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Research Communication

Yield and profitability of clusterbean (*Cyamopsis tetragonoloba*) as influenced by varieties and crop geometry in semi-arid climate of Andhra Pradesh

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ABSTRACT

A field experiment was conducted during the rainy (*kharif*) season of 2013–14 at Rajendranagar, Hyderabad, to evaluate the performance of promising clusterbean [*Cyamposis tetragonolaba* (L.) P. Taubert] varieties, viz. 'RGC 1025', 'HGS 365', 'RGC 936' and 'RGC 1017' and to standardize the crop geometry of clusterbean (30 cm × 7.5 cm, 30 cm × 10 cm, 37.5 cm × 10 cm and 45 cm × 10 cm). Variety 'RGC 1025' recorded higher number of clusters/plant, pods/plant, 1,000-seed weight, seed yield, stalk yield, net returns and benefit: cost ratio than 'RGC 936', 'RGC 1017' and 'HGS 365'. Sowing of clusterbean at 30 cm × 10 cm spacing recorded higher seed yield (575.4 kg/ha), net returns (₹10^3×13.8/ha) and benefit cost ratio (1.63) compared to the other spacings. However, clusters/plant and pods/plant were higher under medium (37.5 cm × 10 cm) and wider spacing (45 cm × 10 cm). Among interactions, clusterbean varieties performed better under closer spacings, as the highest seed yield was recorded with 'RGC 1025' under 30 cm × 7.5 cm, followed by same variety ('RGC 1025') at 30 cm × 10 cm and 'RGC 936' at 30 cm × 7.5 cm spacing. To get higher yield and monetary return under semi-arid environment, clusterbean variety 'RGC 1025' may be adopted with narrow crop geometries, viz. 30 cm × 7.5 cm and 30 cm × 10 cm spacing.

Key words: Clusterbean, Crop geometry, Variety

Clusterbean or *guar* is widely grown in North-Western India and parts of Pakistan, semi-arid high plains of Texas in the USA, Australia and Africa to a smaller extent. In India, it is grown in an area of 3.44 million ha, with a production of 2.21 million tonnes and productivity of 644 kg/ha (Directorate of Extension and Statistics, 2012). India is the leading exporter of *guar* seeds and gum and earn significant foreign-exchange. Particularly during 2012, world demand for *guar* gum has skyrocketed and the price of *guar* has increased by approximately 230% mainly because of increased oil field shale gas demand. (Grestaa *et al*., 2013). *Guar* being a multipurpose legume, is also used in various industries including textile, paper manufacture, stamps, cosmetics, pharmaceuticals etc. It is best adapted to tropical and subtropical climatic conditions with high degree of drought and salinity tolerance and hence could be a valuable alternative crop for the exploitation of the semi-arid environment of the country, as it is not prominently grown in semi-arid region of Andhra Pradesh. Hence there is a need to evaluate and standardize variety which can achieve high yield potential under optimum crop geometry in these climatic conditions of the country.

A field experiment was conducted at College farm, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad, during the rainy (*kharif*) season of 2013–14 in factorial randomized block design with 3 replications, to evaluate the performance of promising clusterbean varieties, namely 'RGC 1025' 'HGS 365' 'RGC 936' and 'RGC 1017', and to standardize the crop geometry for promising clusterbean varieties (30 cm × 7.5 cm, 30 cm × 10 cm, 37.5 cm × 10 cm and 45 cm × 10 cm) under rainfed semi-arid conditions of Andhra Pradesh. The experimental soil was sandy loam with *pH* 7.0, low organic carbon (0.25%), available nitrogen (156.3 kg/ha), phosphorus (21.4 kg/ha) and medium in available potassium (245.6 kg/ha). The crop was supplied with recommended dose of fertilizer, i.e. 20 kg N, 40 kg P_2O_5 and 40 kg K_2O/ha, through urea, single superphosphate and muri-

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ate of potash respectively. The weekly mean maximum and minimum temperature during crop-growth period was 30.8°C and 22.0°C, respectively, and total rainfall received was 475.3 mm in 33 rainy days. Crop was sown on 26 June 2013 at varied geometry levels and each variety was harvested according to their duration as variety 'RGC 1025' and 'HGS 365' were harvested 98 days after sowing (DAS), while 'RGC 936' and 'RGC 1017' were harvested at 90 DAS and 105 DAS respectively. The observations on yield attributes, viz. number of pods/cluster, number of clusters/plant, number of pods/plant, 1,000-seed weight, seed and stalk yields of the clusterbean were recorded using standard methodologies. The economics was worked out on the basis of prevailing rates of inputs and produce (₹45/kg). The analysis of variance of data under factorial randomized block design was carried out using SAS 9.2 software and treatments were compared by computing F-test.

