Sowing Time and Spacing for Summer Sesame (*Sesamum indicum*)

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ABSTRACT

A field experiment was conducted during summer seasons of 2010 to 2012 on clayey soil of Junagadh (Gujarat) to ascertain proper time of sowing (3rd week of January, 2nd week of February and 4th week of February) and spacing (30 cm x 10 cm, 45 cm x 10 cm and broadcast) in relation to growth and yield of sesame (Sesamum indicum L.). The results revealed that sowing in 2nd week of February enhanced growth and yield attributes viz., plant height, branches per plant, capsules per plant and test weight and ultimately gave higher seed yield (1.237 t/ha) and stalk yield (2.132 t/ha) as well as higher net returns (Rs. 44020/ha) and B:C ratio (3.40) over early (3rd week of January) and late (4th week of February) sowing. The results further indicated that 45 cm x 10 cm spacing promoted growth and yield attributes viz., plant height, branches per plant, capsules per plant and test weight compared to 30 cm x 10 cm and broadcast, however 30 cm x 10 cm spacing gave higher seed yield (1.782 t/ha) and stalk yield (2.016 t/ha) along with higher net returns (Rs. 36279/ha) and B:C ratio (2.98) over 45 cm x 10 cm and broadcast sowing. Therefore, sowing in 2nd week of February (when soil temperature reaches 22ºC) and spacing of 30 cm x 10 cm could be appropriate for maximizing yield and monetary returns from summer sesame under south Saurashtra agro-climatic conditions of Gujarat.

Keywords: Spacing, Broadcast

1. INTRODUCTION

Photo-periodically sesame (*Sesamum indicum* L.) is a short-day plant. It is mostly grown during *kharif* and semi-*rabi* season in Saurashtra region of Gujarat. However, it can be successfully grown in summer season (Kathiresan, 2002). Owing to high yield, less infestation of pests and diseases, low cost of cultivation along with high economic returns, large number of farmers of Gujarat in general and Saurashtra region in particular, are tempted toward summer cultivation of this crop. Soil temperature is the major determinant of germination of sesame. Generally, high temperature is required for satisfactory germination. The recommended spacing for sesame is 45-60 cm x 10-15 cm for *kharif* season crop. Due to higher temperature in summer, growth and duration of sesame is comparatively less than *kharif* crop, which obviously tends to closer spacing. Therefore, looking to

the farmers' need, present experiment was conducted to find out appropriate sowing time and spacing for summer sesame under south Saurashtra agro-climatic conditions of Gujarat.

2. MATERIALS AND METHODS

A field experiment was carried out at Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during summer seasons of 2010 to 2012. The soil of the experimental plot was clayey in texture and slightly alkaline in reaction (pH 7.9 and EC 0.36 dS/m) as well as low in available nitrogen (238 kg/ha), available phosphorus (23.5 kg/ha) and medium in available potash (226 kg/ha). During the crop period, the range of maximum temperature was 28.0 - 44.5, 26.2 - 41.6 and 24.0 - 42.3 ºC, average relative humidity was 13 - 62, 15 - 70 and 17 - 70% and evaporation was 3.5 - 13.0, 3.2 - 11.4 and 3.6 - 13.2 mm/day, respectively during 2010, 2011 and 2012. The experiment comprising of three sowing time (3rd week of January, 2nd week of February and 4th week of February) and three spacing (30 cm x 10 cm, 45 cm x 10 cm and broadcast) was laid out in split plot design with four replications. The gross plot size was 6.0 m x 3.6 m, while net plot size for 30 cm 10 cm spacing and broadcast was 5.0 m x 2.4 m and for 45 cm x 10 cm spacing it was 5.0 m x 2.7 m. The sesame variety 'Gujarat Til 2' was sown as per sowing time and spacing treatments using seed rate of 3-5 kg/ha and harvested in May during all the three years. The crop was fertilized with 50-10-0 kg NPK/ha as basal dose in form of diammonium phosphate and ammonium sulphate. For weed management, pendimethalin @ 0.45 kg/ha was applied as pre-emergence supplemented with intercultivation and hand weeding at 30 days after sowing. Irrigations each of 5 cm depth were given at 1.0 IW/CPE ratio. The average daily pan evaporation during the crop period was 8.5, 7.6 and 8.1 mm in 2010, 2011 and 2012, respectively.

