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Optimizing Plant Geometry for Grain Yield and Economic Return Frt Varieties of Green Gram (*Vigna radiate* L.)

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Abstract

The area test becomes done at Instructional Farm, Department of Agronomy, School of Agricultural Sciences, G. H. Raisoni University, Saunsar, District-Chhindwara, in the course of the kharif season of 2021. (M.P.). A break up plot layout become used to installation an test, and it became repeated 3 times. Three inexperienced gram varieties—Kopargaon (V1), Sindhu (NVL-605) (V2), and PDM-139 (Samrat) (V3)—in addition to 4 spacing levels—30*10 cm (S1), 30*15 cm (S2), forty-five x 10 cm (S3), and forty five x 15 cm (S4)—had been examined as number one plot treatments. The inexperienced gram range PDM-139 (Samrat) 30*10 cm is the planted pattern become proven to offer the most manufacturing characteristics, which includes wide variety of pods in step with plant (15.53), wide variety of seeds in step with pod (9.80), and pod length (8.55cm). Greater grain manufacturing of 9.06 q/ha, constant yield of 18. forty nine q/ha, gross go back of 66997 rupees in step with hectare, internet go back of 49618 rupees in step with hectare, and the B:C ratio (2.85:1). These findings verified that the inexperienced gram range PDM-139 (Samrat) recorded the best and notably higher yield and yield characteristics, ensuing in extra financial returns while seeded with a spacing degree of 30 cm x 10 cm.

Keywords: Green Gram; Varieties; Pods; Grain Yield; Stover Yield

Introduction

The cultivation of pulses is significant in Indian agriculture. India is a world leader in the production of pulses, which are an essential component of the nation's whole agricultural system. One of the most significant edible legumes in India is the green gram, often known as the mung bean (*Vigna radiata* L.). It ranks as India's third-most significant pulse crop. The protein content of green gram is high (24%), and it also contains a significant amount of carbs (60%) and fat (1.5%). 1.9 MT of mung beans were produced in 2017 and 2018 from a total of 4.07 M hectares, spread out across many seasons (DES, 2018). While Madhya Pradesh provides 5.47 percent of the nation's total mung bean acreage, or 2.97 million hectares, with 2.20 million tons of production, or 11.57 percent of the nation's total mung bean production in India in 2017-18 [1].

Subsequent rising on green gram margins & submargins fields within subpar control strategies is the motive of its low productivity. In the system competition, plant geometry is important to dominance & repression. To maximise crop yield, best a plant's geometry treasured & crucial in the extra powerful & green use of the plant increase sources available [2].

Low productivity is mostly caused by farmers' inadequate management techniques. Existing species also have low potential yields because of their rapid development, sluggish buildup of dry matter, and resistance to heavy inputs. In contrast, the maximum current technology, which incorporates progressed sorts and included control of nutrients & pests, confirmed 25-42 vantage about a farmer's methods inhuge variety of front-line protests carried out throughout a nation. Improved styles of numerous pulse plants preserve promise to boom productiveness with the aid of using 20-25%. [3]. In order to provide with highest outputs from either crop, its miles essential to possess right both plants numbers & distance. When these range relying at the soil kind and the quantity of rain. The variety of flowers in keeping with unit area needed to create the maximum amount of biomass is the number; if it were to climb above this point; neither the amount of biomass would increase nor decrease. By making proper use of nutrients and solar radiation, the ideal spacing promotes plants to develop in both their aerial and subsurface sections, improving grain output [4,5]. Maintaining correct inter- and intra-row spacing is essential to maintaining an ideal plant population. Maximum or minimal plant densities might reduce green gram output and alter the physiological makeup of the plant. Therefore, a sufficient plant population and the right amount of fertiliser may boost the crop production of green gram. [6] noted comparable outcomes. Taking these factors into consideration, the current experiments were conducted with the goal of examining optimal plant geometry and its effects on various yield metrics and economic returns of green gram.

Materials and Methods

Three inexperienced gram varieties, Kopargaon (V1), Sindhu (NVL-605) (V2), and PDM-139 (Samrat) (V3), have been used as the primary plot treatments, and 4 spacing tiers, 30 cm x 10 cm (S1), 30 cm x 15 cm (S2), forty--five cm x 10 cm (S3), and forty five cm x 15 cm (S4), have been used because the sub plot treatments. The cut-up plot layout known as for 3 replications of every treatment. Before planting, every plot acquired the entire endorsed dose of nitrogen, phosphorus, and potassium on the quotes of 25 kg N/ha, 50 kg P2O5/ha, and forty kg K2O/ha, respectively. At the time of seeding, 100% fertility tiers of every fertiliser, particularly nitrogen, phosphorous, and potassium, have been implemented to every plot as a base application. Fertilizers have been administered thru placement that means they have been positioned five cm under the seed region and five cm remote from the seed row. All different agronomic strategies have been utilised continuously throughout all treatments.

