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Effects of sowing dates and spacing on semi *rabi* green gram

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Abstract

A field experiment was conducted during the semi *rabi* seasons of the year 2016 and 2017 at Pulse Research Station, Anand Agricultural University, Model Farm, Vadodara, Gujarat in sandy loam soil. It evaluates the effect of four dates of sowing (1st week of Sept., 3rd week of Sept., 1st week of Oct. and 3rd week of Oct.) and two spacing (30 cm and 45 cm between rows) on growth and yield of green gram. The results revealed that higher number of pods/plant, number of seeds/pod, pod length and test weight as well as maximum seed and haulm yield were recorded in the crop sown on 3rd week of Sept., while plant height and number of branches per plant in 1st week of September. Plant population was not altered due to different dates of sowing. In general narrow spacing (30 cm between rows) record highest grain and straw yield whereas wider spacing of 45 cm between rows produced significantly highest number of branches/plant, pods/plant and test weight. Plant height, number of seeds/pod and pod length record unaffected due to different spacings.

Keywords: Greengram (GAM-5), sowing dates, spacing, yield and yield attributes

Introduction

The capacity of food legumes to fix atmospheric nitrogen, leaf shedding ability and also solubilize phosphorus in association with phosphorus bacteria and VAM make leguminous crop most effective nutrient recycling agents in nature, food legumes thus play a vital role in nutrient balance and in maintaining soil fertility (Bhise *et al.*, 2011) [2]. Green gram (*Vigna radiata* L.) can be grown as catch crop during aberrant weather. In semi *rabi* season it will give remunerative income to farmers. In general, seed production in *kharif* season get damaged due to continuous rains at the time of harvesting and availability of quality seed become the constraints. To overcome such situation semi *rabi* and summer green gram cultivation is best answer.

Timely sowing of semi *rabi* green gram is more important. The low temperature during early sowing affects the germination adversely whereas the late sown crop may be caught by the early monsoon rains at harvesting time which may create a problem for harvesting and ultimately the yield reduced. Increase in yield can be ensured simply, by maintaining appropriate plant population. It is well documented that line sowing in appropriate rows is the best strategy for higher production (Ansari *et al.*, 2000) [1].

The information on suitable sowing time and optimum spacing for semi *rabi* green gram for middle Gujarat agro-climatic zone is lacking. Keeping this in view the present experiment was conducted.

Materials and Methods

A field experiment was conducted during the semi *rabi* seasons of the year 2016 and 2017 at Pulse Research Station, Anand Agricultural University, Model Farm, Vadodara, Gujarat. Soil of the experimental field was sandy loam with pH 7.19. It was very deep and fairly moisture retentive, low in organic carbon (0.321) and high in available phosphorus (88.91) and potash (321.33). The experiment was laid out in split plot design with four replications wherein four sowing dates (1st week of Sept., 3rd week of Sept., 1st week of Oct. and 3rd week of Oct.) were tried as main plot treatments and two spacings *viz.*, 30cm and 45cm between rows were evaluated in sub plot treatments. Recommended dose of fertilizer (20 kg N + 40 kg P₂O₅/ha) was applied in the form of Urea and DAP at the time of sowing. Four irrigations each of 50 mm were given at 12-15 days interval. For better cultivation, follow all recommended agronomical practices during experimentation period.

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The statistical analysis of the data generated during investigation was carried out on computerized system as per the procedure described by Cochran and Cox (1967). The significant were tested by "F- test" and compared with the value of Table F at 5% level of significance. The value of S.Em.± and C.V. % were also worked out.

Results and Discussion

Effect of date of sowing

Plant population of green gram was not influenced by different sowing dates (Table 1) during individual year as well as in pooled analysis. Data presented in Table-1 indicated that Plant height of green gram was significantly influenced during both the years and in pooled analysis (57.55 cm). It was significantly decreased with delayed sowing. Number of branches/plant (4.37) was also influenced significantly due different sowing dates in pooled analysis. Among different sowing dates, D₁ (4.37) and D₂ (4.26) were at par and recorded significantly higher number of branches/plant as compared to D₃ and D₄ (Table 1). Sowing of semi *rabi* green gram on 3rd week of September recorded significantly higher number of pods/plant (15.95) and pod length (8.03 cm) while significantly the highest seeds/pod (11.46) were recorded under the D₂ (3rd week of September). Significantly the highest 100 seed weight (4.93 g) recorded in treatment D₂ (3rd week of September) and higher grain yield (1063 kg/ha) and haulm yield (1604 kg/ha) as compared to rest of treatment except D₁ (1st week of September)

