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Research Article

EFFECTS OF COMBINED USE OF BIO-FERTILIZERS AND CHEMICAL FERTILIZERS AT DIFFERENT STAGES ON PHYSIOLOGICAL AND MORPHOLOGICAL CHARACTERS OF NAVY BEAN

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ABSTRACT
In order to study the effects of combined use of bio-fertilizers and chemical fertilizers at different stages on physiological and morphological characters of navy beans, an experiment was arranged during 2013 in factorial based on a randomized complete block design in three replications at research station farm of college of agriculture, Islamic Azad University, Marand Branch. Treatments were three levels of biological fertilizer (non-application (control), application at sowing stage and application in complete emergency stage) and chemical fertilizer at four levels (non-application (control), application at sowing stage and application in complete emergency stage and application in flowering stage).Analysis of variances showed that maximum plant development had been seen in combined use of bio fertilizers and nitrogen fertilizers at full-emergence stage (51/09 cm).The highest number of filled pods per unit of area had been seen in combined use of nitrogen fertilizers, bio fertilizers at full emergence and flowering stage that 272 pcs pod were filled. Also the highest seed weight had been seen in combined use of bio-fertilizers and nitrogen fertilizers at full emergence and flowering stage, (40/66 gram).According to the results it could be suggested that bio-fertilizers cannot replace with chemical fertilizers, but they can be used as a supplement along chemical fertilizers and chemical fertilizers are necessary details, however, with optimal use in sustainable agriculture that will be considered.

Keywords: *Bio-Fertilizer, Chemical Fertilizer, Navy Bean*

INTRODUCTION
Bean with 20-25% protein has as equal as meat protein alternative to meat (Ling *et al.*, 1984, Costa *et al.*, 2006). Cowpea is one of the major sources of dietary protein in many parts of the world (Hassan, 2013). Should be noted that despite the need for soil and crop nutrient supply it must be in form that beside meet the agronomic needs prevent their waste pollution. There are reports indicating that two-thirds of inorganic nitrogen in agricultural systems through leaching, sublimation, runoff and erosion is lost (Biswas *et al.*, 2008). Use of renewable resources and inputs is one of the most principal of sustainable agriculture productive agricultural and environmental risks are minimal (Kizilkaya, 2008). Bio-fertilizers, bacterial and fungal micro-organisms that are well-established biological nitrogen and phosphorus in the soil solution, especially in areas where the soil is high in calcium with producing significant amounts of growth hormone mainly of Aux, GA and Cyt have characteristics affect on the growth and yield of crops and soil (Zahir *et al.*, 2004). Nezarat and Gholami (2009) in a study reported that Azotobacter and Pseudomonas increased significantly nutrient absorbent such as, Nitrogen, phosphorus, potassium, iron, cooper and zinc. This study examined the effect of bio-fertilizers (Nitro Kara) and nitrogen in various stages of development to determine the most appropriate cultivation and fertilization process in order to protect the environment, improve nutrition and increase the yield and quality and increase qualities and quantities yield.

MATERIALS AND METHODS
This experimental is carried out in factorial form by completely randomized block design with three replication at the research station of the Islamic Azad University, Marand Branch, north-western Iran, during 2013.The soil of the region is kind of Loamy sand soil and soil PH test run in the range of low to

moderate alkalinity (table 1). Treatments include B: the use of bio-fertilizer (Nitro Kara) (b1: control, b2: contaminated seed in planting stage and b3: the full green stage) and C: nitrogen chemical fertilizer as urea (c1: control c2: planting stage, c3: the full emergence and c4: flowering stage). The cultivar used was local seeds that has unlimited growth habit and viability was 90%. The amount of urea was 200 kg ha-1 that to band 5 cm below the foot of the plant was used. Bio-fertilizer used in the experiments was Nitro Kara (*Azorhizobium caulinodans*). This bacterium is aiding and around plant roots, root, stem and root tissues in the intercellular space activities. The amount recommended in the product in inoculated seeds was at the rate full seed soaked. In the full emergence 200 g Nitro Kara with 20 liters of water mixed and was dumped by crucibles container.

