EVALUATION AND IDENTIFICATION OF SUITABLE HORSE GRAM (MACROTYLOMA UNIFLORUM LAM.) CULTIVARS FOR HIGHER PRODUCTIVITY UNDER RAINFED CONDITIONS

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ABSTRACT

A field investigation was conducted at Agricultural Research Station, Darsi, Prakasam District, Andhra Pradesh to find out the best suitable cultivar during two rabi seasons (rabi 2018-19 and rabi 2019-20). Ten cultivars of horse gram were evaluated for their different productivity and quality traits Among the various productive traits, it was found that HG 11 and AK 38 recorded superior performance and desirable productivity and quality traits. Keeping in view with the important productive traits viz., leaf length, plant height, primary branches, plant leaf length, plant height, primary branches plant^{-1}, secondary branches plant^{-1}, seeds pod^{-1}, pod Hulm plant^{-1}, seed yield plant^{-1} and 100 seed weight possessed by the genotypes, it can be utilized in future breeding programs. Since the number of varieties developed in horse gram is meager and the available variability among the genotypes for various characters is optimum, the breeder can use the potential genotypes which are having certain productive and desirable traits which in turn will act as a fuel for the creation of variability and allows the selection of genotypes for different agro-climatic situations.

KEYWORDS: *Evaluation, Horse Gram, Productivity*

INTRODUCTION:

Horse gram (*Vigna radiata* L.) is one of the important pulse crops in India. It is a protein-rich staple food that contains about 18.9 percent protein, almost three times that of cereals. Rich in leucine, phenylalanine, lysine, valine, isoleucine et. In addition to being an important source of human food and animal feed, plays an important role in sustaining soil fertility by improving soil physical properties and fixing atmospheric nitrogen. It is a drought-resistant crop, suitable for dryland farming, and predominantly used as an intercrop with other crops. Though it has multifarious advantages, the productivity of Horse gram is declining year by year due to various reasons. In India, it occupies an area of 1.84 m.ha. it covers an area of 0.022 m. ha in Andhra Pradesh with a production of 9 t. The productivity of horse gram is 400 kg. ha^{-1} which is less than the national average (500 kg. ha^{-1}) (ICAR outlook 2020-21). The reasons for the low yield of Horse gram are the slow rate of dry matter accumulation during the pre-flowering phase, poor pod set the ng, the onset of leaf senescence during the period of pod development, and low partitioning efficiency of assimilation to grain along with inadequate nutrient supply were identified as the main physiological constraints for yield. Very little research progress has been made in this crop and little effort has been made to evaluate the germplasm, identify superior lines and develop suitable horse gram cultivars with higher productivity and superior quality.

However scarce literature was available for Horse gram foliar spray nutrients as individual and in combination. Hence, looking into importance of germplasm evaluation in enhancing crop productivity of horse gram, a field experiment was conducted to study the Horse gram productivity enhancement through the evaluation of different cultivars.

MATERIALS AND METHODS

The field experiment on Horse gram productivity enhancement through the evaluation of horse gram cultivars comprising released varieties, germplasm collections, and landraces. The experiment was laid out in a randomized block design with three replications at Agricultural Research Station, Darsi, Andhra Pradesh. The plot size of each genotype is m x 0.6 m with 2 rows of m length at a spacing of 60 cm between rows and 30 cm between plants. Recommended agronomic practices and plant protection measures were adopted to raise a healthy crop.

Five competitive plants of each genotype in each replication were randomly taken to record observations on qualitative characters (plant, stem, leaf, pod, and yield and yield parameters). The analysis of variance was carried out according to the method suggested by Panse and Sukhatme (1985)

The data on growth parameters, yield, and yield attributes were taken for statistical analysis (Rangasamy, 1995).

RESULTS AND DISCUSSION

The data were pooled for two years, which indicated that there was a significant difference among treatments for days to 50% flowering, total dry matter (TDM), Crop growth rate (CGR), Leaf area index (LAI), and yield & yield components in Horse gram but there was no significant difference in plant height and a number of branches per plant. The HG69 came earlier days to 50% flowering (28.7 days) when compared to no treatment (31.5 days). Nutrient status is an important and deciding factor in judging the total dry matter accumulation in plants. The dry matter production was higher with the HG11 (49.7 g/plant) which is on par with plants (47.9 g/plant). The plants HG11 recorded maximum pods per plant (26.1), and a number of seeds per pod (6.8) which is on par with HG69 plants. According to Kanakadurga and Sandeep Varma, 2013, it might be due to sufficient genetic diversity, the potential yields could be realized in the horse gram cultivars. This result was in close proximity to the work of Ramani *et al*, 2020. CGR and LAI are maximum at 60 DAS and a decreasing trend was observed later. The HG69 obtained maximum CGR (6.48 g/m^2/day) and LAI (1.72) in all intervals and it is at par with HG11 plants (Table 2). The higher leaf area index might be the reason for the higher accumulation and translocation of nutrients.

