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Yield Performance of Sesame *(Sesamum Indicum* L.) Varieties at Varying Levels of Row Spacing

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Abstract: A field experiment was conducted in the Field Laboratory of Agrotechnology Discipline in Khulna University to evaluate the effect of row spacing on the yield and yield contributing characters of sesame during *Kharif* season, 2007; using the varieties (V1 = T6, V2 = Batiaghata local Til and V3 = BINA Til) and the row spacings (S1 = 15 cm, S2 = 30 cm and S3 = 45 cm). Yield were significantly influenced by the varieties and row spacings. The highest seed yield was produced by the variety BINA Til while the lowest was by the variety Batiaghata local Til and the highest seed yield was produced by row spacing 30 cm while the lowest was by row spacing 45 cm. Seed yield was well correlated with capsules plant^{-1} and seeds capsule^{-1}.

Key words: sesame varieties, row spacing, yield.

INTRODUCTION

Sesame *(Sesamum indicum* L.) is one of the most ancient oilseed crops[3,4] of the world. It is the second largest source of edible oil in Bangladesh next to *Brassica* both in respect of acreage and production[2]. It occupies 80,000 ha of land and produces 49,000 tons of sesame[20]. Its seed contains about 50% edible oil of high quality.

The average yield level of sesame (500-600 kg ha^{-1}) in Bangladesh is quite low[11]. The low average yield of the crop might be due to cultivation of low yielding traditional varieties and poor management practices. But yield can be improved up to 1000 - 1200 kg ha^{-1} under systematic cultivation[1].

Row spacing is one of the important components of systematic cultivation and manipulation of that could increase yield performance.

Due to proper space plant can gain sufficient sunlight, water and nutrition from soil which can influence healthy yield of plant[9,12]. In densely populated sesame fields, the intraspecific competition between the plants is high resulting in lower grain yield. On the contrary, sparsely populated fields with wider spacing could lead to uneconomic utilization of space, profuse growth of weeds and pests and reduction of yield per unit area.

Keeping the views like inter-plant competition for optimum plant nutrients, sun light, moisture and aeration in mind, it may be required to find out a fair combination of row spacing to achieve maximum yield under certain agroclimatic conditions. Hence, this study was designed to see the effect of row spacing on yield components and yield of three sesame cultivars under the agro-ecological conditions of Khulna.

MATERIALS AND METHOD

The experiment was conducted during Kharif season at the experimental field of Agrotechnology discipline of Khulna University, Khulna. The experimental location experiences a sub-tropical climate. The experiment consisted of sesame varieties: i) T6 (V1), ii) Batiaghata local Til (V2) & iii) BINA Til (V3) and of row spacings: i) 15 cm (S1), ii) 30 cm (S2) & iii) 45 cm (S3).

The experiment was laid out in a double factor randomized complete block design (RCBD) with three replications where each unit plot was 3 m × 2 m with 27 treatments. The distance between two adjacent unit plots and that of blocks were 0.25 m and 0.75 m, respectively.

The experimental plots were fertilized with poultry litter @ of 3 t ha^{-1} during the land preparation and fertilizers @ 60 kg N, 175 kg $_{P205,}$ 60 kg K20 & 120 kg gypsum per hectare respectively, were also applied. Additional quantity of 60 kg N per hectare was top-dressed during flower initiation in the form of urea.

Seeds were sown on April 18, 2007 in solid lines with plant spacings 15 cm × 10 cm, 30 cm × 10 cm, 45 cm × 10 cm. Seeds were placed at 2 cm soil depth being covered with loose soil properly. The seedling emerged between April 23-25, 2007. Missing hills were sown with seeds to maintain desired plant population.

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Weeding followed by thinning was done at 12 days of emergence and 20 days after emergence. Irrigation was done at 2 days after sowing to facilitate germination of seeds and before flowering in order to maintain adequate moisture in the field. Some of the experimental plots were attacked by stink bug, mainly the plots of the variety T6. To control the bugs insecticide Malathion 57 EC was applied twice @ 0.2%. At maturity (when about 80% of capsules turned brown colour) the experimental crop was harvested variety-wise.

