Environment & Ecology 35 (2) : 742—745, April—June 2017
Website: environmentandecology.com ISSN 0970-0420

Performance of Clusterbean [*Cyamopsis tetragonoloba* (L.) Taub] Varieties with Foliar Application of Iron

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Received 10 June 2016; Accepted 16 July 2016; Published online 6 August 2016

Abstract A field experiment was conducted during the rainy season 2014-15 to assess effect of foliar application of iron and to evaluate performance of clusterbean [*Cyamopsis tetragonoloba* (L.) Taub] varieties. The twenty treatment combinations consisting of five clusterbean varieties (RGC-986, RGC-1003, RGC-1033 RGC-1055 and RGC-1066) and foliar sprays treatment of 0.5% $FeSO_4$ (control, branching, flowering and branching + flowering) were tested in randomized block design with three replications. Results revealed that variety RGC-1033 proved significantly superior and economically profitable compared to rest of varieties in respect of dry matter accumulation, growth indices like CGR, RGR and LAI, pods/plant, seeds/pod and test weight. Similarly, the seed yield (1816 kg/ha), stover yield (3787 kg/ha) and biological yield (5602 kg/ha) were also significantly higher with variety RGC-1033. Results further indicated that growth and yield proved economically beneficial with foliar application of iron over control.

Keywords Growth, Clusterbean, Varieties, Iron, Yield.

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Introduction

Cluster bean,also known as guar, is a arid legume crop that is cultivated mostly in the arid and semi arid areas as it is drought resistant. The word "guar" represents its derivation from sanskrit word "Gauaahar" which means cow fodder or otherwise fodder of the livestock. There is no other legume crop so hardy and drought tolerant as clusterbean, which is especially suited for soils and climate of Rajasthan. The popular guar gum (28 to 32%), which is used in mining, petroleum drilling and textile manufacturing sectors, is obtained from the endosperm of the seed of the plant. Many genotypes for different agro-ecological situations of arid and semi-arid have been released. The newly developed varieties are superior under particular situation.

Materials and Methods

The experiment was conducted at the Agronomy farm, Sri Karan Narendra Agriculture University, Jobner ($26^0 05'$ N, $75^0 28'$ E) in Agroclimatic zone III A (Semi-arid Eastern Plain Zone) of Rajasthan. The soil was loamy sand in texture, alkaline in reaction (P^H value 8.2), poor in organic carbon (0.14%) with low available nitrogen (130 kg/ha) and medium in phosphorus and potassium content 18.9 and 175.6 kg/ha respectively. The rainfall received during the period (June to October) was 251 mm. Twenty treatment combinations consisting of five clusterbean varieties (RGC-986, RGC-1003, RGC-1033, RGC-1055 and RGC-1066) and four foliar spray treatment of 0.5% $FeSO_4$ (control, branching, flowering and branching +flowering)

Table 1. Effect of foliar application of iron on growth and yield attribute of cluster bean varieties. LAI; Leaf area index; CGR, Crop growth rate; RGR, Relative growth rate; DAS, Days after sowing.

Treatments	At harvest		60 DAS to harvest			Yield attributes		
	Plant height (cm)	Dry matter (g/plant)	LAI at 60 DAS	CGR (g/m /day)	RGR (mg/g/ day)	Pods/ plant	Seeds/ pod (g)	Test weight
Varieties								
RGC - 986	99.7	145.0	5.01	1.31	17.3	38.0	7.60	26.4
RGC-1003	93.9	133.7	4.88	1.09	14.6	35.7	7.46	25.3
RGC-1033	95.4	162.6	5.24	1.63	19.7	42.3	8.16	28.8
RGC-1055	98.9	155.1	5.18	1.45	18.1	39.1	7.91	27.0
RGC-1066	102.7	110.4	4.62	0.88	14.2	33.8	7.36	23.3
SEm ±	2.15	2.67	0.10	0.05	0.16	0.81	0.15	0.49
CD (p = 0.05)	6.14	7.64	0.29	0.13	0.46	2.31	0.43	1.41
$FeSO_4$ application								
Control	94.4	125.0	4.72	1.02	14.7	34.2	7.12	23.5
0.5% $FeSO_4$ at branching	98.8	146.5	5.09	1.34	18.0	39.3	7.74	25.6
0.5% $FeSO_4$ at flowering	96.2	140.5	4.96	1.34	16.2	36.3	7.81	27.0
0.5% $FeSO_4$ at branching+flowering	102.4	153.4	5.17	1.40	18.2	41.4	8.11	28.7
SEm ±	1.92	2.39	0.09	0.04	0.14	0.72	0.13	0.44
CD (p = 0.05)	5.49	6.83	0.26	0.12	0.41	2.06	0.38	1.27
CV (%)	7.59	6.54	7.09	12.7	3.32	7.39	6.69	6.55

