EFFECT OF BIOINOCULANT ON NODULIZATION OF DIFFERENT VARIETIES OF GREEN GRAM

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ABSTRACT: The present investigation aim to determine the effect of Bioinoculant on nodulization of different varieties of *green* gram in kharif 2017. The field experiment was consisting of twelve treatments and three replication with randomized block design at Barwani (Madhya Pradesh) in black cotton soil. Biofertilizers such as *Rhizobium leguminocirum* and *PSB* were applied to seed before sowing of seeds and RDF (NPK) applied in the soil at the time sowing below the seed. In general, twice insecticide and fungicide also sprayed at 20 and 40 DAS for effective control of insects and diseases. The number of nodules was recorded after 20, 40 and 60 DAS respectively. Significantly highest number of nodules was recorded in T_{11} (50% RDF + *R. leguminocirum* + PSB) and lowest in control in both the varieties with two different varieties (Khargone – 5 and JM - 721) in all observation schedule (20, 40 and 60 DAS). However there were found no significant difference between varieties with two different varieties in all observations respectively.

Keywords- Biofertilizers, Nodulization and Varieties of green gram.

Introduction

India is producing 30.23 lakh tons of pulses from an area of 46.5 lakh ha, which is one of the largest pulses (Bengal gram, red gram, green gram, black gram and lentil) producing countries in the world but its productivity is very low as compare to the cereal crop due to lack of suitable nutrient management techniques (Tiwari and Shivhare, 2016).

Bioinoculant are the important components of biofertilizers. It is the latent or living cells of micro-organism which mobilize and augment the availability of plant nutrient (Ahmad and Jan, 2001). Biofertilizers are carrier based inoculants containing cells of efficient strains of specific micro organism used by farmers for enhancing the productivity of the soil by fixing atmospheric nitrogen or by solubilizing soil phosphate or by stimulating plant growth for synthesis of growth promoting substance (Singh et. al., 2004).

Agricultural production is threaten by declining land productivity as a result of non judicial use of chemical fertilizers by the farmers (Maria Balint et al., 2013). Application of nitrogen and phosphate with biofertilizers increased growth, yield attributes and yield of cereal and pulse crops (Azimi et al., 2013). Application of nitrogen and phosphate with biofrtilizer also increased yield component and yield of *maize* under, Boroujerd environmental condition (Beyranvand and Farnia, 2013).

Green gram is an important food legume of India and world for providing an carbohydrate, protein, magnesium and calcium (Ahmad et al., 2004). It grows successfully on sandy loam to clay loam soil, usually grown on low to medium depth in the irrigated and rainfed crop during *kharif* and *summer* (Abraham and Lal, 2003). It is a short duration crop and takes from 65-80 days to mature (Smith and Roberts 1987). In an attempt to reduce environmental risk and cost with integrated use of chemical and biofertilizers (Rhizobium, Phosphate solubilizing micro-organism) has been considered as possible substitutes for traditional mineral fertilizers (M.Cabello et al., 2005).

Material and methods

An experiment was conducted at farmer's field (Village – Rehgun, district – Barwani Madhya Pradesh) in black cotton soil during *kharif* 2017. The field was prepared by ploughing once, with tractor drawn plough followed by two cross harrowing. Final operation was done by rotavator to obtain fine seed bed. Physico chemical properties of the experimental field were done by according to standard procedure. For that soil sample was collected in sterile plastic bages and transported to the soil laboratory for soil analysis. The randomized block design was choose for statistical analysis and all treatments were randomized within three replications as per plan of layout.

Seeds of green gram (*Vigna radiata)* variety Khargone – 5 and JM-721 were obtain from Regional Pulse Research Station, Agriculture college, Indore (M.P) India. Seeds were treated with biofertilizers such as *R. leguminocirum* and *PSB* before sowing and RDF (NPK) applied in the soil at the time sowing below the seed at 30 cm row distance with the combinations of 12 different treatments i.e. (1) Control (No fertilizers), (T_2) *Rhizobium leguminisoram*, (T_3) *Phosphate Solublisizing Bacteria* (PSB), (T_4) Both *Rhizobium* + *PSB*. (T_5) 50 % N (N = 10 Kg N ha^{-1}) + PSB, (T_6) 50% P_2O_5 (20 Kg P_2O_5 ha^{-1}) + *R. leguminisoram*, (T_7) 50 % RDF (10:20:0 Kg N: P_2O_5 & K_2O ha^{-1}), (T_8) 100 % RDF (20:40:0 Kg N: P_2O_5 & K_2O ha^{-1}), (T_9) 50 % RDF + *R. leguminisoram*, (T_{10}) 50 % RDF + PSB, (T_{11}) 50 % RDF + *R. leguminisaram* + PSB and (T_{12}) 10 % RDF *R. leguminisoram* + PSB. In general, twice insecticide and fungicide also sprayed at 20 and 40 DAS for effective control of insects and diseases. The plants were gently removed by hand with soil there after proper wash out the root and nodules. The nodules were divided into

white and pink. Pink nodules were counted for further results because pink colour is the indicator of hemoglobin. The early research workers are proved that hemoglobin only found in live nodules. Number of nodules was counted after 20, 40 and 60 DAS respectively.