The collected data were analyzed statistically by using analysis of variance (ANOVA) technique with the help of computer package MSTAT-C. The mean differences among the treatments were compared by Duncan's Multiple Range Test (DMRT)[7]. Functional relationships were developed between yield and yield attributes by using simple regression analysis.

RESULTS AND DISCUSSIONS

Yield of sesame varieties at different rowing spacing are discussed in terms of Capsule plant^{-1} and seeds capsules^{-1}. Other yield attributes like Capsule length (cm), 1000 seed weight (g) and seed yield plant^{-1} (g) are also measured.

Capsule Plant^{-1}: The variety T6 produced the highest number of capsules plant^{-1} (65.56) and the variety BINA Til produced the lowest number of capsules plant^{-1} (56.40). These results are in agreement with that of[10,15,16]. They reported that the number of capsules plant^{-1} varied significantly in different cultivars.

Narrow spacing (15 cm) gave the lower number of capsules plant^{-1} (39.27). Maximum number of capsules plant^{-1} (76.89) was recorded in the highest spacing (45 cm). This increase in capsule number plant^{-1} might be attributed to wider row spacing and less inter or intra plant competition in the community. Similar trend in number of capsules plant^{-1} in sesame was reported in[19]. Singh and Yadav also reported an increase in pods plant^{-1} due to increase in row spacing in field peas[14].

However, the highest number of capsules plant^{-1} (82.00) was recorded in the highest spacing (45 cm) with the variety T6. The lowest number of capsules plant^{-1} (34.70) was obtained in the lowest spacing (15 cm) with the variety BINA Til. This reduction might be due to extreme limitation of spacing and leaves (sink) for the formation and development of capsules. Similarly the results of other yield attributes can be described from the Table 1.

Seeds Capsules^{-1}: Number of seeds capsule^{-1} was significantly influenced by varieties. The variety BINA Til produced the highest number of seeds capsule^{-1} (86.16) and the variety Batiaghata local Til produced the lowest number of seeds capsule^{-1} (61.41). These findings corroborated with those reported in[10]. Das *et al.* reported that MM 7 (Mutant) produced the highest number of seeds pod^{-1} (29.2) followed by MM 20 (Mutant) (28.0) and BINA Sharisha 4 (27.8) at Dinajpur[6]. Variable effect of varieties on seeds capsule^{-1} in sesame plant was also reported by Begum *et al.*[5].

The number of seeds capsule^{-1} varied significantly by different row spacing. The widest row spacing (45 cm) produced the highest number of seeds capsule^{-1} (82.46) and the narrowest (15 cm) row spacing produced the lowest number of seeds capsule^{-1} (62.11). Decrease in row spacing increased intraspecific competition which eventually caused reduction in the number of seeds capsule^{-1}. In[17] the authors found that with the increase of row spacing number of seeds capsule^{-1} decreased.

The interaction of variety and row spacing on the number of seeds capsule^{-1} was significant (Table 1). The interaction of the highest row spacing (45 cm) with the variety BINA Til resulted in the highest number of seeds capsule^{-1} . This might be attributed to the less competition for assimilate during seed development. The interaction of the lowest row spacing (15 cm) with the variety Batiaghata local Til resulted in the lowest number of seeds capsule^{-1}. This might be attributed to the more competition for assimilate during seed development.

Capsule Length (cm): The variety BINA Til produced longer capsule (3.15 cm) and the variety Batiaghata local Til produced shorter capsule (2.00 cm). The longest capsule (2.64 cm) was obtained from 45 cm row spacing and the shortest capsule (2.37 cm) was obtained from 15 cm row spacing. The interaction of variety and row spacing had significant effect on the length of capsule (Table 1). The maximum length of capsule (3.26 cm) was recorded in highest spacing (45 cm) with the variety BINA Til and the lowest length of capsule (1.82 cm) was obtained in the lowest spacing (15 cm) with the variety Batiaghata local Til.

