The Bioscan 9(4): 1545-1547, 2014
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

EFFECT OF SPACING AND FERTILIZER LEVELS ON GROWTH AND YIELD OF URDBEAN

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KEYWORDS
Fertilizer levels
Spacing
Yield

Received on :
13.05.2014

Accepted on :
29.10.2014

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ABSTRACT
A field experiment was conducted at Pulses Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during Kharif season of 2011-12 on Blackgramgenotype AKU-07-04. The experiment was laid out in Factorial randomized block design with three replication and eight treatment combinations. The growth character and yield attributes viz, number of leaves, number of branches, leaf area, dry matter, number of pod plant-1, number of grain pod-1and grain yield plant-1 wasrecorded higher under wider spacing (45x10 cm) than closer spacing(30x10 cm). All these character were recorded higher by application of fertilizer level 30:60 kg NP2O5 ha-1 than the fertilizer level of 20:40 kg NP2O5 ha-1but was par with the fertilizer level of 40:80 NP2O5 ha-1. Interaction effect between spacing and fertilizer levels did not influence the growth parameters and yield of Blackgram.

INTRODUCTION

Urdbean (Blackgram) is one of the important pulse crop in Indian agriculture. The importance of this crop than other pulse crop is by virtue of its high nutritional value, short duration, adaptability to all season and suitability to various cropping systems. Nitrogen and phosphorus are most important plant nutrient for crop production. Nitrogen constituent of chlorophyll, harnesses solar energy and fixes atmospheric CO2 as carbohydrates.Phosphorus play important role in root development, nodulation, flowering, fruiting and is usually a constituent of phospholipids, nucleic acid, protein, coenzyme, NAD, NADP, and ATP. (Yugandhar and Savithramma, 2013).

It is prime necessicity to maintain optimum plant population by maintaining inter and intra row spacing properly.Maximum or minimum plant density may minimize yield of Blackgram causing physiological change in plant. Hence appropriate Fertilizer dose with adequate plant population may increase crop yield of Blackgram.Similar results were noted by Mehmet (2008). Optimum row spacing plays an important role in contributing to the high yield because thick plant population will not get proper light for photosynthesis and can easily be attacked by diseases. On the other hand, very small population will also reduce the yield (Pookpakdi and Pataradilok, 1993). Uniform spacing generally gives a greater yield than hill groupings under favorable moisture conditions. Blackgram is highly responsive to nitrogen and phosphorus. Leaf area is made up of the total green lamina area of emerged leaves (Keating and Carberg, 1993). Greater leaf area is necessary to have superior yield and yield components in grain legumes (Muchow, 1985). Saini and Thakur (1996) stated that moderate doses of nitrogen and phosphorus (30:60 kg N:P per hectare) significantly increased the plant height, branches plant-1 and leaf area index of grain legumes compared to no N and P. The higher grain yield of blackgram is associated with significantly superior yield attributes e.g. effective number of pods per plant and 1000 seed weight (Singh *et al.*, 1993).

Keeping this in view of above facts, it was necessary to undertake an investigation to find out optimum level of nitrogen, phosphorus and the optimum plant density for the AKU-07-04 genotype in Kharif season.

MATERIALS AND METHODS

A field experiment entitled "Effect of spacing and fertilizer level on promising urdbeangenotype AKU-07-04" was conducted at Pulses Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during kharif season of 2011-12.Soil was clayey in texture with high amount of potash (320 kg ha-1) and moderate in phosphorus (18.80kg ha-1) and low in Nitrogen (190 kg ha-1), slightly alkaline in nature.The experiment was laid out in Factorial randomized block design with three replication and eight treatment combinations. Treatment combination were comprised of two level of spacing viz. 30X10cm (S1), 45x10cm (S2) and four levels of fertilizer viz. Absolute control (F0), 20:40 kg NP2O5 ha-1(F1), 30:60 kg NP2O5ha-1(F2), 40:80 kg NP2O5ha-1(F3). Similar research was done related to Blackgram by Prasad *et al.* (2014).Full dose of fertilizer were applied at the time of sowing. Nitrogen was applied through urea and phosphorus through single super phosphate (SSP).Similar type of fertilizer

application was done by Dalal *et al.* (2010) in case of Pigeonpea. Intercultural operations were done as and when necessary.The Urdbean crop was shown on July 4thand harvesting was undertaken in October 14th. Rainfall received during the season (399.4 mm) was 116.4 mm less than the normal (515.8 mm).Data obtained were statistically analyzed following the procedure as described by Gomez andGomez (1983).

