



## Effect of dates of sowing and varieties on yield and quality of cluster bean (*Cyamopsistetra gonoloba* L.)

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**Abstract:** A field experiment was conducted at Agricultural College Farm, Bapatla (Andhra Pradesh), study the effect of different sowing dates on the yield and quality of different varieties of clusterbean. The experiment was laid out in factorial randomized block design replicated thrice, six dates of sowing from 15<sup>th</sup> September to 1<sup>st</sup> December at fifteen days interval and two clusterbean varieties viz. RGC-936 and RGC-1003. Results revealed that growth parameters, yield attributes, yield (1568 kg ha<sup>-1</sup>) and quality parameters viz. gum content (31.6 %), protein content (30.1 %) and viscosity (3783 cP) were highest with RGC-1003 sown at 15<sup>th</sup> November, which was at par with 1<sup>st</sup> December sowing with same variety. The study results showed that the clusterbean crop can be grown successfully in non-traditional area as a *rabi* crop.

**Keywords:** Clusterbean, Quality, Sowing dates, Varieties, Yield

### INTRODUCTION

Cluster bean is an annual legume popularly known as gum guar, an important source of nutrition to human beings and animals. Being a legume, it has the capacity to fix up atmospheric nitrogen. The endosperm of guar seed is an important hydrocolloid widely used across a broad spectrum of industries. India is the largest producer of clusterbean and contributes to 80 per cent of total clusterbean production in the world. The area, production and productivity of clusterbean in India is 51.52 lakh hectares, 26.61 lakh tons and 478 kg ha<sup>-1</sup> respectively during 2012-13 (Ministry of Agriculture, Government of India, 2014-15). It is grown mainly in Rajasthan, Gujarat, Haryana, and Punjab. The grain yield of clusterbean in India is extremely low and has been static over the last several decades. This may be due to the fact that efforts have not been made to find out the optimum agronomic requirements of this crop. Among other crop production factors, sowing time contributes a lot towards the yield potential. Henry and Kacker (2001) observed that guar genotypes interacted significantly with the environment in enhancing yield. Therefore, considering the growing export demand and its various industrial uses there is a need to find out suitable sowing date and variety of cluster bean to enhance productivity and quality as it is gaining popularity in nontraditional areas.

### MATERIALS AND METHODS

The present investigation was conducted at Agricultural College Farm, Bapatla (15° 55' N latitude and 80° 30' E longitudes, at an altitude of 4.29 m above mean sea level), Andhra Pradesh, India during *rabi*, 2014-15. The experimental field was clay loam, slightly alkaline in soil reaction (pH 7.2) and EC is (0.26 dsm<sup>-1</sup>), low in organic carbon (0.48%) and available nitrogen (190 kg ha<sup>-1</sup>), medium in available phosphorus (22.0 kg ha<sup>-1</sup>) and high in available potassium (290.5 kg ha<sup>-1</sup>). The mean maximum and mean minimum temperatures recorded during crop growth period were 31.1°C and 20.0°C, respectively. The average relative humidity was 77.0 per cent. A total rainfall of 387.3 mm was received in 15 rainy days during the crop growth period. The experiment was conducted in randomized block design with factorial concept with three replications and consisted of six dates of sowing from 15<sup>th</sup> September to 1<sup>st</sup> December at fifteen days interval as the first factor and two clusterbean varieties viz. RGC-936 and RGC-1003 as second factor. The inoculated seeds through *Rhizobium* culture were hand dibbled by adopting a spacing of 45 cm x 10 cm. The crop was supplied with recommended dose of fertilizer i.e., 20 kg N, 40 kg P<sub>2</sub>O<sub>5</sub> and 40 kg K<sub>2</sub>O ha<sup>-1</sup> in the form of urea, single super phosphate and muriate of potash respectively. The gum content of clusterbean seed was determined by Das *et al.* (1977), protein content by (A.O.A.C., 1960)

and viscosity of gum was measured by using Brookfield viscometer, Model RVF, at 60 rpm, spindle no.64.

## RESULTS AND DISCUSSION

**Growth parameters:** The highest growth parameters (plant height, number of branches plant<sup>-1</sup>, drymatter accumulation, days for 50% flowering and days to maturity) were recorded with November 15<sup>th</sup> sowing which was significantly superior to other dates of sowings (Table 1). However, it was also comparable with December 1<sup>st</sup> sowing for plant height and dry matter accumulation. In case of varieties, the highest growth parameters were recorded with the variety RGC-1003,

which was significantly superior to RGC-936. A significant decrease in growth parameters were observed due to early sowings. This might be due to due to favorable climatic conditions prevailed during the crop growth period by late sown crop when compared to early sowings. More number of days for 50% flowering with late sowing might be due to low mean maximum and minimum temperatures coupled with lower bright sunshine hours and lesser day length, which might have increased vegetative growth and thus increased in days to 50% flowering. The growth parameters obtained were in accordance with those of Buttar and Kaur (2010) and (Meena *et al.*, 2014).

