Date of sowing and nitrogen fertilization effect on sesame

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Abstract: An experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh, from 15 February to 30 March 2006 with a view to studying the effect of date of sowing and nitrogen level on the seed yield of sesame. The experiment consisted of four sowing dates viz., 15 February, 1 March, 15 March and 30 March and four nitrogen levels viz., 40, 60, 80 and 100 kg N ha^{-1}. The experiment was laid out in a randomized complete block design with three replications. The result showed significant variations due to date of sowing for all the crop characters viz. plant height, number of total capsules $plant^{-1}$, number of effective capsules $plant^{-1}$, number of non-effective capsules $plant^{-1}$, length of capsule, number of seeds $capsule^{-1}$, number of sterile seeds $capsule^{-1}$,1000-seed weight, seed yield, stover yield and harvest index. The highest seed yield (1.92 t ha^{-1}) was recorded from 1 March sowing. Nitrogen had significant effect on all the parameters studied except non-effective capsule number and 1000-seed weight. The highest seed yield (2.07 t ha^{-1}) was recorded from 100 kg N ha^{-1}.The interaction of time of sowing and nitrogen level exerted significant effects on all the parameters studied except number of sterile seeds $capsule^{-1}$, 1000-seed weight. Therefore for obtaining higher seed yield, sesame may be sown between1-15 March along with application of 80-100 kg N ha^{-1}.

Key words: Sowing date, Nitrogen level, seed yield, Sesame

Introduction

Sesame (*Sesamum indicum* L.) is an important and widely grown oil crop of the world. It is locally known as Til. Because of its drought resistance ability, it can be cultivated as rainfed crop in upland condition. Sesame is grown in almost all regions of Bangladesh**.** In 2003-2004, the crop covered an area of 80 thousand hectares in Bangladesh with the production of 49 thousand tons (BBS, 2004). The climate and edaphic conditions of Bangladesh are quite suitable for its cultivation. The crop is cultivated either as a pure stand or as a mixed crop with aus rice, jute, groundnut, millets and sugarcane. The crop is grown in both the *rabi* and the *kharif* seasons of Bangladesh but the *kharif* season covers about two-third of the total sesame area. Khulna, Faridpur, Pabna, Barisal, Rajshahi, Jessore, Comilla, Dhaka, Patuakhali, Rangpur, Sylhet and Mymensingh districts are the leading sesame producing areas of Bangladesh (Kaul and Das, 1986; BARI, 1994). Yield and quality of sesame are very

low in Bangladesh due to poor management practices (Rahman *et al*., 1994). For successful production of crop many factors, such as, quality seed, weed control, proper fertilization, irrigation, method of sowing, optimum sowing time, seed rate, and time of harvest are indispensable. Yield decreases progressively with the delay in planting from optimum date of sowing (Chimanshette and Dhoble et al., 1992). Delay sowing consequently reduced the maturity period of sesame (Stumpf, 1959). The practice of intensive cropping with modern varieties caused a marked depletion of inherent nutrient reserves in soil of Bangladesh. Deficiency of primary nutrients specially nitrogen has been reported since a long time. Nitrogen is one of the accelerating factors of crop production. It is one of the dominant factors for low yield of sesame. Hence, the present experiment was undertaken to find out the optimum date of sowing and suitable nitrogen level for maximizing seed yield of BINA *til*-1.