RESULTS AND DISCUSSION

Effect of Spacing and Fertilizer Level on Growth Attributes

All the growth attributes were significantly influenced due to the different spacing treatment, planting at 30x10cm(S1) recorded significantly higher plant height over the 45X10(S2). The increase in plant height was might be due to competitions for light upto certain limit with higher plant density at 30x10 cm spacing. The above results are in agreement with Achakzai and Panizai (2007).Numbers of branches and leaves per plant were significantly higher with the spacing of 45 x 10 cm (S2) as compared to the spacing of 30x10cm (S1) at harvest. Wider plant spacing which intercepted more photosynthetically active radiation owing to better geometric situation that might have resulted in vigorous plant growth and more number of branches and leaves as compared to narrow spacing. Following observations were noted by Raman and Sinhamahapatra. A spacing of 45x10cm (S2) recorded significantly more leaf area/plantthan the spacing of 30x10 cm (S1).In case of low plant density at 45x10cm there was less competition for moisture, nutrients and intercepted more radiation as a result of which increased the number of branches, number of leaves, and leaf area and thereby produced more dry matter per plant. These results are in agreement with Shaikh *et al.* (2005).

Growth parameters also significantly influenced due to the fertilizer levels at all the stages of crop growth. Application of 30:60 kg NP2O5 ha1(F2) being at par with treatment 40:80kg NP2O5 ha1(F3) than the treatment 20:40kg NP2O5 ha1(F1) and control regarding plant height,numbers of branches and leaves.Since N is a major component of protoplasm help in photosynthesis and enhance metabolic rate, cell division and cell elongation which allow the plant growth faster and phosphorous enhances the root elongation, leaf expansion and help in cell elongation might have resulted in increased plant height due to the application of fertilizer upto certain limit. Similar results have also been reported by Rathore*et.al.* (2010). Increased application of fertilizer ultimately causes more uptake of nutrients in plant, which enhance cell division and thereby increased the growth attributes.Fertilizer application of 30:60 kg NP2O5 ha-1(F2) recorded significantly higher leaf area and dry matteraccumulation over control and remained at par with 40:80 kg NP2O5 ha1(F3) and 20:40 kg NP2O5 ha-1(F1). These results are related to results of Patel *et al.* (2013)

It seems that the authors do not know how to write et al. because it is written differently every time. It should be written as *et al.,* Correct it everywhere.

Effect of Spacing and Fertilizer Level on Root Studies

The spacing of 45x10cm (S2) recorded significantly higher number of root nodules plant-1 and root volume over spacing of 30x10cm (S1). At wider spacing there is less competition for space, moisture and nutrient might have probably increased root nodule as compared to close spacing. These results are in accordance with Ashok Kumar and Sharma (1989).The root length was significantly higher under spacing of 30x10cm (S1) over spacing of 45x10cm (S2)

Fertilizer level significantly influenced root nodule, root length and root volume of crop plant. Fertilizer level of 30:60 kg NP2O5 ha-1(F2) which was at par with 40:80 kg NP2O5 ha-1(F3) recorded significantly higher number of root nodule than 20:40 kg NP2O5 ha-1(F1) and absolute control (F0). Increased fertilizer level influenced better root development and plant vigor which has enhanced the nitrogen fixing power of the plant by increasing the activity of nodulating bacteria and resulting in more no. of nodules plant1.These results are in conformity with Hussain *et al.*(2010).