3. RESULTS AND DISCUSSION

Growth and yield attributes

The data presented in Table-1 indicated that different sowing times significantly influenced growth and yield attributes of sesame. Sowing of sesame crop in 2nd week of February significantly enhanced plant height, number of branches per plant, number of capsules per plant and test weight; however it remained at par with sowing in 4th week of February in respect of test weight. Whereas, significantly the lowest plant height, number of capsules per plant and test weight were observed under early sowing (3rd week of January). Sowing in 4th week of February recorded significantly the lowest number of branches/plant. Enhanced germination due to optimum soil temperature and later on favourable climatic condition might have favoured growth and development under 2nd week of February sowing as compared to early and late sowing. Nath *et al.* (2001) also reported similar results.

The data furnished in Table-1 revealed that significantly the highest plant height, number of branches per plant, number of capsules per plant and test weight were recorded with 45 cm x 10 cm spacing, however it remained at par with 30 cm x 10 cm spacing in case of number of capsules per plant. While, broadcast resulted in significantly the lowest values of these growth and yield attributes. Absence of inter plant competition for moisture and nutrients in wider spacing (45 cm x 10 cm) might have been responsible for improved growth and development of individual plant. These results are in conformity with findings of Shinde *et al.* (2011).

Seed and stalk yield

The data furnished in Table-1 showed that different sowing times significantly influenced seed yield of sesame during individual years and in pooled results. Sowing of sesame crop in 2nd week of February resulted in significantly the highest seed yield of 1.281, 1.320, 1.110 and 1.237 t/ha in 2010, 2011, 2012 and pooled results, respectively. Whereas, significantly the lowest seed yield of 0.587, 0.620, 0.487 and 0.565 t/ha was observed under early sowing (3rd week of January) in 2010, 2011, 2012 and pooled results, respectively. Significantly the highest stalk yield of 2.072, 2.027, 2.298 and 2.132 t/ha was registered with sowing on 2nd week of February in 2010, 2011, 2012 and pooled results, respectively, which remained at par with sowing in 4th week of February in 2011 and 2012. The early sowing (3rd week of January) resulted in significantly the lowest stalk yield of 1.119, 1.404, 1.747 and 1.423 t/ha in 2010, 2011, 2012 and pooled results, respectively. Averaged over three years, sowing in 2nd week of February increased seed yield by 119 and 35% and stalk yield by 50 and 14% over 3rd week of January and 4th week of February sowing, respectively. Improved growth and development of crop with 2nd week of February sowing ultimately resulted in increased yield over early as well as late sowing. The results corroborate the findings of Jadhao *et al.* (1994) and Nath *et al.* (2001).

Table-1 showed that significantly the highest seed yield (1.151, 1.113, 0.984 and 1.083 t/ha) was recorded with 30 cm x 10 cm spacing in all the individual years and pooled results. Whereas, 45 cm x 10 cm spacing resulted in significantly the lowest seed yield (0.811, 0.854, 0.676 and 0.781 t/ha) in all the years and pooled results. The data furnished in Table-1 indicated that significantly the highest stalk yield of 1.782, 2.007, 2.259 and 2.016 t/ha was recorded with 30 cm x 10 cm spacing in 2010, 2011, 2012 and pooled results, respectively. While, sowing at 45 cm x 10 cm spacing resulted in significantly the lowest stalk yield (1.477, 1.580, 1.866 and 1.641 t/ha) in all the years and pooled results. On an average of three years, 30 cm x 10 cm spacing increased seed yield by 39 and 26% and stalk yield by 23 and 14% over 45 cm x 10 cm spacing and broadcast, respectively. Optimum plant population under 30 cm x 10 cm spacing might have been responsible for higher yield compared to narrow and wider spacing. Moorthy *et al.* (1997) also reported analogous results.