**Table 1.** Growth parameters of clusterbean as influenced by dates of sowing and varieties.

Treatments	Plant height (cm)	Number of branches plant <sup>-1</sup>	Dry matter accumulation (kg ha <sup>-1</sup> )	Days to 50% flowering	Days to maturity
<b>Dates of sowing</b>					
Sep. 15 <sup>th</sup>	86.4	8.9	4756	32.5	97
Oct. 1 <sup>st</sup>	87.9	9.4	5397	33.5	95
Oct. 15 <sup>th</sup>	88.9	10.6	5581	35.0	101
Nov. 1 <sup>st</sup>	92.4	11.1	7011	36.5	106
Nov. 15 <sup>th</sup>	104.4	14.1	7849	40.5	112
Dec. 1 <sup>st</sup>	102.9	12.6	7352	37.5	108
SEm±	3.29	0.36	213.6	0.42	0.9
CD(P=0.05)	9.6	1.1	626	1.2	3
<b>Varieties</b>					
RGC-936	89.9	11.1	5872	34.3	101
RGC-1003	97.7	11.2	6777	37.5	105
SEm±	1.90	0.21	123.3	0.24	0.5
CD(P=0.05)	5.6	NS	361.7	0.7	1.5

**Table 2.** Yield attributes of clusterbean as influenced by dates of sowing and varieties.

Treatments	Pods branch <sup>-1</sup>	Pods plant <sup>-1</sup>	Seeds pod <sup>-1</sup>	Test weight
<b>Dates of sowing</b>				
September 15 <sup>th</sup>	5.5	38.23	6.4	27.8
October 1 <sup>st</sup>	5.9	44.97	6.6	29.2
October 15 <sup>th</sup>	6.7	60.7	6.6	29.4
November 1 <sup>st</sup>	7.2	86.57	6.9	29.6
November 15 <sup>th</sup>	9.4	124.6	7.5	31.6
December 1 <sup>st</sup>	8.3	110.6	7.2	30.7
SEm±	0.35	3.68	0.06	0.29
CD(P=0.05)	1.0	10.8	0.2	0.9
<b>Varieties</b>				
RGC-936	6.1	63.5	6.6	29.1
RGC-1003	8.2	91.7	7.1	30.3
SEm±	0.20	2.13	0.03	0.17
CD(P=0.05)	0.6	6.2	0.1	0.5

**Table 3.** Yield and quality of clusterbean as influenced by dates of sowing and varieties.

Treatments	Grain yield (kg ha-1)	Haulm yield (kg ha-1)	Gum content (%)	Protein content (%)	Viscosity (cP)
Dates of sowing					
September 15 <sup>th</sup>	721	3029	26.9	25.4	2672
October 1 <sup>st</sup>	848	3292	28.4	27.0	3070
October 15 <sup>th</sup>	1079	3580	29.4	27.9	3143
November 1 <sup>st</sup>	1353	3708	29.5	28.0	3473
November 15 <sup>th</sup>	1568	3929	31.6	30.1	3783
December 1 <sup>st</sup>	1491	3740	30.8	29.3	3533
SEm±	46.0	139.0	0.34	0.35	57.7
CD(P=0.05)	135	408	1.00	1.04	169
Varieties					
RGC-936	1071	3263	28.3	26.9	2926
RGC-1003	1283	3829	30.5	29	3633
SEm±	26.5	80.2	0.20	0.20	33.3
CD(P=0.05)	78	235	0.6	0.6	98

**Yield attributes:** The highest yield attributes (number of pods branch<sup>-1</sup>, number of pods plant<sup>-1</sup>, number of seeds pod<sup>-1</sup> and test weight) was observed with 15<sup>th</sup> November sowing, which was significantly superior to the rest of sowing dates (Table 2). With regard to the varieties, the maximum yield attributes was recorded with RGC-1003 and was significantly superior to RGC-936. Higher yield attributes recorded with late sowing might be due to optimum weather conditions coupled with more growing days during reproductive phase which might have helped in transformation of more assimilates and subsequently develop more yield attributes with delayed sowing, whereas, in early sowings crop was affected with high amount of rainfall and lesser growing days during reproductive phase might have reduced the yield attributes. Similar results were also reported in case of yield attributes of clusterbean in similar weather conditions by Lakshmi Kalyani (2012).

**Yield:** Among dates of sowing the highest grain yield was recorded 15<sup>th</sup> November sowing which was on a par with 1<sup>st</sup> December sowing (Table 3). Between varieties, the highest grain yield was recorded with RGC-1003 which was significantly superior to RGC-936. Similar trend was followed by haulm yield. The higher grain yield with delay sowing might be due to combined effects of higher values recorded for growth characters and yield attributing characters as well as favourable weather conditions like optimum temperature, more sunshine hours and rainless maturity period that prevailed during grain filling and maturity stages of the crop growth whereas, in earlier date of sowings weather conditions were not favorable. The present results in relation to yield of clusterbean were also in

accordance with those of Veera Jain *et al.* (1987) and Gill *et al.* (2012). With regard to the varieties, the highest grain yield was recorded with RGC-1003 which was significantly superior to that of RGC-936. This might be due to higher number of pods per plant, number of seeds per pod, test weight with variety RGC 1003.

**Quality parameters:** The maximum gum content, protein and viscosity were observed with 15<sup>th</sup> November sowing followed by 1<sup>st</sup> December. With regard to the varieties, the maximum gum content, protein and viscosity was recorded with RGC-1003 which was significantly superior to RGC-936. A significant decrease in quality was observed due to early sowings. This might be due to the decreased Growing Degree Days (GDDs) and high amount of rainfall during crop growing period experienced by early sown crop when compared to late sowings. Longer the day length during reproductive stage as well as favourable weather conditions that prevailed during grain filling and maturity stages of the crop growth is helpful in improving the quality of clusterbean. Kumar and Rodge (2012) also observed that summer sown guar gave higher gum content and viscosity of guar gum than *kharif* season sown in South India.

### Conclusion

The clusterbean crop sown during second fortnight of November found to be the optimum time of sowing for getting higher yield (1568 kg ha<sup>-1</sup>) and quality *viz.* gum content (31.6 %), protein content (30.1 %) and viscosity (3783 cP). Between varieties, an overall performance of variety RGC-1003 was the best over RGC-936. In conclusion, the clusterbean crop can be grown

successfully in non-traditional area of Southern India as a *rabi* crop.

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