Biological Forum – An International Journal **16(2): 57-59(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Study on Yield and Economics of Summer Green Gram Varieties Sown in Different Sowing Windows

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(Received: 03 December 2023; Revised: 22 December 2023; Accepted: 04 January 2024; Published: 15 February 2024)
(Published by Research Trend)

ABSTRACT: A field experiment entitled "Performance of green gram varieties in different sowing windows in summer season" was conducted during summer season of 2022-2023 with three green gram varieties at Agronomy Farm, College of Agriculture, Nagpur. The experiment was laid out in split plot design with four sowing windows *i.e.* 7th MW, 8th MW, 9th MW and 10th MW as main plot factor and three varieties *viz.* Pusa Vaishakhi, Shikha and Samrat as sub plot factor, replicated thrice. Key findings revealed that sowing during the 7th MW resulted in significantly higher yield attributing characters *viz.*, number of pods plant^{-1}, number of grains pod^{-1}, number of grains plant^{-1}, harvest index (%) and 100 grains weight along with grain and straw yield ha^{-1}. Among the varieties, variety Pusa Vaishakhi recorded significantly higher values for these yield attributing characters. The gross and net monetary returns and benefit: cost ratio of green gram was significantly higher in crop sown during 7th MW and in variety Pusa Vaishakhi.

Keywords: Green gram, sowing window, variety, grain yield, economics.

INTRODUCTION

Green gram (*Vigna radiata* L.) is one of the 13 food legumes grown in India and third most important pulse crop of India after chickpea and pigeon pea. In India, it is grown on an area of 13.7 lakh ha with the production of 4.7 lakh tones and productivity of 336 kg ha^{-1}. In Maharashtra, it is grown on an area of 5.54 lakh ha with production of 3.72 lakh ha and productivity of 672 kg ha^{-1} (Anon., 2011).

Sowing time is a critical factor for attaining optimum growth and yield of green gram as sowing at improper time may affect the germination, growth and development of the crop resulting in low yield. Now a days, a change in the behaviour of weather is being witnessed as a result of global warming. The atmospheric temperature begins to rise, right from the end of January. Hence, it was felt necessary to revalidate the sowing time of summer green gram, as early completion of crop cycle, vacating the field earlier facilitates early land preparation for oncoming *kharif* season.

Variety selection also plays a pivotal role in influencing yield outcomes. While numerous high-yielding green gram varieties exist, not all perform optimally during the summer season. Synchronization of growth stages of a crop with prevailing weather condition is very important for exploiting the full production potential. The optimum time of sowing may vary with different varieties of green gram (Sarkar *et. al*., 2004). Therefore, this study was carried out to find out most suitable planting time and best performing variety of green gram during summer season for Nagpur region.

MATERIALS AND METHODS

The present field investigation was carried out during summer, 2022-2023 to study the performance of green gram varieties under different sowing windows during summer season at Agronomy farm, College of Agriculture, Nagpur, Maharashtra State, India. The experimental soil was medium black, uniform and levelled. It was medium in available nitrogen (260.30 kg ha^{-1}) low in available phosphorous (18.25 kg ha^{-1}) and very high in available potassium (370.85 kg ha^{-1}) with medium organic matter content. Experiment was laid out in split plot design with three replications with 12 treatment combinations comprising of four sowing windows (D_1- 7th MW, D_2- 8th MW, D_3- 9th MW and D_4- 10th MW) as main plot and three varieties (V_1- Pusa Vaishakhi, V_2- Shikha and V_3- Samrat) as sub plot treatments. The seeds were sown at 45 × 10 cm spacing. The gross and net plot size were 4.5 x 5.0 m^2 and 3.6 × 4.0 m^2, respectively.

RESULTS AND DISCUSSION

A. Yield attributes

Number of pods plant^{-1}. Maximum number of pods plant^{-1} were observed in the crop sown during 7th MW (D_1) which was at par with 8th MW (D_2) sown crop. Higher number of pods plant^{-1} in earlier sowing window might be due to the favorable weather conditions for crop growth, low flower drop and more

fruit setting during summer season. Among different varieties highest number of pods plant^{-1} was produced by variety PusaVaishakhi (V_1) and it was significantly superior over the other two varieties. The difference might be due to genetic potential of cultivar. Similar results were also reported by Jadhav (2011).

Number of grains pod^{-1}. Various sowing windows significantly influenced number of grains pod^{-1} in summer green gram. Sowing done during 7th MW (D_1) recorded significantly highest number of grains pod^{-1} (9.30) compared to the later sowing windows. This might be due to the fact that during harvesting, all the pods were matured and turned black whereby each and every seed got the chance to become fully matured. Variety PusaVaishakhi produced highest in number of grains pod^{-1} (9.42), however it was at par with variety Shikha (9.00). This reason might be due to genetic variability of variety PusaVaishakhi and seeds fully matured during harvesting. The findings are in close accordance with Tijare (2012).

Number of grains plant^{-1}. Crop sown during 7th MW recorded significantly highest number of grains plant^{-1} (212.22) as compared to crop sown during 8th, 9th and 10th MW. This might be due to early sown crop recorded significantly highest number of pods plant^{-1} which might have resulted in increased number of grains plant^{-1}. Among the various varieties tested, variety PusaVaishakhi recorded significantly highest number of grains plant^{-1} (202.67), however it was at par with variety Shikha.