Table 1: Analysis of variance of some characteristics

S.O.V	df	Plant development	100-seed weight	Days to flowering	Number of filled pods per unit area
Rep	2	1/505 ^{ns}	2/505 ^{ns}	0/36 ^{ns}	22/86 ^{ns}
Bio-fertilizer	2	9/099**	3/3318*	5/59*	2/3001*
Chemical N	3	7/8765**	3/9967 **	7/70**	4/8654**
Bio × Chemical	6	4/1243 **	4/8967 **	4/44**	4/1889 **
Error	22	50/23	0/66	9/94	725/611
CV	-	1/50	0/39	1/76	2/26

** And ** significant at 5% &1% respectively.*

Statistical Analyze

In order to check the normality of data, analysis of variance and mean comparison MSTAT-C software were used. The means of the treatments were compared using the Duncan test at $P< 0.05$.

RESULTS AND DISCUSSION

The analysis of variance showed significant effect of interaction between bio- and chemical nitrogen fertilizer on plant height, pods Number, biomass dry weight, seed yield ($p<0.01$), and number of branches per plant ($p<0.05$), (table 1).

Plant Development

According to the plant development (figure 1), application of biological and chemical fertilizers at all stages causes increasing in plant development compared to control treatment. The highest plant development had been seen in combined use of nitrogen fertilizers and biological fertilizers at full emergence stage (51/09 cm). In research conducted by (Ojaghloo *et al.,* (2007), combined use of Azotobacter, bio-fertilizers and nitrogen fertilizers caused to maximum vegetative growth, plant development and crop yield increase in (*Carthamus tinctorius L*). Rodriguez-Navarro *et al.,* (2000), found significant interactions between different bacterial strains and varieties in nodulation, plant growth and development, plant height, dry weight of shoot and xylems composition of beans. Bio-fertilizers and nitrogen fertilizers are activator of some enzymatic systems and also play a key role in cell division and cell elongation. These factors led to increased plant development (Ojaghloo *et al.,* 2007).

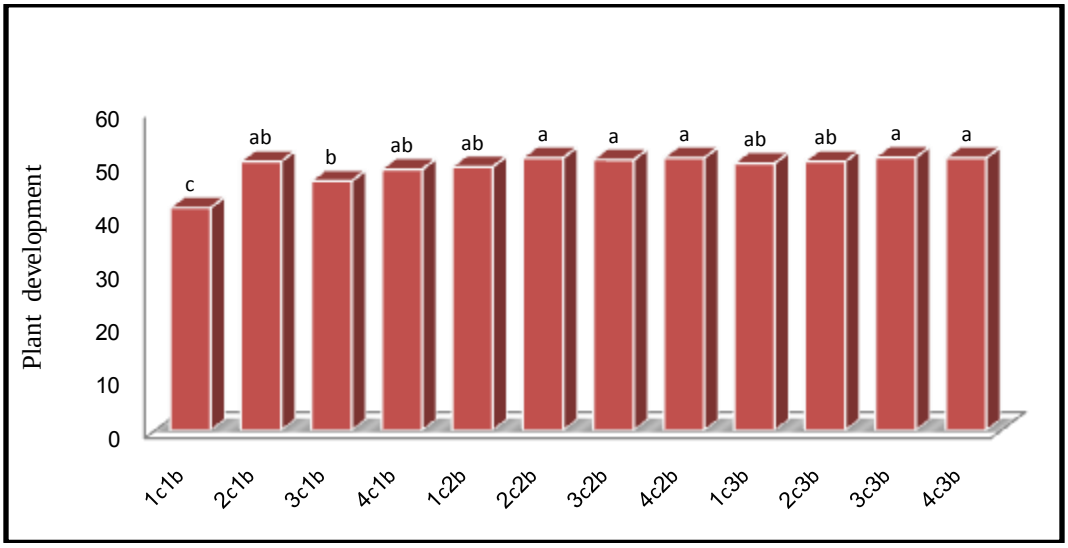

Figure 1: Effects of combined use of bio-fertilizers and chemical fertilizers on plant development.

