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YIELD VARIATIONS IN SESAMUM SOWN AT MONTHLY INTERVALS IN SUB-HUMID LATERITIC ACID TRACT OF WEST BENGAL

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The results of the field experiment revealed that sesame was sensitive to low temperature, but the variety B-67 was less affected due to low temperature as observed from its growth duration. It took 8 to 16 days less time to mature and produced 1.7 q/ha more yield than that of improved local. Growth continued for a long duration when the crop was sown in October (110-126 days) and this was followed by February and September sown crop (90-108 days). Crop grown in *Kharif* season matured early (80-90 days). Tall plants were found in June sown crop of B-67 and April sown crop of Improved local. Maximum yield (17 q/ha) was recorded in March sown crop followed by February and August sown crop. The October sown crop produced lowest yield (4.5 q/ha). The yield obtained from the crops sown in other months ranged from 7.4 q/ha to 9.4 q/ha. The oil content ranged from 43.5% in wet months to 46.5% in other months. The high yield was associated with high number of branches and pods per plant with large number of bold seeds. B-67 proved to be superior in this zone.

Sesame is an important oilseed crop in our country and its cultivation is extended in eastern India particularly in West Bengal day by day due to severe shortage of vegetable oil in this state. Now about 65 thousand hectares of land is utilized for sesame cultivation in West Bengal. This crop is widely grown in this State in summer (dry) season after taking a *rabi* crop in irrigated lands and it is also grown as rainfed crop in *Kharif* season in the uplands where rice is not grown due to scarcity of water. The average yield (622 Kg/ha) of this crop in West Bengal is very low inspite of its high yield potentiality (Ghosh and Sen, 1980). This is mainly because this crop is grown on wide range of climatic conditions starting from February to September in West Bengal and secondly, in *Kharif* season it is mostly grown on poor soils of uplands where no other crop can profitably be grown. Although some investigations have been made on nutritional aspects and recorded valuable conclusions in favour of fertilization to this crop (Ghosh and Maji, 1983) yet information regarding its best time of sowing for maximum production and fitting this crop under intensive cropping sequences at suitable time are lacking at present. Keeping this idea in view an attempt has been made in this paper to analyse the yield variations of sesame when sown at monthly intervals in the sub-humid lateritic tract of West Bengal. This will enable the farmers to include this crop in their intensive cropping programme at the most suitable time.

MATERIALS AND METHODS

Field experiment was conducted

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during 1980 and 1981 at the College of Agriculture Farm, Sriniketan, Visva Bharti located at 23.39°N latitude, 87.42°E longitude at an elevation of 58.9 m above the sea level. The soil of the experimental field was lateritic sandy loam (60.6% sand, 23.0% silt and 15.0% clay) having 0.30% organic carbon, 160 kg/ha available N, 8.0 kg/ha available P and 105 kg/ha available K with a pH of 5.6. The climatic condition of the area has been sown in table 1. The mean minimum temperatures fell below 20°C in November and continued to be so till the early weeks of March. The mean maximum temperatures during these months ranged from 25°C to 31°C Total annual rainfall received in this area was 1369 mm of which about 85% of rainfall was recorded during four monsoon months from June to September. Two varieties of Sesame viz, B-67 and Improved local were sown on second week (9th to 11th) of every month starting from February to October during both 1980 and 1981 in rows of 30 cm apart in a split plot design keeping dates of sowing in the main plots and varieties in the sub plots of 6m X 3m size with three replications A general dose of 60 Kg N, 40 Kg P_2O_5 and 40 kg K_2O/ha was given in all plots. Half nitrogen in the form of urea and full dose of phosphorus and potassium in the form of single super phosphate and muriate of potash respectively were applied at sowing. Remaining half dose of nitrogen was top dressed at 30 days after sowing. The first weeding alongwith thinning were done 20 days after sowing keeping the plants 12 cm apart within rows and second weeding was completed at 40 days after sowing. The crop received irrigations as and when required in addition to rainfall received during its growth stages. The crop was adequately protected from diseases and insect pests. Observations were recorded on height of the plants, number of branches per plant, number of pods per plant, number of grains per pod and test weight of grains (1000 grain wt.), Alongwith grain yield at maturity. The oil content of its grains was estimated through Soxhlet's Extraction apparatus (Ward and Johnston, 1950). Plant height, number of branches per plant, and number of pods per plant were measured from ten randomly selected plants in each plot. Ten randomly selected pods from each plot were tested for number of grains per pod and their test weights were recorded after drying these grains. Grain yields were obtained from an area of 5m x 1.8m The time taken for completing different growth stages of this crop were also recorded in this experiment.