Interactions between sowing time and spacing, year and sowing time, and year and spacing were found to be non-significant in respect of growth, yield attributes and yield throughout the results.

Correlation between germination and soil temperature

To establish relationship between germination and soil temperature under different dates of sowing, the coefficient of correlation (r) was worked out (Table 2). The data indicated that germination per cent showed positive and significant correlation with soil temperature at 5 and 10 cm depth during all the three years. As the crop is sown at shallow depth, soil temperature at 5 cm depth is determinant for germination. The data ultimately suggest that soil temperature (at 5 cm depth) of at least 22ºC is seems to be necessary for satisfactory germination of sesame during summer season.

Economics

Sowing in 2nd week of February gave maximum net returns of Rs. 44020/ha with B:C ratio of 3.40, followed by sowing on 4th week of February, which recorded net returns of Rs. 28125/ha and B:C ratio of 2.53.

Sowing the crop at 30 cm x 10 cm spacing accrued maximum net returns of Rs. 36279/ha and B:C ratio of 2.98, followed by broadcast by recording net returns of Rs. 24813/ha and B:C ratio of 2.34.

4. CONCLUSION

It was concluded that higher yield and net returns from summer sesame could be achieved by sowing in 2nd week of February at 30 cm x 10 cm spacing under south Saurashtra agro-climatic conditions of Gujarat.

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Table 1. Effect of sowing time and spacing on growth, yield attributes and yield of sesame and economics

Treatment	Plant height (cm)	Branches /plant	Capsules /plant	1000-seed weight (g)	Seed yield (t/ha)				Stalk yield (t/ha)				Net returns (Rs/ha)	B:C
					2010	2011	2012	Pooled	2010	2011	2012	Pooled		
Sowing time														
Jan. 3rd week	52.3	2.10	37.8	4.57	0.587	0.620	0.487	0.565	1.119	1.404	1.747	1.423	10243	1.56
Feb. 2nd week	63.7	2.56	48.9	5.35	1.281	1.320	1.110	1.237	2.072	2.027	2.298	2.132	44020	3.40
Feb. 4th week	58.4	1.84	42.5	5.16	0.949	0.927	0.884	0.920	1.691	1.793	2.127	1.870	28125	2.53
LSD (P=0.05)	4.7	0.15	4.5	0.32	0.108	0.111	0.118	0.056	0.236	0.245	0.229	0.117	-	-
Spacing														
30 cm x 10 cm	58.1	2.12	44.6	4.97	1.151	1.113	0.984	1.083	1.782	2.007	2.259	2.016	36279	2.98
45 cm x 10 cm	60.4	2.39	47.4	5.41	0.811	0.854	0.676	0.781	1.477	1.580	1.866	1.641	21296	2.17
Broadcast	55.9	2.00	37.2	4.69	0.854	0.900	0.821	0.858	1.624	1.638	2.047	1.769	24813	2.34
LSD (P=0.05)	1.5	0.07	4.2	0.20	0.077	0.092	0.058	0.042	0.122	0.196	0.149	0.088	-	-

Table 2. Mean weekly soil temperature and germination at different sowing times and correlation between soil temperature and germination

Parameter	Year	3rd week of January	2nd week of February	4th week of February	Correlation coefficient (r)
Soil temperature (°C) at 5 cm depth	2010	21.4	22.9	24.5	0.8801*
	2011	19.5	22.9	23.2	0.9985**
	2012	19.5	21.1	21.6	0.9930**
Soil temperature (°C) at 10 cm depth	2010	23.1	24.4	26.0	0.8541*
	2011	20.7	24.5	24.8	0.9995**
	2012	21.0	22.2	23.7	0.9019*
Germination (%)	2010	64.5	81.2	82.1	
	2011	62.2	78.0	78.4	
	2012	60.8	75.6	78.1	

**** indicates significant at 5% level of significance, ** indicates significant at 1% level of significance***