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Research article

IDENTIFICATION OF SUITABLE GUAR GENOTYPES FOR SUMMER SEASON OF SEMI-ARID REGION

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ABSTRACT: Cluster bean (*Cyamopsis tetragonoloba* (L.) Taub.) is a nitrogen-fixing legume has been used as a green manure, forage and as a seed crop. Guar gum, extracted from the pods of the guar plant, is widely used as an emulsifier, thickener and stabiliser in food and cosmetics. Approximately 23% of the guar seed is the gum (galactomannin). With growing international demand for the guar gum, identification or development of suitable varieties for different agro climatic conditions along with high seed yield and quality gum is the pressing need of the hour. To address these issues five guar varieties were evaluated during summer for their yield potential along with biotic factors. The genotype RGC-1017 performed better for biomass, pod number and seed yield as well as showed resistance to cutworm disease. RGC-986 a long duration variety produced high vegetative biomass with good root and shoot system may serve as a dual purpose variety for fodder and seed.

Key words: Guar, genotypes, semi-arid region

INTRODUCTION

Guar or cluster bean (*Cyamopsis tetragonoloba* (L.) Taub) is a drought-tolerant annual legume with incredible industrial importance (Jackson and Doughton 1982). Guar tolerates high temperatures and dry conditions and is adapted to arid and semi-arid climates (Undersander *et al*., 1991). There is huge demand for guar derivatives and have extensive use in a number of industries (Whistler and Hymowitz 1997). Guar gum is used as a thickening agent and as an additive in a wide variety of food and dairy products and also used as an animal feed. Petroleum exploration companies used it as a sealant in oil and gas well drilling.

India is a leading exporter of guar gum with 80% of world production, followed by Pakistan. During 2013, the guar seed was cultivated in 32 lakh hectares and production was around 25 lakh tonne (Economic Times 2013). The main areas of cultivation of Guar gum in India are Rajasthan, Gujarat, Haryana, Punjab, Uttar Pradesh, Madhya Pradesh, Tamil Nadu, Maharashtra, Karnataka and Andhra Pradesh. Guar basically grown under arid rainfed conditions and there were year to year huge yield fluctuations due to erratic rainfall (Pathak *et al*., 2009; Singh *et al*., 2003 & 2005). Most of the varieties currently being grown were developed under arid conditions and research need to be focused on their suitability for different environments and identifying the management strategies to enhance both seed yield and recovery of quality gum which are crucial to expand the cultivation of this commercially important crop to new areas.

MATERIALS AND METHODS

Five genotypes of cluster bean (*Cyamopsis tetragonoloba* (L.) Taub) RGC-1017, RGC-1003, RGC-1066, RGC-936 and RGC-986 were obtained from Rajastan Seed Corporation and raised at CRIDA, Hyderabad during summer 2013 to evaluate their yield potential under semi arid environment. The selected genotypes were sown in 2.25m x 2.0m plots maintaining 15cm space between plants and 45cm between rows. The crop was maintained moisture and nutrient stress free by irrigating at regular intervals and applying recommended dose of fertilizers. During the crop growth period the average temperature was 30.6^{o}C with maximum temperature 42.8^{o}C and minimum 14.5^{o}C, and RH ranged from 31% to 100% with an average RH of 54.6%. The biomass, seed yield and yield contributing characters were quantified at harvest and compared among the genotypes to identify the best genotype for the summer season. The pest and disease incidence on different genotypes was also recorded.

RESULTS

The ANOVA for biomass and seed yield parameters were presented in Table.1. The selected guar genotypes recorded highly significant difference for biomass and seed yield at harvest. The total biomass of the genotypes ranged from 21g/pl (RGC-1066) to 103g/pl (RGC-986) and seed yield from 4.8g/pl (RGC-986) to 16.9g/pl (RGC-1017) (Fig. 1). The guar variety RGC-986 recorded more of vegetative biomass, delayed flowering as well as less number of pods at harvest (Table 2) and its allocation of biomass towards reproductive structures was only 8.8%. This genotype also recorded high value for both stem girth and root biomass indicating its probable use for both seed and fodder- a crucial requirement in arid and semi arid regions. The genotypes RGC-1017 and RGC-1003 produced more pods and registered highest seed yield, however it was observed that RGC-1003 was prone to cutworm disease and the plant population was reduced. The guar is a dry habitat legume crop grown under resource constraint situations. In India this crop provide low cost source of livelihood for poor arid farmers (Kumar and Rodge 2012).