Results

Number of nodules was counted after 20, 40 and 60 DAS respectively. The total number of nodules per plant significantly increased between 20 and 40 DAS, and then fell markedly (Table 1) at 60 DAS. Total number of nodules per plant was significantly higher in Khargone - 5 than JM - 721 at all dates except 20 DAS. On average, the T_{11} (50% RDF + *R. leguminocirum* + PSB) had the highest number of nodules per plant at all sampling dates there was no significant differences between varieties except 60 DAS (Figure 1).

Table 1. Effect of bioinoculant on number of nodules at different DAS

Treat-ment	Khargone – 5			JM - 721		
	20	40	60	20	40	60
T_1	9.67	17.21	4.99	11.75	19.03	4.17
T_2	14.80	26.34	7.64	16.27	26.35	5.82
T_3	16.67	29.67	8.60	19.97	32.35	7.11
T_4	18.80	33.46	9.70	20.73	33.59	7.37
T_5	19.00	33.82	9.81	21.47	34.78	7.65
T_6	21.67	38.57	11.18	22.33	36.18	7.96
T_7	20.33	36.19	10.50	23.93	38.77	8.52
T_8	21.13	37.62	10.89	24.63	39.91	8.77
T_9	21.73	38.69	11.22	25.47	41.26	9.08
T_{10}	23.53	41.89	12.15	26.83	43.47	9.56
T_{11}	27.27	48.53	14.08	27.63	44.77	9.85
T_{12}	24.40	43.43	12.60	25.50	41.31	9.09
SEm (+/- 5)	1.24	2.22	0.87	0.97	1.57	0.86
SED	1.76	3.13	1.23	1.37	2.21	1.22
CD (5%)	3.64	6.49	2.54	2.83	4.58	2.52

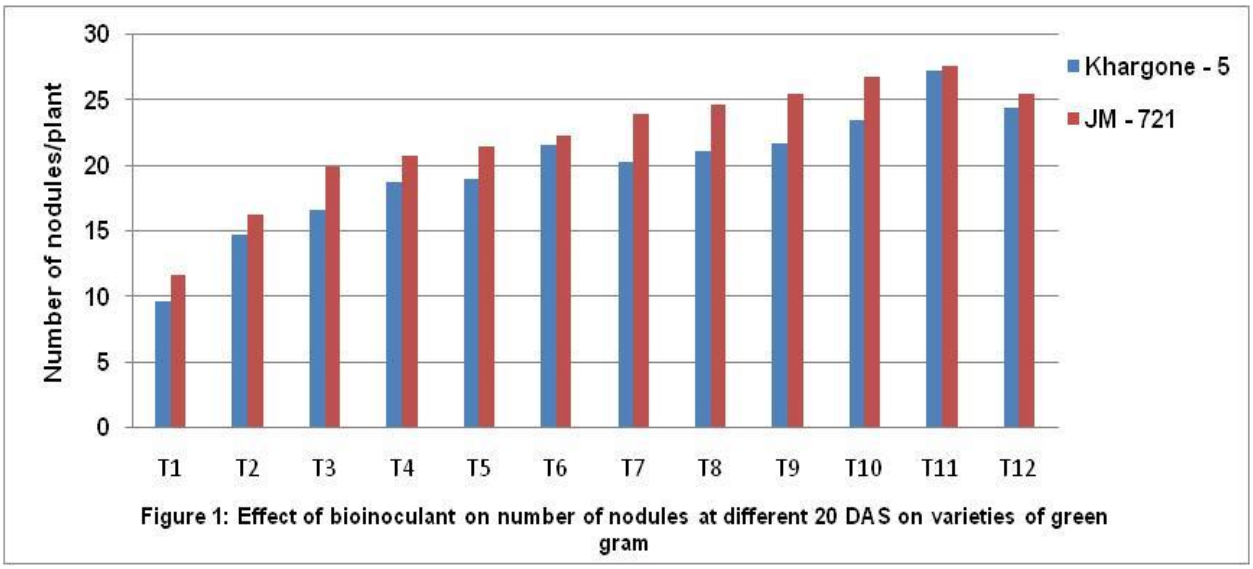

Figure 1: Effect of bioinoculant on number of nodules at different 20 DAS on varieties of green gram

