RESEARCH ARTICLE

EFFECT OF INORGANIC NUTRIENTS AND BIO-INOCULANTS ON BLACKGRAM (*VIGNA MUNGO* L.)

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Received-20.02.2017, Revised-06.03.2017

Abstract: A pot experiment on blackgram crop was conducted at pot house of the Department Soil Science and Agriculture Chemistry, C.S.Azad University of Agriculture and Technology Kanpur during kharif -2013 with variety shekhar-2 . The dose of experiment were 50% SR , 50% SR+Rh , 50% SR+PSB, 50%SR+Rh+PSB , 100% SR , 100 %SR+Rh , 100% SR+PSB, 100%SR+Rh+PSB , . The result showed that number of branches /plant varied from 1.5 to 4.5 and 2.5 to 5.5 at 30 and 60 DAS, respectively. The number of nodules ranged from 8.75 to 23.0 and 16.0 t0 30.50 at 30 and 60 DAS, respectively .The grain yield varied from 8.50 to 15.20 q/ha and stover yield varied from 12.60 to 23.80 q/ha . The N content in grain ranged from 3.16 to 4.24 % and P from 0.60 to 0.69 % .The N content in stover varied from 1.03 to 1.09 % and P From 0.24 to 0.29 % . The total nitrogen uptake ranged from 39.83 to 90.60 kg/ha and P uptake from 8.35 to 16.6 kg/ha . The protein content in black gram grain showing the range of variation from 19.75 to 26.62 % The treatment T_9 (100%SR+Rh+PSB) gave the best results in terms of branches , number of nodules, garain and stover yield, nutrient content, uptake values and protein content.

Keywords: Black gram, Crop, Inorganic nutrient, Production

INTRODUCTION

Being rich in protein, pulses not only form a vital part of the human diet, but also play a crucial role in balancing the dietary proteins. India holds the first rank in pulses production and consumption in the world. India grows the largest varieties of pulses in the world accounting for about 32% of the area and 23%of the world production. The important pulse crops are chickpea (48%), pigeon pea (16%), *urdbean* (9%), *mungbean* (7%), l entil (6%) and field pea (4%). The major pulse producing states are Madhya Pradesh (24%), Maharashtra (15%), Uttar Pradesh (12%), Rajasthan (12%) and Andhra Pradesh (9%), which together account for 72% of the total production. An estimated amount of 30 to 147 kg/ha biological nitrogen is fixed by different pulse crops in the soils in which they are grown. All data based on the book "State of Agriculture 2012-13" Government of India Ministry of Agriculture Department of Agriculture & Cooperation New Delhi.

Pulses production has registered a remarkable increase from 14.76 million tonnes in 2007-08 to a record level of 18.24 million tonnes in 2010-11. The production of pulses is estimated marginally lower at 17.09 million tonnes in 2011- 12. The increase in total production of pulses has been on account of improvement in production levels of *tur, urad* and *moong*. The average annual growth rate of area Bengal. However, the average productivity of pulses in India is less than the average productivity of 890 Kg/ha in world. Among the major pulses producing countries, the highest average yield of pulses has been recorded at 4219 Kg/ha in France, followed by 1936 Kg/ha in Canada and 1882 Kg/ha in USA in 2010. Cultivation of pulses is mostly (85% of the area) under rainfed condition, on Marginal lands , on low fertile soil by resource poor farmers. Non availability of High Yielding Variety, low Seed Replacement Rate (SRR), high susceptibility to pests especially *Helicover-pa armigera, inadequate* market linkage are the primary reasons for low yield of pulses. With a view to minimize the problem and ensure protective irrigation at the critical stage of plant development sprinkler set, mobile rain gun, pump set, etc. are distributed to farmers for efficient use of water from Dug well, Pond and Polythene lining pond. Further, the seed multiplication ratio (SRR) has been increased to 22.51% in 2010-11 from 10.41% in 2006-07.