were tested in randomized block design with three replications. The seed was sown manually on 10 July 2014 maintaining spacing of 30 cm × 10 cm, with 20 kg/ha seed rate. Each plot consisted gross dimension of 4.0 m × 3.0 m and net area 3.0 m × 1.8 m.Thinning was carried out 20 DAS to maintain required plant population. Net return and benefit : cost ratio were calculated on the basis of prevailing market prices of seed of clusterbean varieties. Leaf-area index, crop-growth rate (CGR), relative growth rate (RGR) were worked out by using standard method for analysis and formula.

Results and Discussion

Effect of varieties

Results revealed that at harvest RGC-1066 (Table 1) attained maximum plant height over RGC-1003 and RGC-1033 remained statistically at par with RGC-986 and RGC- 1055. The increase in plant height due to RGC-1066 was to the magnitude of 9.4, 7.7 respectively, over RGC-1003 RGC-1033 at harvest. However RGC-1033 produced highest dry matter at harvest over other varieties. The maximum leaf area index was obtained with RGC-1033 (5.24) which was significantly higher over RGC-1066, RGC-1003 and remained at par with RGC-986 and RGC-1055. It indicated an increase of 13.5% over variety RGC - 1066. The highest CGR and RGR from 60 days after sowing to harvest obtained by RGC - 1033 which was significantly over RGC - 1066, RGC - 1003 and RGC-986, RGC-1055 and took highest yield compared to the other varieties consequently produced higher pods/plant, seeds/pod over rest of varieties and test weight remained at par with RGC-1055. Under present investigation all varieties were grown under identical conditions; however, marked variation in quality, growth parameter and yield could be ascribed on account of genetic capabilities to exploit available resources for their growth and development. The better performance of RGC-1033 seems to be on account of higher growth attributes [2]. The maximum seed yield and test weight has been provided by RGC-1033 [3]. Kumar and Kaushik [4] and Rawat et al. [5] also reported differential growth behavior of clusterbean varieties in terms of plant height, number of branching and dry matter accumulation. Further, RGC-1033 produced signifi-

Table 2. Effect of foliar application of iron on yield and economics of clusterbean varieties. B : C ratio, benefit : cost ratio.

Treatments	Seed yield (kg/ha)	Stover yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)	Economics Net returns (Rs/ha)	Economics B : C ratio
Varieties						
RGC-986	1353	3423	4775	28.9	33914	1.42
RGC-1003	1325	3234	4559	29.2	32714	1.37
RGC-1033	1816	3787	5602	32.4	53651	2.25
RGC-1055	1569	3580	5149	30.6	43140	1.81
RGC-1066	1187	3028	4215	28.2	26835	1.13
SEm ±	39	110	126	0.76	1131	0.03
CD (p = 0.05)	111	314	361	2.18	2290	0.09
$FeSO_4$ application						
Control	1310	3129	4438	29.4	32173	1.36
0.5% $FeSO_4$ at branching	1506	3569	5075	30.0	40456	1.70
0.5% $FeSO_4$ at flowering	1433	3320	4753	29.5	37286	1.57
0.5% $FeSO_4$ at branching + flowering	1550	3624	5174	30.1	42288	1.77
SEm ±	35	98	113	0.68	1012	0.03
CD (p = 0.05)	99	281	323	NS	2048	0.08
CV (%)	9.26	11.1	8.99	8.85	7.28	7.18