Materials and Methods

The experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh during the period from February to June 2006 to find out the effect of date of sowing and nitrogen level on seed yield of sesame. The experimental area was under Sonatala Soil Series of the Old Brahmaputra Floodplain Agro-ecological Zone (AEZ 9) (UNDP and FAO, 1988). The soil type was non-calcareous dark gray and the parent material was Brahmaputra river born deposit. The land was medium high with moderate drainage facility. The soil of the experimental unit belongs to the textural class silty loam having p^H of 6.50 containing 1.71% organic matter, .010% total nitrogen, 26.00 ppm available phosporus, 0.14me exchangeable potassium/100 g soil and 13.90 ppm available sulphur. The experiment included four sowing dates viz. 15 February, 1 March, 15 March and 30 March and four levels of nitrogen viz. 40, 60, 80 and 100 kg ha^{-1}. BINA til-1 cultivar was used as a test crop in the experiment. The experiment was laid out in a randomized complete block design with three replications. Each unit plot size was 4m × 2.5m. Each plot was fertilized with TSP, MP and Z_nSO_4 @150, 50 and 5 kg ha^{-1}. Urea, as a source of N, was applied as per treatments. The whole amount of TSP, MP, Z_nSO_4, and 50% of urea were incorporated at the time of final land preparation. The remaining urea was applied 20 days after sowing. Different intercultural operations such as gap filling, weeding and pesticide application were done as and when necessary. A total of five sample plants were randomly selected and uprooted from each plot prior to harvest for recording data on yield components. After sampling, harvesting was done at different dates at proper maturity. The first sown crop was harvested on 24 May; second sown crops on 8 June, third sown

crops on 13 June and last sown crop on 22 June 2006. The data were recorded on plant height, number of total capsules, number of effective capsules, number of non-effective capsules, length of capsule, number of seeds capsule^{-1}, number of sterile seeds capsule^{-1},1000-seed weight, seed yield, stover yield, biological yield and harvest index. All the data were statistically analyzed and mean differences were adjudged by Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Effect of date of sowing

Significant variations due to date of sowing were found for all the crop characters of sesame (Table 1). Sowing on 1 March was found the best regarding number of effective capsules plant^{-1} (52.5), number of seeds capsule^{-1} (109.74) and 1000-seed weight (3.37 g) which ultimately resulted in the highest seed yield (1.92 t ha^{-1}). It is interesting to note that number of sterile seeds capsule^{-1} were found to be increased gradually with delay in sowing and reached the peak (5.43) when planted on 15 March. But number of non-effective capsules plant^{-1} was decreased with delay in sowing. Results revealed that delay in sowing after 1 March gradually decreased seed yields and the lowest seed yield (1.51t ha^{-1}) was recorded from 30 March sowing. This result closely resembles to that obtained by Ieda *et al.* (1999) who also opined that delaying in sowing decreased seed yields of sesame. Stover yield also followed the similar trend producing the highest value (4.2t ha^{-1}) when sowing was done on 1 March and thereafter declined. But, 15 March sowing registered the highest harvest index (31.94%).

Effect of nitrogen level

Nitrogen fertilization significantly influenced all the parameters except number of non-effective capsule plant^{-1} and 1000-seed weight (Table 2). Yield enhancing characters like number of effective capsules plant^{-1} and number of seeds capsule^{-1} were found to be the highest (36.92 and 102.75, respectively) with the highest level of nitrogen (100 kg ha^{-1}). The yield retarding character like sterile seeds capsule^{-1} was found to be the highest (5.18) with the lowest level of nitrogen (40 kg ha^{-1}). Data clearly shows that seed yield increased with the increase in nitrogen level. The highest seed yield (2.07 t ha^{-1}) was obtained from 100 kg N ha^{-1} and 40 kg N ha^{-1} produced the lowest seed yield (1.39 t ha^{-1}). Mitra and Pal (1999) also obtained the highest seed yield from 100 kg N ha^{-1} while others obtained the same from 60 kg N ha^{-1} (Sumathi and Jaganadham, 1999) or from 90 kg N ha^{-1} (Om *et.al*., 2001). Like seed yield, stover yield and harvest index were also increased with the increment of N level up to the highest level i.e. 100 kg N ha^{-1}.