To provide proper market infrastructure, the market linked extension support through Small Farmers Agribusiness Consortium (SFAC) under 60000 Pulses village programme is being implemented. Moreover, the Minimum Support Prices (MSPs) of Pulses have been increased substantially to incentivize Farmers to increase the production and productivity of pulses. Research Institutes like ICAR, IIPR, SAUs besides ICARDA and ICRISAT are making efforts to evolve varieties resistant to Helicoverpa. Emphasis is also being given on area expansion through promoting pulses cultivation in rice fallows, intercropping of pulses with oilseeds, cotton, cereals etc. Productivity enhancementthrough A3P demonstrations, INM,IPM& popularization/ promotion of the High Yielding varieties/hybrids. Under the National Food Security Mission (NFSM) from Rabi 2007-08, Accelerate Pulses Production Programme (A3P) is being implemented To accelerate The production of Pulses, particularly Red gram, Green gram, Blackgram, Chick pea and Lentil by promoting production and protection technologies. Integrated Development of 60000 Pulse Villages is implemented in selected watershed areas in major pulses growing states by providing

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funds for in-situ moisture conservation, new farm ponds with polythene lining and or dug wells. The special plan to achieve 19+ Million Tonnes of Pulses production is also under implementation during Kharif 2012-13.

METHOD AND MATERIAL

The experiment was conducted in Micro plots at pot culture of the size of 1ft × 1ft with the capacity of 20 kg in *"Pot culture house"* of the Department of Soil Science and Agricultural Chemistry, C.S. Azad University of Agriculture and Technology, Kanpur during Kharif season 2013. The soil of experimental pot low in organic carbon, available nitrogen and phosphorus but medium in case of potassium nutrient . The pH and EC of soil was in normal range. The soil was sandy loam in texture. The pH, EC and organic carbon are analyse by the method described by Jackson (1967). Available N_2 was determine by Alkaline permanganate method as described by Subbiah and Asija (1956). Available phosphorus was extracted with 0.5 M $NaHCO_3$ Olsen 0et al. (1954). The plant samples were also analyse for N and P. Nitrogen was determined by Kjeldal's method (Jackson 1967). Phosphorus was determined calorimetrically (Chapman and Pratt,1961). For quality characterstics the protein content in grain was also determined by the method described by Mc Cready and Hassid (1943).

Table 1. Effect of different treatments on the number of branches and number of nodules in blackgram:

Treatments	No. of Branches		No. of Nodules	
	At 30 DAS	At 60 DAS	At 30 DAS	At 60 DAS
Control	1.50	2.50	8.75	16.00
50%SR	3.25	4.25	10.75	20.25
50%SR+Rh	3.50	4.50	18.25	28.50
SR+PSB	3.75	4.25	16.50	27.50
50%SR+Rh+PSB	4.00	4.75	20.0	29.51
100%SR	4.25	4.50	18.50	30.25
100%SR+Rh	4.50	5.00	22.50	36.75
100%SR+PSB	4.25	5.25	22.01	35.50
100%SR+Rh+PSB	4.75	5.50	23.00	38.50
SE(d)	0.704	0.687	1.568	1.204
CD at 5%	1.461	1.427	1.718	2.500

Table 2. Effect of different treatment on grain, stover yield and protein content of blackgram .

Treatment	Grain Yield (q ha-1)	Stover yield (q ha-1)	Protein (%)
Control	8.50	12.60	19.75
T_2 50%SR	10.60	16.20	25.56
50%SR+Rh	11.70	18.00	25.87
50%SR+PSB	11.60	17.80	25.62
50% SR+Rh+PSB	11.90	18.30	26.08
100%SR	13.10	19.70	24.21

100%SR+Rh	14.30	21.90	26.31
100% SR+PSB	14.10	21.20	26.48
100% SR+Rh+PSB	15.20	23.80	26.62
SE(d)	**2.873**	**2.626**	**0.80**
CD at 5%	**1.384**	**1.265**	**1.62**