cantly higher seed yield and stover yield over RGC-1066, RGC-1003 and RGC-986, RGC-1055. The harvest index of variety RGC-1033 remained at par with RGC-1055 (Table 2). This subscribes to the view that there was adequate supply of metabolites under RGC-1033 compared to other varieties for growth and development of reproductive structures [6]. RGC-1033 also proved most efficient in realizing highest net returns and benefit: cost ratio, which were significantly higher over rest of the varieties. The next best variety in order of superiority of growth and yield and economic was RGC-1055.

Effect of foliar application

A foliar application of 0.5% $FeSO_4$ at branching + flowering stage significantly enhance growth parameters viz., plant height, dry matter. LAI, CGR, RGR (Table 1). The foliar application of 0.5% $FeSO_4$ (branching, flowering, branching + flowering) significantly increased yield attributes viz., pods/plant, seeds/pod and test weight over control (Table 2). But in case of seed, stover and biological yield a single spray of 0.5% $FeSO_4$ at branching stage also recorded at par yield with spray at branching + flowering stage and increase over control. Interaction between varieties and foliar application of 0.5% $FeSO_4$ was non significant. The foliar application of 0.5% $FeSO_4.7\ H_2O$ was found to increase pod yield, haulm yield and shelling percentage of groundnut than control [7]. Zeidan et al. [8] also observed in wheat remarkable improvement in yield attributes and yields due to application 0.1% $FeSO_4$. A significantly increased growth with both 25 kg $FeSO_4$/ha as basal dose and foliar spray of 0.5% $FeSO_4$ at 25 and 40 DAS in comparison to control in mungbean [9].

Conclusion

It was concluded that under prevailing conditions, clusterbean varieties RGC-1033 appear suitable for cultivation in semi-arid Rajasthan along, foliar spray of 0.5% $FeSO_4$ at branching stage.

References

1. Hallock DL (1978) Relative effectiveness of several Mn sources on Virginia type peanuts. Agron J 71 : 685—688.

2. Choudhary AK, Majumdar VL, Shekhawat SS (2006) Evaluation of clusterbean genotypes for cultivation in summer season. Nat Symp on Arid Legumes for Sust Agric, pp 52.
3. Sharma NK, Ratnoo SD (2014) Yield optimization in clusterbean through improved seed and crop management practices in arid Rajasthan. J Prog Agric 5 : 31—34.
4. Kumar V, Kaushik VK (2014) Growth substances response to clusterbean [*Eyamopsis tetragonoloba* (L.)] growth parameters. Agric Sust Devel 2 : 11—13.
5.` Rawat U, Rajput RL, Rawat GS, Garg SK (2015) Effect of varieties and nutrient management on growth, yield and economics of clusterbean (*Cyamopsis tetragonoloba* L.). Res on Crops 16 : 64—67.
6. Kalyani D, Lakshmi (2012) Performance of clusterbean genotypes under varied time of sowing. Leg Res 35 : 154.
7. Guruprasad BP, Kurigod Vittar, Hundekar ST (2009) Influence of methods of iron sulfate application on yield and nutrient uptake by groundnut *(Arachis hypogaea* L.) genotypes on calcareous soils. Karnataka J Agric Sci 22 : 1104—1106.
8. Zeidan MS, Mohamad FM, Hamouda HA (2010) Effect of foliar fertilization of Fe, Mn and Zn on wheat yield and quality in low fertility sandy soils. World J Agric Sci 6 : 696—699.
9. Meena KK, Meena RS (2013) Effect of sulfur and iron fertilization on growth parameters, yield attributes, yields and nutrient uptake of mungbean (*Vigna radiata* L.) in arid western Rajasthan. Environ Ecol 31 : 227—231.