RESULTS AND DISCUSSION

Growth stages and their duration: The time taken from seeding to emergence varied markedly due to sowing of the crop at different months (Table 2). It ranged from 3 days in May to August sowing to 8 days in February sowing in B-67 and 3 days in June July sowing to 10 days in February sowing in Improved local variety. This result clearly stated that low temperature prevailing during germination period delayed the rate of emergence of this crop and the delaying was more in Improved local than in B-67. Similar trend of results were also ob-

Table 1. Climatic condition at Sriniketan.*

Months	Temperature (°C) Max.	Min.	Rainfall (mm)	Relative humidity (%)	Sunshine (hrs.)
January	25.2	11.7	11.2	69.7	8.4
February	28.4	14.3	13.9	59.2	8.5
March	34.2	20.1	20.2	53.4	8.0
April	37.7	23.8	50.9	60.6	8.4
May	38.0	25.2	87.7	69.3	9.0
June	36.8	26.0	185.0	78.7	6.2
July	32.5	25.8	310.4	84.7	4.2
August	32.0	25.8	294.9	87.2	4.7
September	32.0	25.3	257.4	85.1	5.6
October	31.4	22.7	116.7	80.5	7.3
November	31.4	17.3	16.2	73.8	8.1
December	26.0	12.3	4.7	69.9	7.8
Total :			1369.2 mm.		

* Average climatic condition for 14 year (1967 to 1980)

Table 2. Growth stages and duration of sesame sown at monthly intervals (average of two years: 1980-81)

Months of Sowing	Duration from seeding to emergence (days		Duration from seeding to flowering (days)		Duration from seeding to maturity (days)	
	B-67	Improved local	B-67	Improved local	B-67	Improved local
February	8	10	46	52	92	108
March	5	6	38	44	86	96
April	4	5	35	39	80	89
May	3	4	37	40	84	93
June	3	3	35	39	81	90
July	3	3	34	37	80	88
August	3	4	34	38	81	90
September	4	5	39	45	90	104
October	7	8	48	56	110	126

served in case of duration from seeding to flowering and so also from seeding to maturity. Crop sown in October took maximum time (48 days in B-67 and 56 days in Improved local) to flower because of advent of winter season which restricted its growth rate. This was closely followed by February sown crop. April to August sown crop took least time (34 to 37 days in B-67 and 37 to 40 days in Improved local) to flower because of

Table 3. Effect of time of Sowing on height of the sesame plants sown at monthly intervals

Month of sowing	Height of the plants (cm)					
	1980			1981		
	B-67	Improved local	Mean	B-67	Improved local	Mean
February	69.2	101.8	85.5	72.3	110.5	91.4
March	95.2	112.2	103.7	102.0	115.6	08.8
April	123.8	129.5	126.7	118.6	125.6	22.1
May	136.8	115.5	126.2	128.8	120.6	24.7
June	142.5	93.2	117.9	130.6	100.6	20.1
July	79.5	68.3	74.2	82.6	70.8	76.7
August	76.5	62.2	69.4	80.2	70 5	75.5
September	70.5	60.0	56.3	76.5	60.5	68.5
October	47.2	42.2	44.7	47.6	40.4	44.0
Mean	93.5	87.3	—	94.2	90.4	—
	Variety	Months	V x M	Variety	Months	V x M
S Em ±	3.2	6.8	9.6	3.0	6.3	8.9
C. D. at 5%	—	19.3	27.3	—	17.8	25.2
C. V.	18.5	—	—	16.7	—	—

high temperature prevailing during this period which enhanced rapidly the rate of growth and development of this crop (Joshi, 1961). Similarly, the duration of the crop from seeding to maturity was also maximum in October, sowing in both B-67 (110 days) and Improved local (126 days), intermediate in February / September sowing (90 92 days in B-67 and 104-108 days in Improved local) and minimum in the April-August sown crop (80-84 days in B-67 and 88-93 days in Improved local). The crop grown in Wet months with high humidity and temperature suffered more from the incidence of diseases caused by *Cercospora seami, Phytophthora parasitica; Macrophomina phoseoli* and *Rhizoctonia batalicola* than that grown in other seasons.

Plant height and branching : It was revealed from the results presented in Table 3 that June sown crop of B-67 and April sown crop of Improved local produced tallest plants during both the years. Both the varieties recorded lowest height of the plant when sown in October due to exposer of the crop to prolong low temperature after emergence. The crop sown from July to September also recorded lower height of the plant than those when sown in summer months. It was interesting to note that Improved local produced taller plants than B-67 when sown February to April but the reverse was the case when the crop was sown during May to October. Maximum number of branches per plant was recorded from March sown crop (4.9 to 5.9) during both the years. This was significantly superior to all other sowing treatments (Table 4). February, May and August sown crop also re-

corded good number of branches per plant (3 7 to 4.3) while April, June, July, September and October sown crops were very poor in branching (2.2 to 3.3 branches / plant) during both the years. October sown crop produced lowest number of branches per plant (2.2 to 2.3) as it exposed to very low temperature at branching. B-67 recorded significantly higher number of branches per plant (3.7 to 4.0) than Improved local (3.3 to 3.5) during both the years.

