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EFFECT OF PLANT GEOMETRY AND METHODS OF WEED CONTROL ON GROWTH AND YIELD OF PIGEONPEA

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ABSTRACT

The experiments was conducted at the Crop Research Station, Bahraich, (U.P.) during kharif, 2009-10 and 2010-011 to evaluate the effect on plant geometry and methods of weed control on growth and yield of pigeonpea. The treatments consisted 4 types of plant geometry viz.,50X20 cm, 60X20 cm, 70X20 cm and farmer practice and 3 methods of weed control viz, two hand weeding at 35 and 65 DAS, application of lasso @ 2.0 litre ha $^{-1}$ just after sowing, application of lasso @ 2.0 litre ha $^{-1}$ just after sowing and one hand weeding @ 65 DAS. The treatment spacing of 60X20 cm and weed control application of lasso and one hand weeding found more production and remunerative than other treatments. The higher yield (27.98 q ha^{-1}) was recorded under the spacing of 60X20 cm which was significantly better than other treatments. Application of lasso @ 2.0 litre ha $^{-1}$ just after sowing and one hand weeding proved significantly better than other methods of weed control and C:B ratio was also higher under these treatment.

Keywords: Plant geometry, methods, weed control, pegeonpea

INTRODUCTION

Pigeonpea is the second most important legume crop of India occupying 14.5% area and contributes to 15.5% of total pulse production (Mishra *et al*., 2011). Pigeonpea is a wonderful gift of nature being the richest source of protein nutrition to the pre dominantly vegetarian population in our country (Kumar and Singh, 2011). Crop was grown in kharif season alone either mixed with jowar, bajara, maize, urd and moong, by broad cast method in Eastern Uttar Pradesh. Plant geometry of crop has a great role in crop growth as well as seed production. Proper plant population reflects the higher yield of crop. Control of weed flora in pigeonpea was also very important factor for higher yield. In kharif season weed biomass was more and reduced the crop yield. Hence keeping these views the present experiment was conducted to find out the suitable plant geometry and methods of weed control to check the weed flora in pigeonpea.

MATERIALS AND METHODS

The experiment was conducted at the Crop Research Station, Bahraich, (U.P.) during *kharif*, 2009 and 2010 respectively with 4 types of plant geometry *viz.*, 50X20 cm, 60X20 cm, 70X20 cm and farmer practice and 3 methods of weed control *viz*, two hand weeding at 35 and 65 DAS, application of lasso @ 2.0 litre ha $^{-1}$ just after sowing, application of lasso @ 2.0 litre ha $^{-1}$ just after sowing and one hand weeding at 65 DAS. Soil was normal in reaction (pH 7.5), low in organic carbon 2.6 g kg^{-1}, available N 180 kg ha^{-1}, P_2O_5 13.5 kg ha^{-1} and K_2O 278 kg ha^{-1}. Nitrogen, P_2O_5 and K_2O was applied as basal dressing @ 15, 30, and 45 kg ha^{-1}. Twelve treatments (4 plant geometry and 3 level of weed control method) were replicated three times in split plot design. The plant geometry was located in main plot and weed control were located in sub plot. Narendra arhar-1 was sown on 30th June in each year and weed control methods were adopted as per treatments. All agronomic practices were adopted as per requirement of the crop. Biometric observations such as plant height, branch per plant, and pod per plant, number of seed per pod and test weight of pegionpea were recorded. Grain and straw samples were digested in diacid mixture and N, P and K contents were determined by adopting standard methods (Jackson 1973). Grain yield was recorded after harvesting of crop and economics of each treatment were calculated on nearest market price of produce.

RESULTS AND DISCUSSIONS

Effect of plant geometry: The data (Table 1) revealed that the plant height, branches per plant, number of grains per pods and test weight

increased significantly with increase in plant geometry (70X20 cm). The increase in yield attributing characters might be due to the improved nutritional condition for plant growth and development. But grain and straw yield of pigeon pea increased significantly with plant geometry of 60X20 cm which may be due to higher plant population in comparison to plant geometry (70X20 cm). Low value of these characters was noticed under farmer practice which might be attributed due to poor crop growth. The yield (27.98 q ha^{-1}) was noticed under spacing of 60X20 cm and was increased by 5.7, 6.3 and 29.2 per cent over spacing of 50X20, 70X20 cm and farmer practice which was due to proper plant population as well as proper growth of plant. The highest net income (Rs. 44366 ha^{-1}) was recorded under 60X20 cm. Plant geometry, which was significantly superior by 7.9, 8.7 and 39.9 per cent over 50X20 cm, 70X20 cm and farmer practices; and same trend, was also observed under C: B ratio among the treatments. The mean data on NPK uptake by crop showed that higher NPK uptake (33.57:61.55:41.97 kg ha^{-1}) was observed under spacing of 60X20 cm which was significantly superior to other plant geometry because of better crop growth and yield, due to proper root development.