Among the varieties tested, variety 'RGC 1025' recorded significantly higher yield attributes like clusters/plant, pods/plant, and 1,000-seed weight than 'RGC 936', 'HGS 365' and 'RGC 1017' (Table 1). It was mainly owing to effective translocation and distribution of photosynthates from source to sink; in turn more number and vigorous yield attributes. However, the highest pods/cluster were produced by 'HGS 365' might be owing to non-branching pattern of the variety. The bold seed quality of 'RGC 1025' was the main reason for higher 1,000-seed weight. Similar trend was noticed by Bhadoria and Kushwaha (1995) and Kalyani (2012). Crop geometry of 45 cm × 10 cm was on a par with 30 cm × 10 cm but significantly superior to closer (30 cm × 7.5 cm) and medium spacing (37.5 cm × 10 cm) in terms of yield attributes including pods/cluster, clusters/plant, pods/plant that was attributed to better proliferation of individual plant at wider spacing leading to more fruiting branches/plant and in turn, number of clusters and pods/plant. Similarly, 1,000-seed weight was also higher with wider spacing (45 cm × 10 cm) than the other spacings. These results confirm the findings of Bains and Dhilon (1977). 'RGC 1025' variety gave significantly higher seed and stalk yield than the other varieties and was followed by 'RGC 936', while the lowest seed and stalk yield was recorded with 'RGC 1017'. The superiority of 'RGC 1025' to the other varieties with respect to yield attributes and yield may be owing to its genetic potentiality to utilize the growth resources and translocate photosynthates from source to sink and also this variety was found more tolerant to insect-pest attack compared to the other cultivars. Similar results were reported by Kalyani (2012). Among the different spacings, highest seed and stalk yield was obtained under 30 cm × 7.5 cm being at par with 30 cm × 10 cm and significantly superior to 37.5 cm × 10 cm and 45 cm ×10 cm which was in turn was at par with each other. There was wider variation in recommendation of plant geometry across different climatic condition as reported by Siddaraju *et al.* (2010) and Reddy and Reddy (2011). The highest returns and benefit: cost ratio were obtained with 'RGC 1025' variety, closely followed by 'RGC 936' which was superior to 'HGS 365' and 'RGC 1017' (Table 1). Selection of the suitable variety is important non-monetary input that influences the seed yield and gross returns, as also supported by Kalyani (2006). Plant density also significantly influenced the economics seed production of clusterbean with

Table 1. Yield, yield-attributing characters and economics of clusterbean as influenced by varieties and crop geometry

Treatment	Yield attributes				Yield (kg/ha)		Economics	
	Pods/ cluster	Clusters/ plant	Pods/ plant	1,000-seed weight (g)	Seed yield	Stalk yield	Net returns (×10³ ₹/ha)	Benefit: cost ratio
Variety								
'RGC 1025'	4.8	17.9	87.1	28.3	575	4,192	13.8	1.94
'HGS 365'	5.9	12.8	71.6	25.5	456	3,234	7.8	1.55
'RGC 936'	4.3	15.6	74.5	27.3	492	3,582	9.7	1.67
'RGC 1017'	4.5	13.2	62.1	25.1	321	2,640	1.4	1.10
SEm±	0.1	0.3	1.3	0.2	5.5	100	0.2	0.02
CD (P=0.05)	0.4	0.8	3.7	0.4	16	280	0.8	0.06
Crop geometry (cm)								
30 × 7.5	4.7	13.5	70.1	25.1	490	3,999	9.233	1.61
30 × 10	5.0	14.5	69.6	25.5	477	3,406	9.118	1.63
37.5 × 10	4.6	14.8	74.7	27.3	437	3,180	7.172	1.50
45 × 10	5.2	16.6	80.9	28.2	439	3,063	7.390	1.52
SEm±	0.1	0.3	1.3	0.2	5.5	98	0.2	0.02
CD (P=0.05)	0.4	0.8	3.7	0.4	16	284	0.8	0.06

each increment decrease in crop geometry from 45 cm × 10 cm to 30 cm × 7.5 cm, net returns and benefit: cost ratio increased. The maximum net returns were obtained when clusterbean was sown at 30 cm × 7.5 cm, followed by 30 cm × 10 cm and it was minimum with wider crop geometry of 37.5 cm × 10 cm.

The significant interaction effect for seed yield was observed between varieties and spacing (Table 2). Majority of the varieties, viz. 'RGC 1025', 'RGC 936' and 'RGC 1017' gave the highest seed yield when grown under 30 cm × 7.5 cm, while 'HGS 365' performed better when sown at 30 cm × 10 cm than the other spacings. Therefore, clusterbean should be planted at narrow row spacing in semi-arid areas. Significant interaction between varieties and spacing were also reported by Siddaraju *et al.* (2010).

Table 2. Interaction between varieties and crop geometry on seed yield (kg/ha) of clusterbean

Treatment	*Crop geometry (cm)*			
	30 × 7.5	30 × 10	37.5 × 10	45 × 10
Variety (V)				
'RGC 1025'	750	550	463	539
'HGS 365'	322	527	502	473
'RGC 936'	343	538	454	434
'RGC 1017'	344	296	331	313
Interaction V × S	SEm± 11.0		CD (P=0.05) 32.0	

Thus, 'RGC 1025' is suitable and adaptable variety for getting higher yield and economic returns when planted at narrow crop geometries of 30 cm × 7.5 cm and 30 cm × 10 cm under semi-arid conditions of Andhra Pradesh.

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