Results and Discussion

Yield and Yield Attributing Characters

The information surely displays that beneath Neath numerous treatments, the range of pods according to plant, pod period, range of seeds according to pod, take a look at weight, and seed and stover manufacturing according to hectare all rose with time. The most range of pods according to plant, pod period, range of seeds according to pod, seed yield according to hectare, and stover yield accord-

ing to hectare have been all drastically better for PDM-139 (Samrat) most of the 4 sorts (13.03, 6. fifty-seven cm, 8.05, 7. sixty-seven q/ha, and 17.08 q/ha, respectively) than for the others. The crop planted at a 30 cm x 10 cm spacing had the very best common range of pods according to plant, period of pods, range of seeds according to pod, yield of seeds and stover according to hectare (12.91, 6.29 cm, 7.64, 7. forty-six q/ha, and 17.14 q/ha, respectively) most of the spacing levels. In phrases of the interactions among inexperienced gram sorts and spacing levels, it turned into found that inexperienced gram range PDM-139 (Samrat) sown with spacing stage of 30 cm x 10 cm produced extensively extra seeds and stover according to hectare (15.53, 8. fifty--five cm, 9.80, 9.06 q/ha, and 18. forty-nine q/ha, respectively) than different sorts. Significant versions throughout sorts have been found for some of yield parameters. The inexperienced gram range PDM-139 produced the maximum pods according to plant, period of pods, seeds according to pod, take a look at weight, seed yield, straw yield, and harvest index measurements (Samrat). These results have been by and large due to PDM-139 (Samrat) having the maximum branches, which translated into the maximum pods produced according to plant, pod period, sparkling pod weight, and take a look at weight while as compared to all different kinds examined. Higher vegetative development, especially a better range of branches, assisted withinside the synthesis of extra food, which can also additionally have boosted yield characteristics. Similar end result turned into mentioned via way of means of [7]. These outcomes are in near conformity with the findings of *[8,9]*. Rise withinside the range of leaves, which served as a powerful photosynthesis shape and generated a huge amount of carbohydrates withinside the plant system, can be the reason of the growth in grain yield and its characteristics. More blossoms have been produced via way of means of extra plant life on extra branches, growing the manufacturing of end result and the first-rate of these end result. Kudi *et al.* (2017) and Narendra *et al.* (2017) each mentioned findings of a comparable kind (2019).

The plant geometry of 30 x 10 cm was documented together with the highest yield and yield characteristics. The improved source-sink relationships caused by the availability of balanced and enough nutrients as well as better light, space, and moisture than in tight spacing can be ascribed to the greater growth and development of plants under optimal plant density. recorded maximum biological, seed, and straw yields as well as harvest index. It may be because there are more plants per unit space now. [10-12], all observed similar findings (2019).

Table 1: Effect of Different Varieties and Spacing on Yield and Economics of Green Gram

Treatment	Number of pods per plant	Pod length (cm)	Number of grains per pod	Seedyield(q/ha)	Stoveryield(q/ha)	GMR (Rs/ha)	NMR (Rs/ha)	B: C ratio
	Effect of varieties							
V_1	11.52	5.36	6.85	5.53	15.40	41347.39	23968.39	1.37
V_2	8.90	3.73	5.07	4.91	14.00	36750.35	19371.35	1.11
V_3	13.03	6.57	8.05	7.67	17.08	56852.86	39473.87	2.26
S. Em±	0.32	0.20	0.24	0.09	0.22	695.32	695.46	0.04
C. D.	1.28	0.81	0.97	0.40	0.89	2803.29	2803.83	0.16
	Effect of spacing							
S_1	12.91	6.29	7.64	7.46	17.14	55444.82	38065.82	2.18
S_2	12.18	5.59	7.06	7.00	16.67	52071.00	34692.00	1.99
S_3	10.16	4.62	6.20	5.07	14.36	37968.04	20589.03	1.18

