EFFECT OF SOWING DATE AND TIME OF HARVESTING ON THE YIELD AND YIELD CONTRIBUTING CHARACTERS OF SESAME (*Sesamum indicum* L.) SEED

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ABSTRACT

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An experiment was carried out at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh, during the period from February to June 1999 to investigate the effect of sowing date and time of harvesting on the yield and yield contributing characters of sesame seed (Sesamum indicum L.). The experiment consisted of three sowing dates viz., 26 February, 10 March and 22 March and four harvesting times viz., harvesting at 30, 35, 40 and 45 days after flowering (DAF). The experiment was laid out in a split-plot design accommodating sowing date in the main plots and time of harvesting in the sub-plots with three replications. The highest plant height, number of branches plant^{-1}, capsules plant^{-1}, seeds capsule^{-1}, seed yield (kg ha^{-1}) and stover yield (kg ha^{-1}) were obtained from the crop sown on 26 February. Most of these characters were statistically identical to 10th March sowing except plant height, number of branches and capsule plant^{-1} but all of them were recorded significantly lowest in 22 March sowing compared to first sowing. The highest seed yield (251.30kg ha^{-1}) was obtained in 26 February sowing and thereafter reduced with delay in sowing. Harvesting time had also significantly affected plant height, number of branches plant^{-1}, capsule branch^{-1}, capsule plant^{-1}, seeds capsule^{-1}, weight of 1000 seeds, seed yield (kg ha^{-1}) and stover yield (kg ha^{-1}). The results also indicated that the sesame variety T6 produced the highest seed yield when sown on 26 February and harvested at 40 DAF.

Key words: Sowing date, harvesting time, yield contributing characters, sesame variety T6

INTRODUCTION

Sesame *(Sesamum indicum* L.) is one of the important oil crops widely grown in different parts of the world. Among various oil crops grown in Bangladesh sesame ranks next to mustard in respect of both cultivated area and production. Sesame is grown almost all regions in Bangladesh. In 1997-1998 the crop covered an area of 80 thousand hectares in Bangladesh with an average yield of 49 thousand tons (BBS, 1998). The crop is grown in both summer and winter seasons in Bangladesh. The summer sesame covers about two thirds of the total area of Bangladesh (Kaul and Das, 1986, BAR!, 1994).

Sesame is a short day plant and flowers in 42-45 days when exposed to 10 hour day length (Weiss, 1983). The climatic and edaphic conditions of Bangladesh are quite suitable for cultivation of sesame crop. The crop is cultivated either as a pure stand or as a mixed crop with aus rice, jute, groundnut, millets and sugarcane. Sesame is a diversified crop with high class edible oil having versatile usage. Sesame oil is used mostly for edible purposes and in confectionery and for illumination (Martin and Leonard, 1964). It is also used for other purposes, such as, in manufacture of margarine, soap, paint, perfumery products and of pharmaceutical as an ingredients for drugs and as dispersing agent for different kinds of insecticide (Cobley, 1967, Masefie1d, 1965: McIlroy, 1967: Tribe 1967). The sesame oilcake is a very good cattle feed since it contains protein of high biological value and appreciable quantities of phosphorus and potash.

Bangladesh faces an acute shortage of edible oil. As a result, she has to import edible oil from different countries of the world at the cost of huge amount of foreign exchange. Sesame yield is very low 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 time of sowing (Cane, 1949). The effect of photoperiodism on sesame has been thoroughly studied, since this is a major factor influencing seed yield but no studies are reported regarding the optimum sowing time. Research works are limited on sowing dates and time of harvesting in sesame. Therefore, the present study was undertaken to find out optimum sowing time and harvesting time to get high yield of sesame seed.