Table 1. Effect of date of sowing on different plant characters of sesame

Date of sowing	Plant height (cm)	Total capsules plant^{-1} (no.)	Effective capsules plant^{-1} (no.)	Non-effective capsules plant^{-1} (no.)	Capsule length (cm)	Seeds capsule^{-1} (no.)	Sterile seeds capsule^{-1} (no.)	1000-seed weight (g)	Seed yield (t ha^{-1})	Stover yield (t ha^{-1})	Harvest Index (%)
15February	93.93 d	45.08 b	34.42 b	10.67 a	5.02 b	81.41 d	4.67 b	3.51 a	1.73 b	3.8 b	31.2 a
1 March	122.26 a	52.5 a	45.75 a	6.75 b	5.39 a	109.74 a	3.56 c	3.37 a	1.92 a	4.25 a	31.01 a
15 March	113.94 b	19.33 c	17 c	2.33 d	4.41 c	101.42 b	5.43 a	2.95 b	1.78 b	3.77 b	31.94 a
30 March	106.51 c	15.33 d	10.75 d	4.58 c	3.83 d	93.99 c	5.07 ab	2.73 b	1.51 c	3.79 b	28.16 b
S_x	0.79	0.7	0.68	0.34	0.06	0.79	0.16	0.08	0.04	0.04	0.52
Level of significance	**	**	**	**	**	**	**	**	**	**	**
CV (%)	2.50	7.37	8.76	19.41	4.22	4.82	11.81	8.61	7.7	3.49	5.91

In a column figurers with same letter or without letter do not differ significantly whereas figures with dissimilar letter differ significantly (as per DMRT)

** = Significant at 1% level of probability

TABLE 2. Effect of nitrogen level on different plant characters of sesame

Nitrogen level (Kg hac^{-1})	Plant height (cm)	Total capsules plant^{-1} (no.)	Effective capsule plant^{-1} (no.)	Non-effective capsules plant^{-1} (no.)	Capsule length (cm)	Seeds capsule^{-1} (no.)	Sterile seeds capsule^{-1} (no.)	1000-seed weight (g)	Seed yield (t ha^{-1})	Stover yield (t ha^{-1})	Harvest Index (%)
40	103.16 d	27.08d	21.5c	5.58	4.29c	90.64d	5.18a	2.98	1.39d	3.37d	29.18b
60	106.91c	29.75c	23.08c	6.67	4.66b	94.39c	5.17a	3.11	1.59c	3.78c	29.53b
80	111.3b	32b	26.42b	5.58	4.76b	98.78b	4.29b	3.2	1.89b	4.17b	31.13a
100	115.2a7	43.42a	36.92a	6.5	4.93a	102.75a	4.09b	3.27	2.07a	4.29a	32.48a
S_x	0.79	0.7	0.68	0.34	0.06	0.79	0.16	0.08	0.04	0.04	0.52
Level of significance	**	**	**	NS	**	**	**	NS	**	**	**
CV (%)	2.50	7.37	8.76	19.41	4.22	4.82	11.81	8.61	7.7	3.49	5.91

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** = Significant at 1% level of probability

NS = Not significant

Interaction effect date of sowing and nitrogen level

Interaction of date of sowing and nitrogen level significantly influenced all the parameters except number of sterile seeds capsule^{-1} and 1000-seed weight (Table 3). Sowing on 1 March and 100 kg N ha^{-1} interacted favorably to give the highest number of effective capsules plant^{-1} (66.67) and number of seeds capsule^{-1} (116.43) which ultimately resulted in the highest seed yield (2.3 t ha^{-1}) and was similar to those obtained from the same date of sowing combined with 80 kg N ha^{-1} and 15 March sowing combined with 80 kg N ha^{-1}. On the other hand the combination of 1 March sowing and 80 kg N ha^{-1} performed the best in respect of highest stover yield (4.7 t ha^{-1}).