S_4	9.36	4.38	5.71	4.59	13.78	34450.29	17071.29	0.97
S. Em±	0.33	0.24	0.19	0.16	0.29	1187.15	1187.16	0.07
C. D.	0.99	0.71	0.57	0.49	0.89	3554.54	3554.58	0.20
	Interaction effect between varieties and spacing							
S_1V_1	13.27	6.19	7.73	7.81	17.98	57926.50	40547.50	2.33
S_1V_2	9.93	4.12	5.40	5.54	14.97	41410.83	24031.83	1.38
S_1V_3	15.53	8.55	9.80	9.06	18.49	66997.13	49618.14	2.85
S_2V_1	12.33	5.86	7.58	7.42	17.55	55101.03	37722.04	2.16
S_2V_2	9.13	3.68	5.20	4.82	14.42	36173.70	18794.70	1.07
S_2V_3	15.07	7.23	8.40	8.78	18.05	64938.27	47559.27	2.73
S_3V_1	10.27	4.80	6.40	3.50	13.40	26526.33	9147.33	0.52
S_3V_2	9.00	3.58	5.00	4.79	13.65	35833.83	18454.83	1.06
S_3V_3	11.20	5.49	7.20	6.94	16.04	51543.93	34164.93	1.96
S_4V_1	10.20	4.58	5.67	3.42	12.65	25835.70	8456.70	0.48
S_4V_2	7.53	3.56	4.67	4.48	12.97	33583.03	16204.03	0.92
S_4V_3	10.33	5.00	6.80	5.89	15.72	43932.14	26553.13	1.52
S. Em±	0.45	0.21	0.17	0.09	0.32	3302.31	3302.64	0.01
C. D.	0.91	0.43	0.16	0.19	0.65	6604.62	6605.28	0.03

Gross Monetary Return (GMR)

The results showed that there was a substantial difference between the greatest gross return, which was obtained in 30*10 cm, and 30*15 cm, extra among both 45*10 cm and 45*15 cm. Significantly, variety "PDM-139 (Samrat)" had the highest gross return, while variety "Sindhu (NVL-605)" had the lowest. Data revealed that PDM-139 (Samrat) calculated a substantial maximum gross return when planted having a gap level of 30 cm x 10 cm & variety. This was followed by PDM-139 (Samrat) sown but a separation level of 30 cm x 15 cm. According to [13], the cultivar Indira Urd-1 utilizing a density of 30x10 cm should be utilized to increase black gram yields and economics.

Net Monetary Return (NMR)

Spacing changed into a whole lot better in 30*10 cm than in 30*15 cm, with 45*10 cm being the subsequent maximum and 45*15 cm being the bottom. The varieties "PDM-139 (Samrat)" and "Sindhu (NVL-605)" had the best and lowest internet returns, respectively. Data confirmed that a massive most internet go back changed into calculated with a spacing of 30*10 cm with range in PDM-139 (Samrat), accompanied via way of means of a spacing of 30*15 cm with range in PDM-139 (Samrat), and that the bottom internet go back changed into finished with a spacing of forty-five cm x 15 cm with version in Sindhu (NVL-605). According to [13], 30x10 cm plant density produced the best internet receipts for Rs. 17,748 & the best benefit: fee ratio 1.22, accompanied via way of means of 45x10 cm (Rs. 15940/ha and 1.11). According to [6] a number of the unique cultivars, Indira Urd-1 had the best internet returns of Rs. 17,943/ha and the fine benefit: fee ratio of 1.24, accompanied via way of means of RU-0352 and RU-03-16. The elevated internet returns is probably attributed to PDM-139's (Samrat) stepped forward expression of growth, yield characteristics, and yields.

B: C Ratio

Spacing was much higher in 30*10 cm than in 30*15 cm, with 45*10 cm being the next closest and 45*15 cm being the furthest apart. Data showed that a considerable maximum B:C ratio was calculated for a distance 30*10 cm within variety in PDM-139 (Samrat), followed by a spacing of 30 cm x 15 cm with variety in PDM-139 (Samrat), and that the lowest B:C ratio was achieved for a distance 45 cm x 15 cm with variation in Sindhu (NVL-605). According to [15] The most effective treatment was a 60 kg seed rate per hectare at a 45 cm row to row spacing. a cost-to-return ratio of 3:10 and a maximum net return of Rs. 37351/ha.

The greater grain and straw yields per hectare of these three types, which commanded higher market prices, were the cause of the increased financial benefit. The variants Kopargaon and Sindhu (NVL-605), on the other hand, had the lowest net returns with a B: C ratio. The lowest grain and straw yields per hectare were the cause of this. These results support those of [7,11,14].

Conclusion

The combination of spacing level 30*10cm under variety PDM-139 (Samrat) is advised based on the current findings, as it increases the seed output of green gram and yields greater financial returns.

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