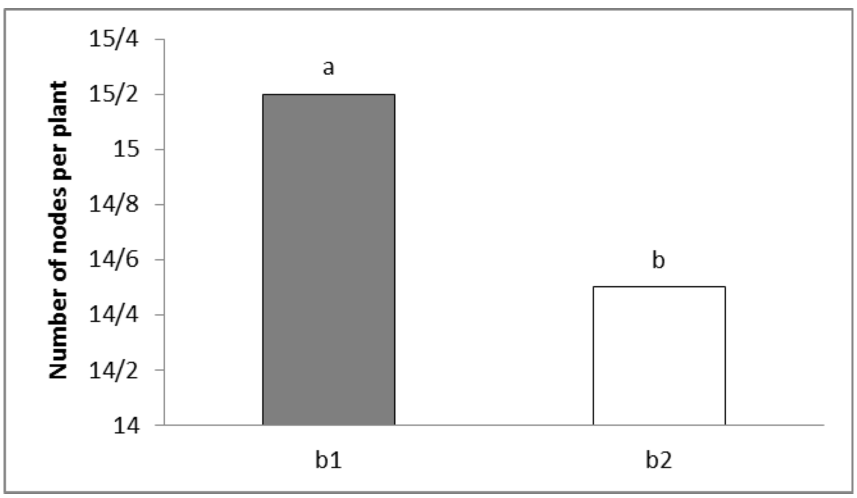


Fig-1: Number of nodes per plant

Seed weight per plant

Analysis of variance shows that Azospirillium brasilense has a significant effect on Seed weight per plant at 1% level (Table 1) so that comparison shows the highest Seed weight per plant 30.733 Inoculation of azospirillum (a1) and the lowest Seed weight per plant was no insemination (26.558). Inoculation with Azospirillum bacteria can cause weight gain and increase the rate of seed germination and plant growth may change during the process [7]. Analysis of variance shows that 2 have a significant effect on the level of phosphate fertilization on Seed weight per plant is 5%. (Fig-2).

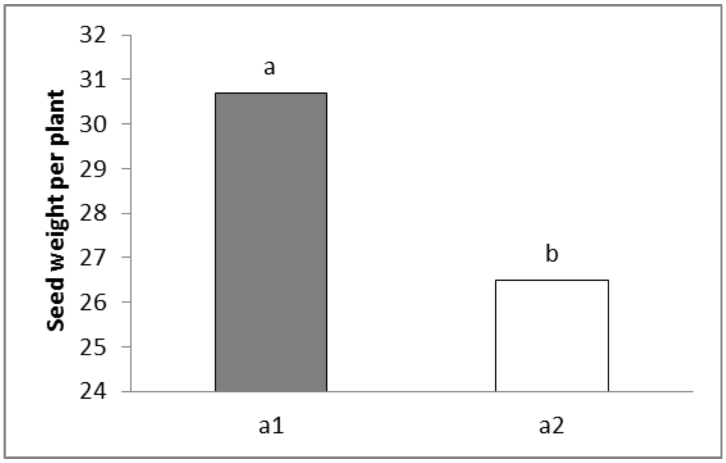


Fig-2: Seed weight per plant

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