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Effect of clusterbean genotypes (*Cyamopsis tetragonoloba* L.) with different seed rate on green fodder yield.

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Abstract: *The field experiment was carried out during kharif 2015 in sandy loam soil at Zonal Agricultural Research Station, Vishweshwaraiah Cannal, Mandya district coming under the southern dry zone of Karnataka. The present investigation was carried out to know the effect of different genotypes and seed rates on green fodder yield. The field experiment was laid out in factorial RCBD with 18 treatment combination viz., 6 genotypes (HG 870, HG 563, HG365, HG 220, Goma manjari and BR 99) and 3 seed rates (30, 40 and 50 kg ha^{-1}) respectively. Among the different treatment combination, genotype HG 563 had recorded significantly higher plant height (78.02 cm), branches plant^{-1} (5.63), trifoliate leaves (16.97), green fodder yield (214.52 q ha^{-1}) and dry matter yield (40.76 q ha^{-1}) and a seed rate of 50 kg ha^{-1} has significantly higher plant height (72.55 cm), green fodder yield (204.18 q ha^{-1}) and dry matter yield (38.79 q ha^{-1}) over other treatment combinations.*

INTRODUCTION

Forages are the main source of animal food for their better growth and development and livestock is the backbone of agriculture industry. The scarcity of green fodder and grazing resources in the country has kept the livestock to suffer continuously with malnutrition and which resulting in their production potentiality at sub-optimum level as compared to developed nations.

India is having the largest livestock population of 520 million heads, which is about 15 per cent of the world's livestock population, supporting 55, 16, 20 and 4 per cent of world's buffaloes, cattle, goats and sheep population, respectively. But, the country has only 4.4 per cent of the cultivated area under fodder crops with an annual total forage production of 833 million tons (390 m t green and 443 m t dry fodders). Whereas, the annual forage requirement is 1594 million tons (1025 m t green and 569 m t dry) to support the existing livestock population. The present feed and fodder resources of the country can meet only 48 per cent of the requirement, with a vast deficit of 52 per cent (61.1% and 21.9% of green and dry fodder) (Anon., 2009).

Although, India stands first in milk production (90 m t) in the world, but average milk yield is very low (5 litres per animal) compared to developed countries (24 litres/animal). Deficit supply of green fodder is one of the main reasons for low milk yield along with other factors like imbalanced nutrition, good quality fodder.

Among the forages, legumes are important in supplying the most demanding and quality nutrients like protein, minerals and vitamins to the animals. Leguminous forage can be used as supplement with straw-based diets for ruminants in order to improve digestibility of feed and overall performance of ruminants. Clusterbean (*Cyamopsis*

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tetragonoloba L.), a versatile short duration leguminous plant commonly grown as grain pulse, vegetables, gaur gum and fodder in semiarid and humid tropics. It is quick growing and excellent in forage quality.

METHODOLOGY

Investigation was carried out to evaluate 6 clusterbean genotypes with 3 seed rate to find out suitable genotype and seed rate for maximum green fodder production. Sowing was taken up during *kharif* 2015 with 18 treatment combination and 3 replication. Randomization was followed for treatment allocation in field. Sowing was taken with row spacing of 30 cm and plant to plant spacing was made to vary. Growth parameters were observed at 15 days interval from sowing *viz.*, 15, 30 DAS and at harvest and yield parameters were recorded at harvest. Harvesting was taken at 50 per cent flowering of the crop. Destructive samples were taken from net plot. All the growth and yield parameters were subjected to statistical analysis according to Gomez and Gomez procedure.

RESULTS AND DISCUSSION

Improved varieties of crop generally contribute to higher level of production, selection of a suitable variety is very important because the crop is harvested for fodder at vegetative stage, since biomass production is important. Seed rate is one of the most important factors which determine the yield and quality of fodder crops. Maximum yield can be obtained at the optimum density where competition between the plants is minimum.

The height of the plants differed significantly between genotypes at different stages of crop growth. Genotype HG 563 recorded significantly higher plant height (78.02 cm) compared to the other varieties (Table 1). Significant variation in different genotypes may be due to the inherent character of genotypes (Shekar *et al.*, 2010 and Tsigewoin *et al.*, 2003). The genotypes also differed significantly in number of leaves, branches and leaf area. Significantly higher number of leaves was recorded with HG 563 compared to variety Goma manjari, HG 870, HG 365 and HG 220 respectively. This supports the findings of Yusufali (2005) and Bhavya

Table 1
Effect of genotype and seed rate on growth and yield parameters

Treatments	*Plant height (cm)*	*Number of trifoliate leaves*	*Number of branches plant^{-1}*	*Green fodder yield (q ha^{-1})*	*Dry matter yield (q ha^{-1})*
		Genotypes			
HG 220	72.18	11.06	6.50	193.49	36.76
HG 563	78.02	16.97	5.63	214.52	40.76
HG 365	75.97	14.20	4.77	203.01	38.57
HG 870	65.20	11.98	6.50	198.65	37.74
Goma manjari	62.68	11.00	5.20	184.54	35.06
BR 99	60.17	7.83	5.20	180.34	34.26
S.Em.±	1.94	0.38	0.43	2.41	0.46
CD at 5% 5.59	1.08	1.23	6.93	1.32	
			Seed rate		
30 kg ha^{-1}	66.39	13.29	5.42	187.55	35.63
40 kg ha^{-1}	68.17	12.04	5.85	195.55	37.15
50 kg ha^{-1}	72.55	11.18	5.63	204.18	38.79
S.Em.±	1.37	0.27	0.30	1.70	0.32
CD at 5% 3.95	0.77	NS	4.90	0.93	
			Interaction		
Genotype X Seed rate	NS	NS	NS	NS	NS
CV (%)	8.45	9.28	9.77	8.78	9.49