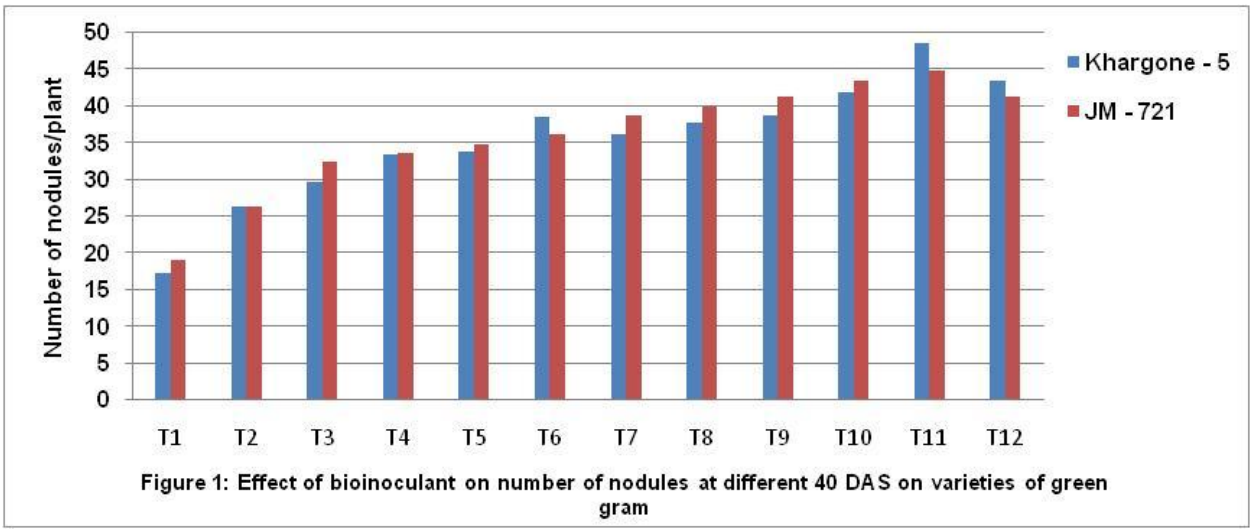

Figure 1: Effect of bioinoculant on number of nodules at different 40 DAS on varieties of green gram

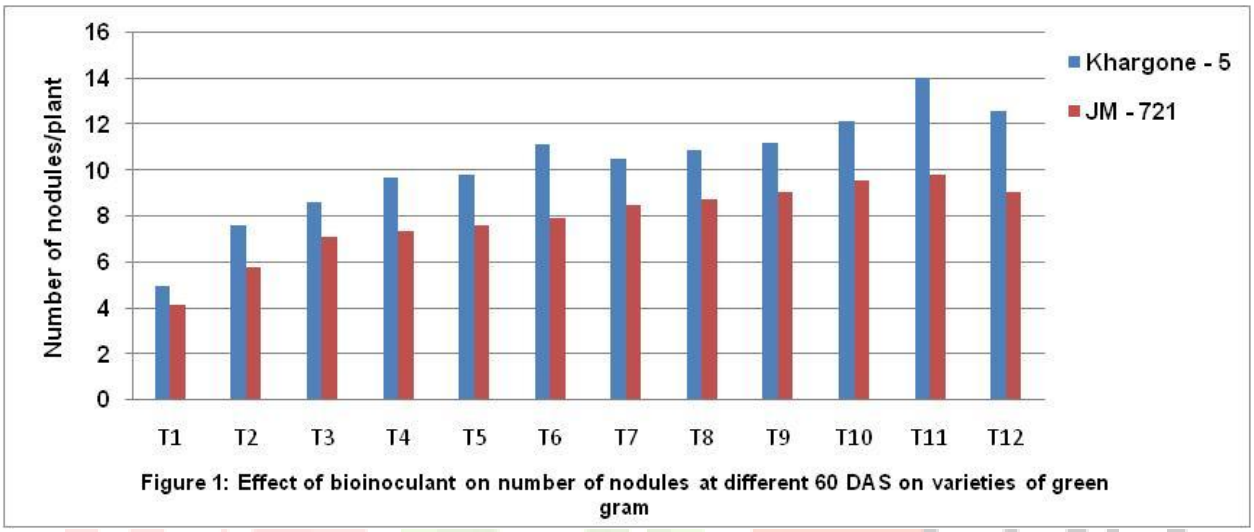

Figure 1: Effect of bioinoculant on number of nodules at different 60 DAS on varieties of green gram

Discussion

The highest number of nodules/plant (48.53) was recorded in T_{11} with the application of 50% RDF + *R. leguminocirum* + PSB due to the both biofertilizers initial availability of primary nutrients provide favourable environment for effective growth nodules. The same results also found by Das et al. 2002 and Zammurad et al. 2006 who are worked on various crop of pulses i.e. green gram, lentil and garden pea. At 20 DAS total number of nodules/plant were observed in variety of JM – 721 because initial stage growth of this variety is greater than the Khargone – 5 might be due to its genetic characters. Ahmad et.al (2004) also did the such type work on comparative study of the effect of biofertilizers on Nodulation of different varieties of *Mung bean(Phaseolus vulgaris L.*).

Conclusion

When seed treated with bacterial bioinaculent *Rhizobium + PSB* showed significantly increase in the plant growth and nodulation, hence the use of biofertilizes should be encouraged to the organic farmers because chemical fertilizers are expensive due to this reason soil fertility management is the big challenge in organic farming systems.

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