Number of Filled Pods per Unit Area

According to the number of filled pods (figure 2), seems that application of biological and chemical fertilizers at all stages caused increase in number of filled pods compared to control treatment. The highest numbers of filled pods were related to treatment of combined use of nitrogen fertilizers and biological fertilizers at full emergence stage (272 pcs). Hamidou *et al.*, (2007), showed that number of filled pods per plant in navy bean varieties were between (9-22 numbers). El-kramany *et al.*, (2007), in the study on peanuts with the aim of replacing chemical fertilizers by organic fertilizers, expressed the highest number of filled pods per plant, related to treatments that received 75 percent chemical fertilizer and 25 percent bio-fertilizer along with organic materials. According to flags high activity, effected by bio-fertilizers and Nitrogen fertilizers usages, ovule inoculation procedure is done properly so hollow and immature seeds will produce less. Hence, the high activity of photosynthesis level, high Assimilate producing and increasing of grain portion in assimilate production could be considered as factors towards increasing the number of filled pods.

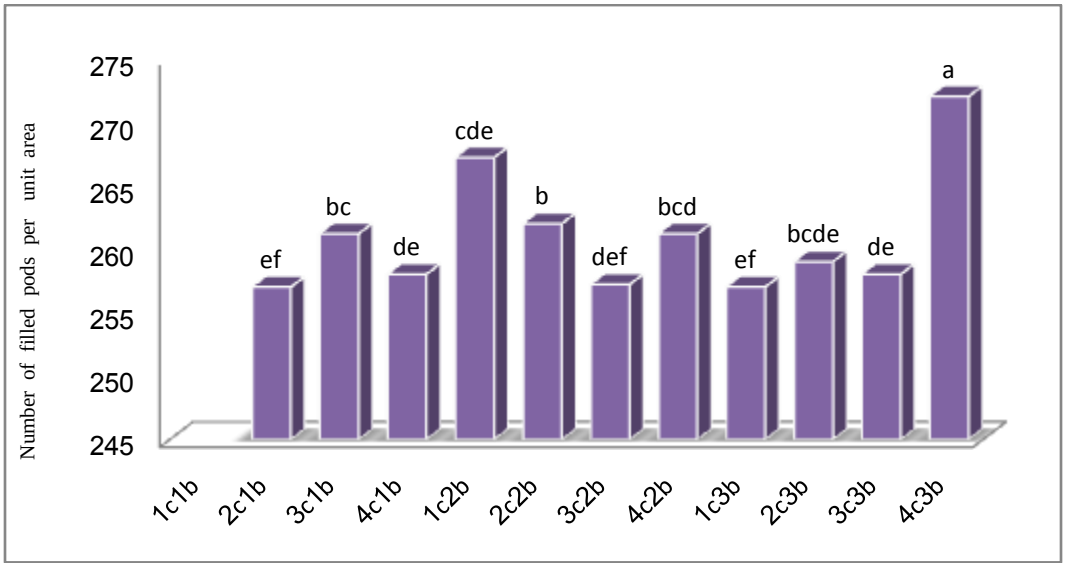

Figure 2: Effects of combined use of bio-fertilizers and chemical fertilizers on number of filled pods per unit area

Days to Flowering

According to days to flowering (figure 3), seems that application of biological and chemical fertilizers at all stages caused increase in days to flowering in all the treatments as compared to control treatment. The maximum days to flowering was seen in treatment of no fertilizer use. Difference between maximum and minimum days to flowering was (14/76 %). In a study (Patriquim, 1982- Skinner *et al.*, 1987) reported that Azotobacter increased use of better absorption of water and nutrients by root system and in accelerating growth and flowering plant is useful located. Therefore, use of fertilizers, will changes C/N ratio that causes early flowering.