(2012). The increase in these factors may be due to better growth and development of plants with less competition with each other and better utilization growth factors. (Table 1). In the present investigation, variety HG 563 recorded significantly higher green fodder yield (214.52 q ha^{-1}) and dry matter yield (40.76 q ha^{-1}) over Goma manjari (180.34 q ha^{-1} and 34.26 q ha^{-1}). The higher green fodder yield with HG 563 was mainly due to higher growth and yield parameters. The results are in conformity with the findings of Purushotham *et al*. (1998) and Shekar *et al.* (2010).

Plant height at harvest with 50 kg seeds ha^{-1} was 72.55 cm compared to 66.39 cm, 68.17 cm and 64.44 cm with 30 and 40 kg seeds ha^{-1} respectively (Table.1). This increase in plant height with respect to increased seed rate because of in search of sun light and apical dominance. These findings are in comparative with work carried by Tsigewoin and Agarwal (2001). Likewise, number of leaves $plant^{-1}$ @ 30 kg seeds ha^{-1} at harvest was 13.39 compared to 12.04 and 11.18 with 40 and 50 kg seeds ha^{-1} respectively (Table.1). This increase in number of leaves with respect to decreased seed rate was due to more special area available for growth of the plants as given by Yusufali (2005) and Kurubetta (2006). In the present investigation the green forage yield (204.18 q ha^{-1}) and dry matter yield (38.79 q ha^{-1}) were significantly higher at 50 kg seeds ha^{-1} (Table.1) over other level of seed rates. The higher green forage yield with 50 kg seeds ha^{-1} was mainly attributed to most efficient utilization of all the resources and optimum number of plants per hectare compared to lower and higher level of seed rate.

The interaction between genotype and seed rate were found non significant.

Significantly higher net income (Rs. 15316.89 ha^{-1}) was recorded with a treatment combination of variety HG 563 with seed rate of 50 kg ha^{-1} followed by same variety with 40 kg seeds per ha^{-1} (Rs. 14358.96 ha^{-1}). This was mainly due to increased green forage yield.

Similarly, variety HG 563 with seed rate of 50 kg ha^{-1} (Table 2) recorded significantly higher B: C ratio (3.09). This is due to relatively higher gross and net income and lower cost of cultivation. Results are in conformity with the findings of Amarnath (2001), Yusufali (2005) and Kurubetta (2006).

Table 2
Economics of fodder clusterbean genotypes as influenced by different seed rates

Treatments	*Total cost of cultivation (Rs. ha^{-1})*	*Gross returns (Rs.ha^{-1})*	*Net returns (Rs.ha^{-1})*	*B:C ratio (Rs.ha^{-1})*
HG 220 @ 30 kg ha ^{1}	7023	17351.85	10328.85	2.47
HG 220 @ 40 kg ha ^{1}	7418	18620.37	11202.37	2.51
HG 220 @ 50 kg ha ^{1}	7813	20777.78	12964.78	2.66
HG 563 @ 30 kg ha ^{1}	7659	19990.74	12331.74	2.61
HG 563 @ 40 kg ha ^{1}	7354	21712.96	14358.96	2.95
HG 563 @ 50 kg ha ^{1}	7322	22638.89	15316.89	3.09
HG 365 @ 30 kg ha ^{1}	7489	19472.22	11983.22	2.60
HG 365 @ 40 kg ha ^{1}	7884	20388.89	12504.89	2.59
HG 365 @ 50 kg ha ^{1}	7279	21222.22	13943.22	2.92
HG 870 @ 30 kg ha ^{1}	6727	19175.00	12448.00	2.85
HG 870 @ 40 kg ha ^{1}	7122	20157.00	13035.00	2.83
HG 870 @ 50 kg ha ^{1}	7517	20187.00	12670.00	2.69
Goma manjari @ 30 kg ha ^{1}	10499	17888.89	7389.89	1.70
Goma manjari @ 40 kg ha ^{1}	10834	18472.22	7638.22	1.71
Goma manjari @ 50 kg ha ^{1}	11229	18898.15	7669.15	1.68
BR 99 @ 30 kg ha ^{1}	7809	15546.30	7737.30	1.99
BR 99 @ 40 kg ha ^{1}	7204	17907.41	10703.41	2.49
BR 99 @ 50 kg ha ^{1}	7599	18851.85	11252.85	2.48

CONCLUSION

Variety HG 563 has resulted in significantly higher green forage, dry matter, crude protein and crude fibre yield over other varieties and least performances was seen in Goma manjari. Seed rate @ 50 kg ha^{-1} has recorded significantly higher green fodder, dry matter, crude protein and crude fibre yield and high monetary benefits over other seed rates. Seed rate @ 30 kg ha^{-1} has recorded lowest growth and yield components.

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