Effect of spacing

In Table-1 to Table-3 presented data regarding growth, yield attributes and yield of semi *rabi* green gram. Significant response of spacing found on plant stand (197). Plant height found not significant effect of spacing. Perusal of data presented in Table-1 and Table-2 indicated that crop sowing at 45 cm inter row spacing recorded significantly the highest (4.06) number of branches per plant and pods per plant (14.18). This might be due to better utilization of space for development. Seed per pod and pod length was found non significant. Sowing at wider spacing (45 cm apart) recorded significantly the highest test weight (4.52 g) and narrow spacing (30 cm) was recorded significantly the highest grain (922 kg/ha) and haulm (1284 kg/ha) yield of semi *rabi* green gram as compared to wider spacing.

Interaction effect

Interaction effect of date of sowing and spacing found significant effect on semi *rabi* green gram yield. Data presented in Table-4 (green gram grain yield) and Table-5 (haulm yield) indicated that sowing of green gram on 3rd week of September at narrow distance recorded significantly the grain yield (1261 kg/ha) and haulm yield (1844 kg/ha).

Economics

Economics of various treatments was worked out on the basis of average yield of two years considering present price of produce and inputs (Table-6). The data revealed crop sown on 3rd week of September at narrow spacing of 30 cm remunerate the maximum net profit (Rs. 54234/ha) with the highest value of BCR (3.53).

Table 1: Final plant stand, plant height and number of branches per plant of semi-*rabi* green gram as influenced by different sowing dates and spacing.

Treatment	Plant population (No.)			Plant height (cm)			Branches/plant (No.)		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
Date of sowing									
D ₁ : 1 st week of Sept.	160.6	176.0	168.3	61.58	53.53	57.55	4.42	4.33	4.37
D ₂ : 3 rd week of Sept.	162.6	174.4	168.5	60.17	48.90	54.54	4.18	4.35	4.26
D ₃ : 1 st week of Oct.	156.8	174.3	165.5	38.70	40.82	39.76	3.48	3.75	3.61
D ₄ : 3 rd week of Oct.	157.4	167.1	162.3	35.78	35.22	35.50	3.25	3.30	3.28
S.Em. ±	2.57	3.73	2.27	1.88	0.64	3.14	0.11	0.13	0.09
C.D. at 5 %	NS	NS	NS	6.01	2.06	14.11	0.37	0.41	0.26
C.V.%	4.55	6.11	5.45	10.83	4.08	8.48	8.49	9.25	8.89
Spacing									
S ₁ : 30	183	211.1	197.0	49.22	44.03	46.63	3.65	3.76	3.71
S ₂ : 45	136	134.8	135.3	48.89	45.21	47.05	4.01	4.10	4.06
S.Em. ±	1.23	1.94	1.15	0.52	0.65	0.42	0.08	0.05	0.04
C.D. at 5 %	3.79	5.98	3.35	NS	NS	NS	0.24	0.14	0.13
C.V.%	3.09	4.49	3.91	4.23	5.84	5.03	7.99	4.62	6.48
Interaction									
D x S	NS	NS	NS	NS	NS	NS	NS	0.28	0.26
Y x D	-	-	NS	-	-	4.17	-	-	NS
Y x S	-	-	5.09	-	-	NS	-	-	NS
Y x D x S	-	-	-	-	-	NS	-	-	NS

Table 2: Number of pods per plant, seeds per pod and pod length of semi-*rabi* green gram as influenced by different sowing dates and spacing.

Treatment	Pods/plant (No.)			Seeds/pod (No.)			Pod length (cm)		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
Date of sowing									
D ₁ : 1 st week of Sept.	17.10	11.10	14.10	10.65	10.22	10.44	7.77	7.57	7.67
D ₂ : 3 rd week of Sept.	17.50	14.40	15.95	11.60	11.32	11.46	8.30	7.75	8.03
D ₃ : 1 st week of Oct.	14.95	10.38	12.66	9.70	9.47	9.59	6.88	6.80	6.84
D ₄ : 3 rd week of Oct.	13.60	8.85	11.22	8.80	8.87	8.84	6.53	6.54	6.53
S.Em. ±	0.68	0.60	0.45	0.25	0.25	0.18	0.19	0.09	0.10
C.D. at 5 %	2.17	1.91	1.34	0.79	0.78	0.52	0.60	0.28	0.31
C.V.%	12.16	15.07	13.39	6.90	6.95	6.93	7.15	3.41	5.65