Table 3. Effect of treatments on nitrogen uptake in blackgram (kg ha^{-1})

S.N	Treatments	Grain uptake ($kgha^{-1}$)	Stover uptake ($kgha^{-1}$)	Total uptake ($kgha^{-1}$)	Grain uptake ($kgha^{-1}$)	Stover uptake ($kgha^{-1}$)	Total uptake ($kgha^{-1}$)
1	**Control**	26.86	12.97	39.83	5.11	3.24	8.35
2	**50%SR**	43.35	16.68	60.03	6.57	4.05	10.62
3	**50%SR+Rh**	48.43	18.9	67.33	6.74	4.5	11.24
4	**50%SR+PSB**	47.56	18.69	66.25	7.42	4.45	11.87
5	**50%SR+Rh+PSB,**	49.79	20.88	70.67	7.73	4.94	12.67
6	**100%SR**	50.69	18.86	69.55	8.64	5.31	13.95
7	**100%SR+Rh**	60.2	20.88	81.08	9.58	5.91	15.49
8	**100%SR+PSB**	59.64	23.43	83.07	9.58	5.93	15.51
9	**100%SR+Rh+PSB**	64.44	25.94	90.60	9.7	6.9	16.6
	SE (d)	**1.09**	**1.09**	**5.26**	**0.59**	**0.412**	**0.91**
	CD at 5%	**2.24**	**2.24**	**10.8**	**1.21**	**0.847**	**2.04**

RESULT AND DISCUSSION

The number of branches per plant were recorded at 30 DAS and 60 DAS and presented in table number 1 and It varied from 1.50 to 4.57 and 2.5 to 5.5 at 30 and 60 DAS, respectively .All the treatments gave significantly more branches than control .The treatment combination T_9 (100%SR+Rh+ PSB) gave the maximum number of branches at both the stages of crop growth. The increase in branch numbers of black gram may be described to the joint role of NPK role of N P K and bio- inoculants. The present study fall in the line with findings of several investigators (Saleh *et.al.*2013),

The numbers of nodules were significantly affected by application of rhizobium and PSB at 30 DAS and 60 DAS in current investigation. The nodule numbers are ranged from 8.75 to 23.0 and 16 .00 to 38.50 at 30 and 60 DAS, respectively. The treatment combination T_9 **(**100%SR+Rh+PSB) was best in case of nodule numbers. The nodule numbers are significantly superior in comparison to control. The effect of different treatments on number of nodules was presented in table 1. The increase in nodule numbers of by using of inorganic fertilizers and biofertilizers have been reported by several scientists like Amba *et.al*. (2013), Gawande et.al. (2007) and Tiwari *et.al*. (2005)

The grain and stover yield varied from 8.50 to 15.20 q/ha and 12.60 to 23.80 q/ha respectively . The maximum grain and stover yield was obtained by treatment combination T_9 (100%SR+Rh+PSB). All treatments are significantly superior than control in respect of grain and stover yield of blackgram is due to balanced nutrition through inorganic and biofertilizers. The effect of different treatments on grain yield and stover were presented in table 2. Similar kind of result has been reported Ahmad et.al. (2013).

The protein content varied from 19.75 to 26.62 % in grain of blackgram . The treatment T_9 (100%SR+Rh+PSB) gave the maximum quantity of protein. It mean the 100% dose of NPK along with inoculation of rhizobium and PSB increase the maximum protein content. The effect of different treatments on protein was presented in table 2.

The uptake value of nutrients in grain and stover increased due to concentration of these nutrients and biological yield of grain and stover. It was recorded that total N uptake varied from 39.83 to 90.60 kg/ha and P uptake ranged from 8.35 to 16.6 kg/ha .The uptake value indicate the appropriate quantity of nutrients required for optimum yield in present study . The effects of different treatments on uptake

values were presented in table 3. Similar kind of result have been reported by Singh and Chauhan (2005)

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