Yield components : March sown crop produced significantly higher number of pods per plant than the crop sown in other months (Table 4). Crop sown in October exposed to low temperature and recorded lowest number of pods per plant as well as grains per pod; but the number of grains per pod in crops sown in other months did not vary much. The crops whose flowering period coincided with the monsoon months produced lower number of pods per plant because of poor fertilization in rainy days. The April sown crop also recorded low number of pods per plant due to the occurance of dry spell at the time of flowering. The greatest test weight of grains was observed in February/March sown crop and this was closely followed by the crops sown in August to October during the two years. The rainy season crops recorded lowest test weight of grains. This was due to the fact that the crop received bright sunshine for a short period in the cloudy days and this restricted the photosynthetic rate of this crop particularly during grain filling period and ultimately produced small grains. B-67 produced higher number of pods per plant and grains per pod than Improved local but the test weight of grains was greater in Improved local than that of B-67 during both the years.

Grain yield and oil content : The data presented in Table 4 clearly showed that B-67 significantly out yielded the Improved local variety in this sub-humid lateritic acid tract of West Bengal. March sown crop gave the highest yield (17 q/ha) during both the years. This was also confirmed in their pooled analysis. The high yield was attributed for large number of branches and pods per plant together with great number of bold seeds in the pods of this crop. This type of relationship was also observed by Ghosh and Sen, 1980. The yields obtained from February (13 q/ha and August 10q/ha) sown crops were quite high as compared to the yields recorded in crops sown in other months. The lowest yield obtained from October sown crop (4.5 q/ha) was mainly attributable for stunted growth of the crop which produced few branches and pods containing lower number of grains due to very low temperature prevailing during its entire growth period. The yields obtained from May, June, July and September sown

Table 4 : Effect of time of sowing on yield attributes, grain yield and oil content of sesame sown at monthly intervals

Particulars	Branches/plant		Pods/plant		Grains/pod		1000 grains Weight (g)		Grain yield (q/ha)			Oil%	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	Pooled	1980	1981
Months of Sowing													
February	4.3	4.0	43	46	49	47	3.18	3.01	12.1	13.5	12.8	46.6	46.5
March	5.9	4.9	57	59	53	50	3.17	3.01	16.4	17.8	17.1	46.5	46.3
April	3.2	3.3	31	36	48	46	2.88	2.86	7.2	8.3	7.8	43.7	43.6
May	4.1	3.8	38	43	48	47	2.92	2.89	8.7	9.6	9.2	44.5	44.4
June	3.3	3.4	30	32	49	48	2.82	2.80	6.8	7.9	7.4	43.5	43.6
July	3.3	3.1	37	38	49	46	2.81	2.80	8.9	9.0	8.9	43.6	44.0
August	3.9	3.7	44	46	50	47	3.01	2.91	10.8	10.0	10.4	46.0	45.6
September	3.3	3.2	38	41	49	47	3.07	2.93	9.6	9.2	9.4	46.3	46.9
October	2.2	2.3	2.2	26	42	43	2.95	3.00	4.7	4.2	4.5	46.4	46.4
S. Em (+)	0.31	0.24	2.2	2.9	2.1	1.9	0.074	0.07	0.77	0.72	0.80	0.92	0.75
C.D. at 5%	0.92	0.71	6.7	8.7	6.4	5.7	0.22	0.21	2.30	2.16	2.39	2.79	2.26
Variety :													
B-67	4.0	3.7	40	44	50	49	2.90	2.85	10.3	10.8	10.6	45.9	45.9
Improved local	3.5	3.3	35	38	47	46	3.05	2.98	8.6	9.0	8.9	44.5	44.4
S. Em (±)	0.14	0.11	0.9	1.2	0.92	0.8	0.032	0.032	0.33	0.32	0.37	0.42	0.35
C.D. at 5%	0.40	0.31	2.8	3.7	2.7	2.4	0.09	0.09	0.98	0.94	1.03	1.25	1.05
C.V.	19.6	16.5	14.3	16.0	10.2	9.7	6.0	5.8	19.5	17.2	—	4.9	4.1

crop ranged from 7.4 q/ha to 9.4 q/ha and this yield level of sesame was quite good from the quality point of view. The crops sown in the months of April to July contained lower amount of oil in their grains than that of the crops grown in other months. This might be due to the reason that high temperature together with high humidity prevailing during grain formation affected the fat synthesis of this crop. Vareity B-67 contained greater percentage of oil in its grains (45.9%) and produced higher yield (10 6 q/ha) than Improved local indicating its suitability for cultivation in this Zone.

From the above results it may be concluded that the climate of West Bengal provides a good scope for this crop to be cultivated under rainfed conditions by sowing in June to September. This crop may profitably be grown in the uplands by sowing in June/July as a *Kharif* crop. It may also be taken as a *post kharif* crop after the harvest of rice/Jute by sowing in late August/ September. This crop can yield 7.4 to 10.4 q/ha of grains during this season. With irrigation, the crop can either be fitted in between *rabi* and *kharif* crops from February to April or be grown after two successive crop of *kharif* rice and *boro* rice by sowing in May. Variety B-67 suits very well in this sub-humid lateritic zone of West Bengal.

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