MATERIALS AND METHODS

A field experiment was carried out in the non Calcareous Dark Grey floodplain soil (Sonatala Series) at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh, during the period from February to June 1999. The treatment included three sowing dates viz, 26 February, 10 March and 22 March @ 8kg seeds ha^{-1} and four harvesting times, namely harvesting at 30,35, 40 and 45 days after flowering(DAF). The experiment was laid out in a split-plot design with three replications, sowing date in the main plots and harvesting time in the sub-

plots. Sesame cv T6 was used for experiment. Urea, triple super phosphate, muriate of potash, gypsum and zinc sulphate @ 125, 150, 50, 110 and 5 kg ha^{-1}, respectively. The total doses of triple super phosphate, muriate of potash, gypsum and zinc sulphate along with half of urea were applied during final land preparation. The rest of urea was applied as top dressing at 35 days after sowing. Intercultural operations were done as and when necessary. Ten plants were selected randomly for recording necessary agronomic data on i) plant height, ii) number of branches $plant^{-1}$, iii) number of capsules $branch^{-1}$, iv) number of capsules $plant^{-1}$, v) number of seeds $capsule^{-1}$, vi) 1000 seeds weight vii) seed yield viii) stover yield. Data on yield and yield components were analyzed statistically and means were tested by Duncan's New Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Plant height

The effect of sowing date on the plant height was highly significant and the results have been shown in Table 1. The tallest plant (90.47cm) was obtained in 26 February sowing which was statistically superior to 10 March sowing (86.73cm) as well as 22 March sowing (83.12cm). Increment in plant height was faster at early sowing and thereafter it was slower from 26 February sowing and continued up to 22 March sowing were statistically different. Mulkey *et al.* (1987) also reported that delayed sowing affected plant height. The time of harvesting had significant influence on plant height. The highest plant height (94.8Icm) was obtained when the crop was harvested at 40 days after flowering (DAF) which was statistically similar to harvested at 45 DAF. The shortest plant height (71.16cm) was obtained when the crop was harvested at 30 DAF (Table 2).

Number of branches $plant^{-1}$

The highest number of branches $plant^{-1}$ (5.20) was obtained in 26 February sowing which was statistically different from 10 and 22 March sowing (4.68 and 4.48) (Table 1). It was found that the number of branches $plant^{-1}$ decreased from 26 February to 22 March sowing. Tilak *et al.* (1971) reported that delay in sowing decreased the number of branches $plant^{-1}$. This lower branching in delayed sowing may be due to environmental effect. The highest number of branches $plant^{-1}$ (5.42) was produced when harvested at 40 DAF which were statistically identical when harvested at 45 DAF. The lowest number of branches $plant^{-1}$ (3.83) was obtained at 30 DAF may probably caused due to sesame continues its apical growth until optimum time of maturity. The number of branches $plant^{-1}$ was found to be less at 30 DAF than at 45DAF harvest which were statistically dissimilar (Table 2). The interaction effect of sowing date and time of harvesting showed significant variation on the number of branches $plant^{-1}$ (Table 3). The highest number of branches $plant^{-1}$ (5.49) was obtained at 40 DAF. The lowest number of branches $plant^{-1}$ (3.10) at 30 DAF. They were statistically different. These results revealed that 26 February sowing appeared to be the best sowing date for sesame.

Number of capsules $branch^{-1}$

Sowing dates had no significant influence on number of capsules $branch^{-1}$. Data revealed that the number of capsules $branch^{-1}$ was statistically significant by time of harvesting. The highest number of capsules $branch^{-1}$ (7.02) was observed when the crop was harvested at 40 DAF which was statistically identical to crop harvested at 35 and 45 DAF. The lowest number of capsules $branch^{-1}$ (4.50) was found from 1st harvest (30 DAF) which was statistically dissimilar when harvested at 35, 40 and 45 DAF (Table 2). However, number of capsules $branch^{-1}$ was not significantly affected by the interaction between sowing date and time of harvesting. Numerically, the highest number of capsules $branch^{-1}$ (7.15) was obtained at 40 DAF. The lowest number of capsules $branch^{-1}$ (4.00) was obtained at 30 DAF (Table 3).