Effect on seed yield:

HG11 recorded a significantly higher grain yield of Horse gram (1094.84 kg. ha^{-1}) as compared to other treatments. However, it was at par with HG69 1029.15 Kg ha^{-1}). The significant increase in yield with these treatments is mainly attributed to significant improvement in the number of pods per plant and test weight. The significant increase in yield with HG69 is mainly attributed to a significant improvement in the number of pods per plant. These results were in agreement with the work of Shyam rao *et al.*, 2016 in Horse gram. Priyanka *et al.*, (2016) reported similar findings with cluster bean crops. The lowest grain yield was obtained in HG58 (430.30 kg ha^{-1}) (Table 1). These findings are in good line with those findings obtained in black gram and Horse gram (Britto John and Girija, 2007) and in Bengal gram (Saravanan and Panerselvam, 2014). The findings in the present study are in conformity with Sridhar *et.al*., 2020.

Table 1: Yield and yield component characters for different cultivars of Horse gram (pooled analysis of rabi 2018-19 and rabi 2019-20)

Treatment	50% flowering	PH (cm)	branches/ pl	TDM (g/pl)	pods/pl	Length of a pod (cm)	Seeds /pod	Seed Yield (kg/ha)
V1: AK 38	31.5	33.60	4.93	40.8	34.00	4.37	5.67	942.07
V2: HG 75	32.4	80.83	7.40	42.7	26.80	4.30	5.07	592.81
V3: HG 69	28.7	62.77	7.60	47.9	18.60	4.43	5.33	1029.15
V4: HG 11	30.7	91.23	8.13	51.7	51.53	4.30	5.77	1094.84
V5: HG 58	34.8	96.17	8.33	44.3	21.67	4.70	5.60	430.30
V6: HG 41	32.9	77.30	6.47	45.8	40.00	4.07	5.80	509.23
V7: HG 46	31.8	34.93	5.87	44.1	41.47	4.57	5.67	1003.91
V8: HG 50	29.4	77.10	6.07	48.8	31.40	4.53	5.73	432.84
V9: Palem 2	32.5	96.53	7.07	47.3	37.80	4.50	5.40	623.80
V10: Palem1	33.1	94.63	6.93	39.2	39.53	4.73	5.87	458.30
Mean	32.26	31.64	4.33	44.47	22.14	6.19	3.44	660.34
Sem	1.21	0.61	1.9	2.7	2.6	2.5	1.18	1.7
CD	2.31	NS	NS	2.2	10.8	7.6	2.59	68.2
CV	5.54	5.40	8.5	9.4	14.3	12.4	6.27	10.4

Table 2: CGR and LAI of Horse gram affected by various treatments

Treatment	CGR (g/sq.m/day)				LAI		
	20-40 DAS	40-60 DAS	60-80 DAS	80 DAS - harvest	40 DAS	60 DAS	80DAS
V1: AK 38	3.20	3.89	3.18	3.61	0.86	1.19	1.05
V2: HG 75	2.97	5.28	5.28	4.96	0.74	1.24	1.08
V3: HG 69	4.19	6.48	5.83	5.11	0.93	1.72	1.24
V4: HG 11	3.81	6.18	4.39	4.11	0.87	1.38	1.17
V5: HG 58	3.32	5.64	4.72	4.27	0.79	1.27	1.12
V6: HG 41	2.89	5.26	4.81	3.94	0.82	1.31	1.09
V7: HG 46	2.29	4.99	4.27	3.17	0.84	1.20	1.07
V8: HG 50	2.31	5.11	4.82	4.11	0.92	1.33	1.09
V9: Palem 2	3.27	5.31	5.22	4.28	0.81	1.30	1.10
V10: Palem 1	3.48	5.27	5.33	4.37	0.92	1.71	1.21
Mean	3.57	5.61	4.61	4.11	0.83	1.33	1.12
SEM	0.15	0.49	0.37	0.34	0.21	1.13	2.11
CD	1.27	1.68	1.22	1.12	1.37	1.69	1.94
CV	9.34	16.82	14.68	14.29	9.53	10.62	9.27

CONCLUSION

From the scrutiny of a pooled analysis of the above results, HG11 was found superior for the majority of the productivity of horse gram and can be used as one of the parents in the hybridization program. Further AK 38 and Palem 2 can be recommended for cultivation in the horse gram growing areas of Andhra Pradesh and can also be used in future breeding programs for the incorporation of economic and desirable productivity traits.

Further in view of the wide genetic diversity noticed for various productivity exhibited in these cultivars, they could serve as useful genetic resources and be effectively utilized as the base material in deriving better and useful genotypes by hybridization and directional selection for specific characters in developing new varieties.

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