Effect of Spacing and Fertilizer Level on Yield

Different spacing significantly influenced the grain yield and biological yield. The spacing of 30x10 cm (S1) recorded significantly higher grain yield (1035.36 kg ha-1) than the yield produced (971.39kg ha-1) by the spacing of 45x10 cm (S2). Significantly higher biological yield 2951.25 kg ha-1 was also recorded with spacing 30x10 cm (S1) than spacing 45x10 cm(S2). The plant population per unit area was the prime factor in determining the yield. It also indicated that the fewer

Table 1: Effect of spacing and fertilizer level on growthattributes root attributes & yield of urdbean

Treatments	Plant height (cm)	Number of branches	Number of functional leaves/ plant	Leaf area/plant (dm2)	Total dry matter/ plant (g)	Biological yield (kg/ ha)	Seed yield (kg/ ha)	Root nodule plant-1	Root length(cm) plant-1	Root volume (ml) plant1
A. Spacing										
S1- 30 x 10 cm	39.47	10.54	10.62	8.63	12.56	2951	1035	38.45	20.18	2.67
S2- 45 x 10 cm	34.36	11.34	11.69	9.34	15.64	2737	971	40.15	18.42	2.98
SE (m) ±	0.63	0.20	0.22	0.19	0.19	49.10	14.54	0.55	0.47	0.07
CD (P=0.05)	1.92	0.63	0.68	0.57	0.58	148.96	44.13	1.67	1.45	0.23
B. Fertilizer level										
F0 - Absolute Control	33.77	10.16	10.00	8.20	13.46	2339	754	37.68	15.27	2.48
F1 - 20:40 kg NP ha-1	36.02	10.67	10.96	8.86	14.16	2656	949	38.38	18.84	2.81
F2 - 30:60 kg NP ha-1	39.97	11.73	12.27	9.78	14.78	3259	1180	41.28	22.12	3.16
F3 - 40:80 kg NP ha-1	37.91	11.19	11.39	9.11	13.99	3121	1128	39.88	20.96	2.85
SE (m) ±	0.89	0.29	0.32	0.26	0.27	69.44	20.57	0.78	0.67	0.10
CD (P=0.05)	2.72	0.89	0.97	0.81	0.82	210.67	62.41	2.37	2.05	0.32

Table 2: Root studies of Urdbean as affected by spacing and fertilizer levels

Treatments	Root nodule plant-1	Root length(cm) plant-1	Root volume (ml) plant1
A. Spacing			
S1- 30 x 10 cm	38.45	20.18	2.67
S2- 45 x 10 cm	40.15	18.42	2.98
SE (m) ±	0.55	0.47	0.07
CD (P=0.05)	1.67	1.45	0.23
B. Fertilizer level			
F0 - Absolute Control	37.68	15.27	2.48
F1 - 20:40 kg NP ha-1	38.38	18.84	2.81
F2 - 30:60 kg NP ha-1	41.28	22.12	3.16
F3 - 40:80 kg NP ha-1	39.88	20.96	2.85
SE (m) ±	0.78	0.67	0.10
CD (P=0.05)	2.37	2.05	0.32
Interaction effect			
SE (m) ±	1.10	0.95	0.15
CD (P=0.05)	NS	NS	NS
General mean	39.30	19.30	2.83

yields per plant in case of high density was compensated by increased number of plants. Higher grain yield at closer spacing might be due to the higher plant population, there was increase in the proportion of number of pods produced more seed yield. Similar results were also reported by Singh *et al.* (1994) and Bhairappavar *et al.* (2005).

Different fertilizer levels significantly influenced the grain yield and biological yield. The fertilizer level F2 (30:60 kg NP2O5 ha1) produced significantly highest grain and biological yield over fertilizer level F1 (20:40kg NP2O5 ha1) and control F0. But it was at par with treatment F3 (40:80 kg NP2O5 ha-1). Significant differences were also observed among F3, F1 and F0 in respect of biological yield. Increased vigour and growth with the optimum level of nitrogen and phosphorous application, thus lead to better development of yield attributes and subsequently the grain yield. Similar results were also reported by Hussain *et al.* (2011).

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