Table 1. ANOVA of biomass and seed yield parameters of guar genotypes- 2013 Summer

Parameters at Harvest	Replications	Genotypes
DF	2	4
Leaf dry weight (g/pl)	9.52	7322.9**
Stem weight (g/pl)	34.26	2655.65**
Root dry weight (g/pl)	0.227	13.29**
Pod weight (g/pl)	1.046	181.59**
Total biomass (g/pl)	97.30	3969.78**
Number of pods	288.87	5189.06**
Seed number	3073.07	30346.10**
Seed yield (g/pl)	0.376	67.49**
100 seed weight (g)	0.261	1.30**
HI (%)	2.10	707.17**

Table 2: Mean performance of morphological and biomass parameters of guar genotypes at harvest

Genotype	Plant Height (cm)	Stem girth (cm)	No. of Branches/pl	Leaf area (cm^2/pl)	Root length (cm)	Root Volume (ml)	Pod number/ pl
RGC 1017	104.9	4.53	8.2	924	9.6	3.17	106
RGC 1003	75.4	3.1	5.0	249	8.4	1.33	80
RGC 1066	71.8	3.23	5.6	1036	9.4	1.33	58
RGC 936	89.4	6.6	13.6	1510	11.8	3.57	71
RGC 986	137.9	11.1	14.4	5083	14.1	8.33	163

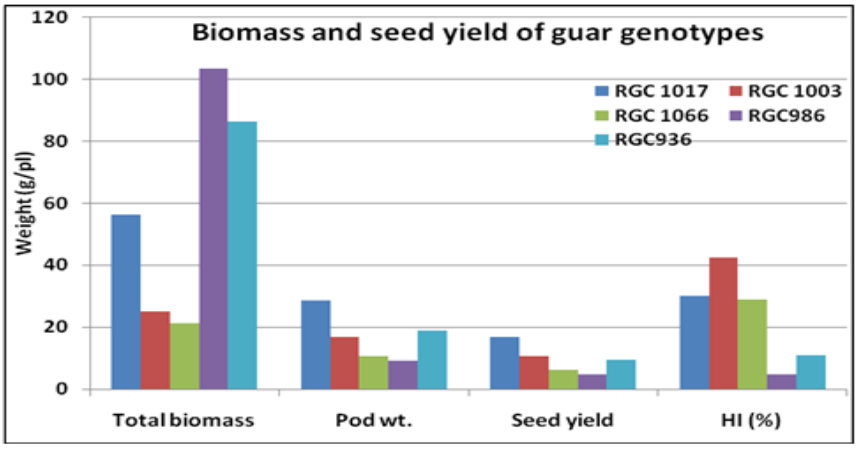

Fig.1: The per plant total biomass, pod weight, seed yield and HI (%) of guar genotypes at harvest- 2013 summer

The guar genotypes were considered as short day plants and sensitive to photo-period. This phenomena influence their fodder and seed yield in different seasons with varying photo period (Paroda et al., 1977). In the present study, the genotype RGC-936 was prominent in its plant habit with profuse branching from base of the stem, with smaller lamina and the seed yield was also high. RGC-1066 an erect guar genotype with less number of branches and majority of the pod formation was on the main stem and it was highly prone to cutworm disease during summer season.

CONCLUSION

The data from the present investigation clearly indicates that there is significant variation in the performance of guar genotypes during summer season not only for growth, biomass production and seed yield but also tolerance to pest and diseases which is crucial for realizing the higher yield.

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