Number of capsules $plant^{-1}$

The highest number of capsules $plant^{-1}$ (45.82) was obtained 26 February sowing and the lowest number of capsules $plant^{-1}$ (38.72) was obtained in 22 March sowing. It was observed that the number of capsules $plant^{-1}$ decreased markedly up to 22 March sowing. Tilak *et al.* (1971) also reported that the number of capsules $plant^{-1}$ decreased with delay in sowing. The harvesting time influenced the significantly the number of capsules $plant^{-1}$. The highest number of capsules $plant^{-1}$ (45.26) was produced when the crop was harvested at 40 DAF which was statistically identical to the crop harvested at 45 DAF and the lowest number of capsules $plant^{-1}$ (36.08) was produced when the crop was harvested at 30 DAF (Table 2). There was no significant interaction effect between sowing date and time of harvesting on the number of capsules $plant^{-1}$. The results indicate that 26 February is the optimum sowing time for sesame to have higher number of capsules $plant^{-1}$ and harvesting at 40 DAF (Table 3).

Number of seeds $capsule^{-1}$

The highest number of seeds $capsule^{-1}$ (58.24) was obtained in 26 February. The lowest number of seeds $capsule^{-1}$ (52.83) was obtained in 22 March sowing which was statistically different. The number of seeds $capsule^{-1}$ (55.70)

obtained from 10 March sowing as well as the number of seeds capsule^{-l} (52.83) produced in 22 March sowing was statistically similar (Table 1) but the later was significantly different from 26 February sowing. The highest number of seeds capsule^{-1} (59.31) was produced when the crop was harvested at 40 DAF and the lowest number of seeds (49.68) was produced when the crop harvested at 30 DAF. It was observed that the number of seeds capsule^{-l} increased progressively from the crop harvested at 30 up to 40 DAF and thereafter reduced when the crop was harvested at 45 DAF (57.27) (Table 2). The reduction the number of seed might be due to shattering of capsule as a result of allowing the crop even after maturity in the field. Similar result was also reported by Mondal *et al.* (1995).This result suggests that delayed harvesting reduced the number of seeds capsule^{-l}. Number of seeds capsule^{-l} was not significantly influenced by the interaction between sowing date and time of harvesting (Table 3).

1000 seeds weight

The maximum weight of 1000 seeds (2.54 g) was obtained when the crop was harvested at 40 DAF and minimum (1.19 g) at 30 DAF. Harvesting at 30 DAF, 35 DAF and 40 DAF produced statistically different results. The 1000 seeds weight increased with delay in harvesting up to 40 DAF. The crop harvested at 40 DAF gave the statistical1y similar weight of 1000 seeds as that of crop harvested at 45 DAF (Table 2). The maximum weight of 1000 seeds was observed when the crop was harvested at 40 DAF and it might be due to optimum maturity and accumulation of maximum dry matter. The minimum weight of 1000 seeds was produced when the crop was harvested at 30 DAF. It might be due to immaturity of the seeds. Interaction of sowing date and time of harvesting had no significant effect on 1000 seeds weight (Table 3). This result suggests that 26 February sowing as optimum for weight of 1000 seeds with harvesting the crop at 40 DAF.

Seed yield (kg ha^{-l})

The highest seed yield (251.30 kg ha^{-l}) was obtained in 26 February which was statistically identical with 10 March sowing (244.60 kg ha^{-l}). The lowest (238.80 kg ha-I) was obtained in 22 March sowing which was statistically similar with 10 March sowing (Table I). It was observed that almost 25 days earlier sowing on 26 February than from 22 March the seed yield increased. Ashtana and Narain (1977) also reported that the highest seed yields were obtained when sown on 15 February and yields were decreased with delay in Sowing. The higher seed yield produced in 26 February was mainly due to production of higher number of branches, capsules plant^{-l} and maximum number of seeds capsule^{-l}. The highest seed yield (313.00 kg ha^{-l}) was produced at 40 DAF and the lowest seed yield (155.10 kg ha^{-l}) was produced at 30 DAF (Table 2). The results indicate that 26 February sowing is the optimum sowing date for sesame to have maximum seed yield.

Stover yield (kg ha^{-l})

The maximum straw yield (1615.33 kg ha^{-l}) was found in 26 February and the minimum straw yield (1371.58 kg ha^{-l}) was obtained in 22 March (Table 1).Early sowing produced taller plants and more number of branches that resulted greater straw yields. This was again due to the production number of branches and increased vegetative growth of plant for favorable weather conditions. Suryavanshi *et al.* (1993) also reported that early sowing significantly increased stover yield. It was observed that straw yield was progressively and significantly increased due to different days after harvesting until 40 DAF, and then the yield was almost leveled. The highest straw yield (1635.44 kg ha^{-l}) was in 40 DAF and then decreased in 45 DAF due to senescence and shedding of leaves. The lowest straw yield (1226.66 kg ha^{-l}) was obtained in 30 DAF (Table 2).