100 grains weight (g). Sowing window does not show significant effect on 100 grains weight of summer green gram. Among the varieties, Pusa Vaishakhi recorded significantly highest 100 grains weight, which was significantly superior over the other two varieties. This might be due to genotypic difference in the varieties. Similar findings were also reported by Jadhav (2011).

Yield (kg ha^{-1}). Crop sown during 7th MW (D_1) produced highest seed yield of 890 kg ha^{-1} which was significantly higher compared to later sowing windows of 8th, 9th and 10th MW. This might be because of the weather condition prevailed during the various growth stages of early sown crop (7th MW) might be more suitable and favourable for the respective growth stages. Compared to the weather condition prevailed during the growth stages of later sown crop (8th, 9th and 10th MW). This might have been resulted in increased yield parameters and ultimately yield of summer green gram. Among different Varieties, PusaVaishakhi produced highest seed yield of 895 kg ha^{-1} which was significantly superior over variety Shikha (736 kg ha^{-1}) and Samrat (652 kg ha^{-1}). Variety PusaVaishakhi might be having inherent genetic potential producing of more number of branches and higher dry matter during summer season as compared to variety Shikha and Samrat, which might have resulted in increased grain yield. Similar results were also reported by Tijare (2012).

Harvest index (%). Highest harvest index was recorded by crop sown during 7th MW (31.70 %), however crop sown during 10th MW recorded the lowest harvest index (27.85 %). Regarding varieties highest harvest index was obtained in the variety PusaVaishakhi (31.29 %) as compared to variety Shikha (28.95 %) and Samrat (28.20 %), which might be due its higher production efficiency. Similar results were reported by Singh *et al*. (2019).

B. Economics

Significantly highest gross monetary returns, net monetary returns and benefit: cost ratio were recorded by sowing window of 7th MW. Delay in sowing of summer green gram beyond 7th MW resulted in significant reduction in gross monetary returns, net monetary returns and benefit: cost ratio. Among the varieties tested, PusaVaishakhi outperformed others varieties (Shikha and Samrat) with significantly higher gross monetary returns, net monetary returns, and benefit: cost ratio. The increase in net monetary returns can be directly linked to a substantial rise in the economic yield of summer green gram.

Table 1: Yield and economics of summer green gram as influenced by different sowing windows and varieties.

	Treatments	Number of pod plant^{-1}	Number of grains pod^{-1}	Number of grains plant^{-1}	100 grains weight(g)	Seed Yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest Index (%)	Gross monetary returns (Rs. ha^{-1})	Net monetary returns (Rs. ha^{-1})	B:C ratio
A	**Sowing windows**										
	D_1-7th MW (12 Feb – 18 Feb)	24.44	9.30	212.22	5.40	890	1917	31.70	75631	50998	3.07
	D_2- 8th MW (19 Feb – 25 Feb)	22.89	8.00	180.00	5.00	774	1829	29.73	65780	41148	2.67
	D_3- 9th MW (26 Feb – 4 Mar)	20.78	8.30	166.67	5.00	724	1793	28.77	61530	36898	2.49
	D_4-10th MW (5 Mar – 11 Mar)	19.89	8.20	159.33	5.10	657	1702	27.85	55873	31240	2.26
	SE(m) ±	0.67	0.27	6.45	0.16	8	37	-	713	713	-
	C.D. at 5%	2.33	0.92	22.32	NS	29	127	-	2467	2467	-
B	**Varieties**										
	V_1 – PusaVaishakhi	24.17	9.42	202.67	5.58	895	1965	31.29	76068	51435	3.08
	V_2 - Shikha	21.92	9.00	195.58	5.08	736	1806	28.95	62588	37955	2.54
	V_3 - Samrat	19.92	7.00	140.42	4.75	652	1660	28.20	55455	30822	2.25
	SE(m) ±	0.42	0.30	7.77	0.12	13	21	-	1097	1097	-
	C.D. at 5%	1.26	0.91	23.29	0.37	39	63	-	3290	3290	-
C	**Interaction**										
	S.E. (m) ±	0.84	0.61	15.54	0.25	26	42	-	2195	2195	-
	C.D. at 5%	NS	NS	NS	NS	NS	NS	-	NS	NS	-
	GM	22.00	8.47	179.56	5.14	761	1810	29.50	64704	40071	2.62

CONCLUSIONS

Sowing of summer gram during 7th MW resulted in higher growth and yield compared to later sowing. Variety PusaVaishakhi recorded higher values for growth contributing characters, yield attributes and yield of summer green gram. Sowing window of 7th MW gave highest gross monetary returns, net monetary returns and benefit: cost ratio among all the sowing windows and among different varieties, variety Pusa Vaishakhi recorded highest gross monetary returns, net monetary returns and benefit: cost ratio.

FUTURE SCOPE

The present findings are based on one year research and needs further 1 or 2 years experimentation for validation of influence of sowing windows and varieties of summer green gram on yield and economics.

Acknowledgement. The author is grateful to College of Agriculture, Nagpur to provide necessary equipment for proper research, Dr. A. A. Choudhary for his valuable guidance.

Conflict of Interest. None.

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How to cite this article: T.R. Marthe, A.A. Choudhary, T. Lokesh and N.D. Chavhan (2024). Study on Yield and Economics of Summer Green Gram Varieties Sown in Different Sowing Windows. *Biological Forum – An International Journal, 16*(2): 57-59.