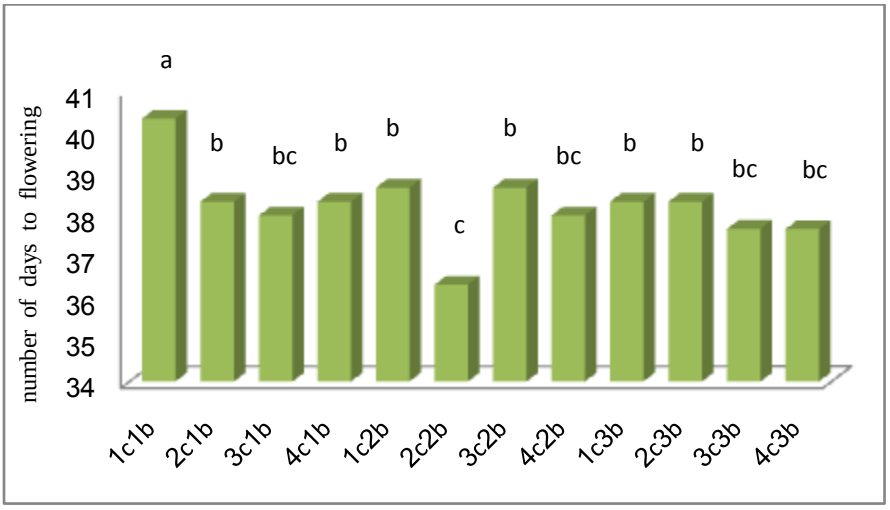

Figure 3: Effects of combined use of bio-fertilizers and chemical fertilizers on days to flowering

100-Seed Weight

According to the 100-seed weight (figure 4), seems that application of biological and chemical fertilizers at all stages caused increase in 100-seed weight (40/66 gram). The most important aspect for producer yield is the portion of the product that has economic significance and rising yield of 100-seed weight that is one of the effective parameters in plant seed yield and more assimilates to grain increased seed weight. One of the most important components of yield is 100-seed weight and higher 100-seed weight, increase seed yield, (Arshi, 1991). Dhillon *et al.*, (1980) also noted to the increasing weight of 1000 grains in the presence of Bio-fertilizers.

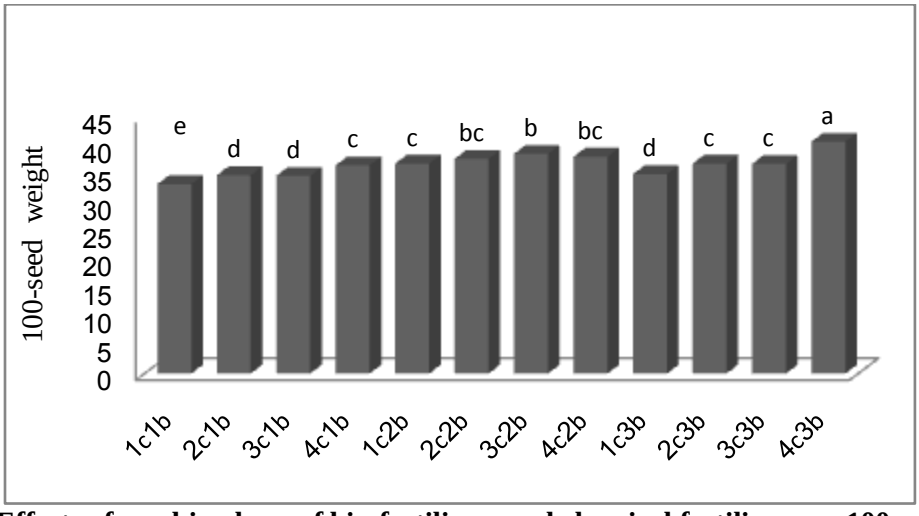

Figure 4: Effects of combined use of bio-fertilizers and chemical fertilizers on 100-seed weight

Increasing weight of 1000 corn grains as influenced by bio-fertilizers has been reported, (Gholami and Biari, 2008). The results of this experiment showed that application of bio-fertilizers could reduce 50% consumption of chemical fertilizers, also produce a good performance and therefore, is not only increase farm profits But the negative consequences of excessive use of chemical inputs also reduced the negative effects on the environment. Consequently, integrated biological and chemical fertilizers applications due to producing of maximum yield and yield components could reduce individually chemical fertilizers usage.

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