TABLE 3. Interaction effect of date of sowing and nitrogen level on different plant characters of sesame

Interaction (Date of sowing x N level	Plant height (cm)	Total capsules plant^{-1} (no.)	Effective capsules plant^{-1} (no.)	Non-effective capsules plant^{-1} (no.)	Capsule length (cm)	Seeds capsule^{-1} (no.)	Sterile seeds capsule^{-1} (no.)	1000-seed weight (g)	Seed yield (t ha^{-1})	Stover yield (t ha^{-1})	Harvest Index (%)
D_1N_1	93.5f	32.33f	24.33f	8b-c	4.53de	80.98f	5.23	3.4	1.4gh	3.2g	30.42
D_1N_2	91.21f	40.33e	29.001e	1.33a	5.07c	78.69f	4.57	3.45	1.67d-f	3.6f	31.64c-e
D_1N_3	95.5f	43de	32.001de	1a	5.13c	82.98f	4.63	3.59	1.9b-d	3.93c-e	32.58a-d
D_1N_4	95.51f	64.67b	52.331b	2.33a	5.33bc	82.99f	4.24	3.58	1.93bc	4.47b	30.19a-d
D_2N_1	110d	48.67c	40.33c	8.33b	4.73d	97.5d	3.46	3.27	1.6e-g	3.73d-f	30c-e
D_2N_2	121.6b	42.33e	34.67d	7.67b-d	5.37bc	109.17b	4.28	3.3	1.7c-e	4.13c	29.09c-e
D_2N_3	128.3a	47cd	41.33c	5.67d-f	5.53b	115.86a	3.41	3.4	2.1ab	4.7a	30.8d-f
D_2N_4	128.9a	72a	66.67a	5.33ef	5.93a	116.43a	3.11	3.52	2.3a	4.43b	34.14b-d
D_3N_1	108d	15ij	13h	2h	4.27ef	95.56d	6.18	2.85	1.4gh	3.27g	30.01ab
D_3N_2	109.3d	21gh	18g	3gh	4.43de	96.86d	6.09	2.94	1.6e-g	3.7ef	30.19c-e
D_3N_3	116.2c	21.33g	19.33g	2h	4.47de	103.76c	4.67	2.92	2.13ab	3.97cd	34.96c-e
D_3N_4	122b	20gh	17.67g	2.33h	4.47de	109.51b	4.78	3.09	2b	4.13c	32.62a
D_4N_1	101de	12.33j	8.33i	4e-h	3.63h	88.54e	5.86	2.4	1.17h	3.27g	26.29a-c
D_4N_2	105.3de	15.33ij	10.67hi	4.67e-g	3.77gh	92.84de	5.74	2.77	1.38gh	3.7ef	27.21f
D_4N_3	105de	16.67h-ij	13h	3.67f-h	3.9gh	92.52de	4.47	2.88	1.44fg	4.07c	26.19ef
D_4N_4	114.5c	17g-i	11hi	6c-de	4fg	102.06c	4.23	2.89	2.03b	4.13c	32.96f
S_x-	1.58	1.41	1.36	0.68	0.11	1.58	0.32	0.16	0.08	0.08	1.04a-c
Level of significance	**	**	**	**	**	**	NS	NS	**	**	**
CV (%)	2.50	7.37	8.76	19.41	4.22	4.82	11.81	8.61	7.7	3.49	5.91

In a column figurers with same letter or without letter do not differ significantly whereas figures with dissimilar letter differ significantly (as per DMRT)

** = Significant at 1% level of probability
NS = Not significant

D_1= 15 February sowing
D_2= 1 March sowing
D_3= 15 March sowing
D_4= 30 March sowing

N_1= 40 kg N ha^{-1}
N_2= 60 kg N ha^{-1}
N_3 = 80 kg N ha^{-1}
N_4= 100 kg N ha^{-1}

Conclusion

From the present study, it may be concluded that under the agro-climatic condition of Mymensingh region, it is better to sow sesame within 1 to 15 March and 80-100 kg N ha^{-1} appears to be enough for obtaining higher seed yield from BINA til-1. However, further studies are to be carried out under different agro-climatic condition across the country to go for recommendation.

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