Table 1: Effect of plant geometry and methods of weed control on growth and yield of pegion pea (Pooled data of 2 years)

Treatments	Plant Population / Plot	Plant height (cm)	Branches/ Plant	Pods/ branch	Grains/ pods	Test weight (g)	Weed Biomass at 35 DAS (kg ha^{-1})	Weed Biomass at 65 DAS (kg ha^{-1})	Weed Biomass at 90 DAS (kg ha^{-1})
Plant Geometry									
50X20 cm	147.22	184.77	19.77	19.55	4.33	85.47	347.77	184.4	78.44
60X20 cm	122.88	192.00	23.44	21.44	5.11	86.71	326.44	170.8	77.77
70X20 cm	105.00	199.55	24.66	22.77	5.22	88.81	332.33	136.1	78.55
Farmer practice	191.66	166.22	16.88	13.33	3.77	80.84	356.44	165.4	104.44
CD (P=0.05%)	2.70	3.51	1.01	0.90	0.72	1.00	8.71	7.86	4.66
Method of Weed Control									
M_1	143.05	186.33	22.08	18.33	4.50	85.35	396.16	176.3	80.16
M_2	138.25	180.33	17.58	17.5	3.66	84.04	328.33	178.2	114.25
M_3	143.75	190.20	23.91	22.5	5.66	86.40	297.75	138.8	60.00
CD (P=0.05%)	2.65	3.05	0.88	0.78	0.62	0.87	7.54	6.81	4.04

M_1- 2 hand weeding at 35 and 65 DAS, M_2- application of lasso @ 2.0 litre ha^{-1} just after sowing, M_3-application of lasso @ 2.0 litre ha^{-1} just after sowing and one hand weeding @65 DAS

Effect of weed control: Yield attributing characters of pegionpea *viz,* no of branch per plant, pod per plant, seed per pod and test weight was significantly influenced by the weed control treatment (Table 1). Application of lasso @ 2.0 litre ha^{-1} just after sowing and one hand weeding at 65 DAS recorded the tallest plant, number of branch per plant, pods per plant, seed per pod and test weight of seed followed by treatment two hand weeding at 35 and 65 DAS. The lower value of above characters was noticed under only lasso application after sowing of crop which might be due to weed competition more under this treatment.

Dry matter of weed: Dry weight of weed at 30 DAS was lowest (326.66 g) under the plant geometry of 60X20 cm which was closely followed by 70X20 cm plant geometry. These treatments being at par were significantly superior to two other treatments. The higher weed biomass (356.44 kg ha^{-1}) was recorded under farmer practice and same trend was observed at 65 and 90 DAS in same treatment. The higher dry weight (396.66 kg ha^{-1}) of weed was noticed under two hand weeding at 35 and 65 DAS was which was due to weed samples were taken before weeding. The lower weed biomass (297.75 kg ha^{-1}) was recorded under application of lasso @ 2.0 litre ha^{-1} + one hand weeding @65 DAS. This might be due to low weed population under the treatment. The higher value of weed biomass at 65 DAS and 90 DAS was recorded under application of lasso @ 2.0 litre ha^{-1}, which might be due to increase in the weed population.

Table 2: Effect of plant geometry and method of weed control on growth and yield economics and uptake of nutrients in pigeon pea (Pooled data of 2 years)

Treatments	Seed yield (q ha^{-1})	Stick yield (q ha^{-1})	Net profit (Rs.ha^{-1})	C:B ratio	Nutrient uptake by whole plant(kg ha^{-1})		
					N	P	K
Plant Geometry							
50X20 cm	26.37	52.75	40851	3.37	31.6	58.0	39.4
60X20 cm	27.98	55.60	44366	3.58	36.7	63.5	49.7
70X20 cm	26.2	52.70	40496	3.35	33.5	61.5	41.9
Farmer practice	19.8	48.81	26640	2.5	31.4	57.6	39.3
CD (P=0.05%)	0.696	0.8	342	0.18	0.5	1.2	0.3
Method of Weed Control							
M_1	25.61	51.67	38389	3.12	30.7	56.3	38.4
M_2	23.32	47.47	35392	3.20	31.6	58.0	39.5
M_3	26.38	52.25	40484	3.30	37.9	61.3	44.9
CD (P=0.05%)	0.60	0.70	315	0.16	0.50	1.15	0.20

M_1- 2 hand weeding at 35 and 65 DAS, M_2- application of lasso @ 2.0 litre ha^{-1} just after sowing, M_3-application of lasso @ 2.0 litre ha^{-1} just after sowing and one hand weeding @65 DAS

Weed control efficiency: Weed control efficiency at 30 DAS was found to be highest under chemical and cultural management practices. Cultural management practices showed the highest weed control efficiency. The lower value of weed control efficiency was noticed under chemical method of weed control. The value was higher under the chemical control only might be due to high weed population which under same treatment at 60 and 90 DAS. Similar findings were reported in jute by Ghorai, (2008) and Rajput (2000).

Nutrient uptake: Data on nutrient uptake (Table 2) indicated that the maximum nutrient uptake (36.76, 63.56 and 49.7 kg NPK $ha^{-1,}$ respectively) was recorded under spacing of 60X20 cm which was significantly superior to all other treatments which might be due to proper plant population and root development. Nutrient uptake was also influenced by methods of weed control. The higher value of nutrient uptake was recorded under chemical + cultural practices of weed control, followed by chemical method of weed control.

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