Spacings									
S ₁ : 30	14.84	10.69	12.76	10.16	9.94	10.05	7.34	7.16	7.25
S ₂ : 45	16.74	11.68	14.18	10.21	10.01	10.11	7.40	7.17	7.29
S.E.m. ±	0.18	0.32	0.18	0.12	0.18	0.11	0.06	0.08	0.05
C.D. at 5 %	0.56	0.98	0.53	NS	NS	NS	NS	NS	NS
C.V.%	4.61	11.32	7.66	4.71	7.33	6.13	3.13	4.34	3.77
Interaction									
D x S	NS	NS	1.07	NS	NS	NS	NS	NS	NS
Y x D	-	-	NS	-	-	NS	-	-	NS
Y x S	-	-	NS	-	-	NS	-	-	NS
			NS			NS			NS

Table 3: 100 seed weight, grain and haulm of semi-rabi green gram as influenced by different sowing dates and spacing.

Treatment	100 seed weight (g)			Grain yield (kg/ha)			Haulm yield (kg/ha)		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
Date of sowing									
D ₁ : 1 st week of Sept.	4.65	4.74	4.69	1001	981	991	1294	1678	1486
D ₂ : 3 rd week of Sept.	4.90	4.96	4.93	1099	1028	1063	1448	1760	1604
D ₃ : 1 st week of Oct.	4.18	4.27	4.23	638	656	647	758	784	770
D ₄ : 3 rd week of Oct.	4.00	4.04	4.02	517	510	513	620	606	613
S.E.m. ±	0.09	0.09	0.06	36.1	38.4	26.4	45.7	50.1	100.0
C.D. at 5 %	0.29	0.29	0.19	115.6	122.9	78.3	146.2	160.2	450.1
C.V.%	5.71	5.62	5.66	12.56	13.69	13.12	12.55	11.74	12.12
Spacings									
S ₁ : 30	4.36	4.46	4.41	924	920	922	1193	1375	1284
S ₂ : 45	4.50	4.55	4.52	704	667	685	867	1039	953
S.E.m. ±	0.05	0.05	0.04	17.5	23.3	14.6	20.6	25.3	16.3
C.D. at 5 %	NS	NS	0.10	53.9	71.9	42.6	63.4	77.9	47.6
C.V.%	4.54	4.37	4.45	8.60	11.76	10.26	7.99	8.38	8.24
Interaction									
D x S	NS	NS	0.21	NS	143.7	85.1	NS	155.9	95.2
Y x D	-	-	NS	-	-	NS	-	-	142.5
Y x S	-	-	NS	-	-	NS	-	-	NS
Y x D x S			NS			NS			NS

Table 4: Interaction effect of sowing dates and spacing on grain yield (kg/ha) of semi-rabi green gram.

Date of sowing	Spacing (cm)	
	S ₁ : 30	S ₂ : 45
D ₁ : 1 st week of Sept.	1113	870
D ₂ : 3 rd week of Sept.	1261	866
D ₃ : 1 st week of Oct.	727	567
D ₄ : 3 rd week of Oct.	587	440
S.E.m. ±	29.16	
C.D. at 5 %	85.10	
C.V.%	10.26	

Table 5: Interaction effect of sowing dates and spacing on haulm yield (kg/ha) of semi-rabi green gram.

Date of sowing	Spacing (cm)	
	S ₁ : 30	S ₂ : 45
D ₁ : 1 st week of Sept.	1706	1267
D ₂ : 3 rd week of Sept.	1844	1365
D ₃ : 1 st week of Oct.	867	675
D ₄ : 3 rd week of Oct.	720	506
S.E.m. ±	32.60	
C.D. at 5 %	95.17	
C.V.%	8.24	

Table 6: Economics of semi-rabi green gram as influenced by different sowing dates and spacing.

Treatments	Grain yield (kg/ha)	Haulm yield (kg/ha)	Gross income (Rs/ha)	Cost of cultivation (Rs/ha)	Net income (Rs/ha)	BCR
Treatment combinations						
D ₁ S ₁	1113	1706	66780	21426	45354	3.12
D ₁ S ₂	870	1267	52200	19646	32554	2.66
D ₂ S ₁	1261	1844	75660	21426	54234	3.53
D ₂ S ₂	866	1365	51960	19646	32314	2.64
D ₃ S ₁	727	867	43620	21426	22194	2.04
D ₃ S ₂	567	675	34020	19646	14374	1.73
D ₄ S ₁	587	720	35220	21426	13794	1.64
D ₄ S ₂	440	506	26400	19646	6754	1.34

Conclusion

It can be concluded from the pooled data that for getting higher grain yield and monitoring returns crop was sown on 3rd week of September at 30 cm spacing (narrow spacing).

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