Table 1 Effect of sowing date on seed yield and its components of sesame seed

Sowing date	Plant height (cm)	Number of branches plant^{-1}	Number of capsules branch^{-l}	Number of capsules plant^{-1}	Number of seeds capsule^{-1}	Weight of 1000 seeds (g)	Seed yield (kg ha^{-l})	Stover yield (kg ha^{-l})
26 February	90.47a	5.20a	6.30	45.82a	58.24a	2.05	251.30a	1615.33a
10 March	86.73b	4.68b	6.18	41.59b	55.70ab	2.03	244.60ab	1512.25ab
22 March	83.12c	4.48c	5.92	38.72b	52.83b	2.02	238.80b	1371.58b
Level of significance	0.05	0.01	NS	0.05	0.05	NS	0.05	0.05

In a column, the figures having similar letter(s) are identical and those having dissimilar letter(s) differed significantly (as per DMRT), NS = Not significant

Table 2 Effect of time of harvesting on seed yield and its components of sesame seed

Time of harvesting	Plant height (cm)	Number of branches plant^{-1}	Number of capsules branch^{-1}	Number of capsules plant^{-1}	Number of seeds capsule^{-1}	Weight of 1000 seeds (g)	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})
30 DAF	71.16c	3.83c	4.50b	36.08c	49.68c	1.19c	155.10c	1226.66c
35 DAF	86.33b	4.47b	6.00a	41.60b	56.11b	1.87b	206.30b	1503.33b
40 DAF	94.81a	5.42a	7.02a	45.26a	59.31a	2.54a	313.00a	1635.44a
45 DAF	94.80a	5.41a	7.01a	45.25a	57.27a	2.53a	305.20a	1633.45a
Level of significance	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

In a column, the figures having similar letter(s) are identical and those having dissimilar letter(s) differed significantly (as per DMRT), NS = Not significant, DAF = Days after flowering.

Table 3 Effect of interaction between sowing date and time of harvesting on seed yield and its components

Time of harvesting	Plant height (cm)	Number of branches plant-^{1}	Number of capsules branch^{-1}	Number of capsules plant^{-1}	Number of seeds capsule^{-1}	Weight of 1000 seeds (g)	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})
$D_1 H_1$	75.81	4.65b	4.80	41.17	51.49	1.19	161.49	1336.66
$D_1 H_2$	89.61	5.16a	6.10	45.67	58.58	1.88	211.99	1626.67
$D_1 H_3$	98.23	5.49a	7.15	48.23	62.67	2.56	321.77	1750.00
$D_1 H_4$	98.22	5.48a	7.14	48.22	60.21	2.55	310.01	1748.00
$D_2 H_1$	70.33	3.74c	4.70	34.56	49.83	1.18	154.18	1250.00
$D_2 H_2$	86.40	4.13c	6.01	41.00	56.40	1.86	206.03	1533.33
$D_2 H_3$	95.10	5.42a	7.01	45.40	59.26	2.54	312.47	1633.33
$D_2 H_4$	95.09	5.41a	7.00	45.40	57.32	2.53	305.80	1630.36
$D_3 H_1$	67.33	3.10d	4.00	32.50	47.73	1.17	149.68	1093.33
$D_3 H_2$	82.97	4.12c	5.90	38.13	53.33	1.86	208.84	1350.00
$D_3 H_3$	91.10	5.35a	6.90	42.13	56.00	2.52	304.84	1523.00
$D_3 H_4$	91.10	5.35a	6.89	42.13	54.27	2.52	299.90	1520.00
Level of significance	NS	0.01	NS	NS	NS	NS	NS	NS

D_1 = 26 February sowing, D_2 =10 March sowing, D_3 =22 March sowing, H_1= Time of harvesting at 30 days after flowering, H_2 = Time of harvesting at 35 days after flowering, H_3 = Time of harvesting at 40 days after flowering, H_4= Time of harvesting at 45 days after flowering

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