1000 Seed Weight (g): The variety T6 and BINA Til produced heavier seeds (2.98 g) and the variety Batiaghata local Til produced lighter seeds (2.97 g). Different row spacings significantly influenced 1000 seed weight in sesame. The highest 1000 seed weight (2.99 g) was recorded in the widest spacing (45 cm). The lowest 1000 seed weight (2.97 g) was found in the lowest (15 cm) and medium row spacing (30 cm) which was statistically different from the highest row spacing effect. Decrease in row spacing increased intra-

Table 1: Interaction effect of variety and row spacing on yield and yield contributing characters of sesame

Variety × row spacing	Capsules Plant^{-1}	Length of Capsule (cm)	Seeds Capsule^{-1}	1000 seed weight (g)	Seed yield plant^{-1} (g)	Seed yield (t ha^{-1})	Biological yield (t ha^{-1})	HI (%)
V_1S_1	43.56	2.23f	60.48g	2.80g	5.71f	1.48c	10.42a	25.94e
V_1S_2	70.87	2.32e	75.82d	2.90d	12.11c	1.52b	9.42b	29.24d
V_1S_3	82.24	2.46d	83.26c	3.11a	16.08a	1.42e	8.14c	24.19f
V_2S_1	39.56	1.82i	50.67h	2.77h	4.21g	1.41e	7.64d	22.28g
V_2S_2	65.88	2.01h	64.07f	2.84f	9.09e	1.45d	7.20e	24.09f
V_2S_3	76.00	2.18g	69.48e	2.98c	11.38d	1.34f	6.22h	20.95h
V_3S_1	34.70	3.05c	75.17d	2.81g	5.52f	1.51b	6.70f	32.04b
V_3S_2	62.07	3.14b	88.68b	2.88e	12.34c	1.54a	6.43g	35.09a
V_3S_3	72.44	3.26a	94.63a	3.00b	15.58b	1.46cd	5.79i	30.45c
Level of significance	NS	0.01	0.01	0.05	0.01	0.01	0.01	0.01
CV (%)	1.58	0.82	0.75	0.27	0.17	0.29	0.47	0.40

V1 = T6 NS = Non-significant
V2 = Batiaghata local Til V3 = BINA Til
S1 = 15 cm S2 = 30 cm S3 = 45 cm

specific competition which eventually caused reduction in yield attributes. The interaction of the highest row spacing (45 cm) with the variety T6 resulted in the highest weight of 1000 seeds (3.11 g). The interaction of the lowest row spacing (15 cm) with the variety Batiaghata local Til resulted in the lowest weight of 1000 seeds (2.77 g).

Seed Yield Plant^{-1} (g): Seed yield in sesame is a function of capsule length, capsules plant^{-1} and seeds capsule^{-1} [8,13]. It was observed that there was significant difference in seed yield plant^{-1} among the varieties tested. The variety T6 produced the highest seed yield plant^{-1} (11.30 g) and the variety Batiaghata local Til produced the lowest seed yield plant^{-1} (8.22 g). Lower spacing (15 cm) gave lower seed yield plant^{-1} (5.14 g). Higher seed yield plant^{-1} (14.35 g) was recorded in the highest spacing (45 cm). Low row spacing reduced seed yield plant^{-1} due to inter and intra plants competition for necessary resources required for growth and development of seed. The interaction effect of variety and row spacing on the seed yield plant^{-1} was significant (Table 1). The highest seed yield plant^{-1} (16.08 g) was recorded in the highest spacing (45 cm) with the variety T6.

The lowest seed yield plant^{-1} (4.21 g) was obtained in the lowest spacing (15 cm) with the variety Batiaghata local Til.

Seed yield plant^{-1} (g) showed a positive and linear relationship with capsules plant^{-1} (Fig. 1). The higher value of R2 (R2 ő 0.832) suggests that 83% of the variations in seed yield plant^{-1} could be explained by the variation in capsule number plant^{-} 1.

Seed yield plant^{-1} (g) when plotted against seeds capsule^{-1} yielded a straight line. This suggests that seed yield plant^{-1} (g) is dependent on seeds capsule^{-1} and more than 65% (R2 ő 0.6701) of the variation in seed yield plant^{-1} could be defined by variation in seeds capsule^{-1} (Fig. 2).

4. Conclusion: It could be concluded that higher seed yield of sesame could be obtained by using BINA Til sowing at 30 cm row spacing under the agroclimatic conditions of Khulna. The experiment was, however, conducted for only one season and hence the results be considered as tentative.

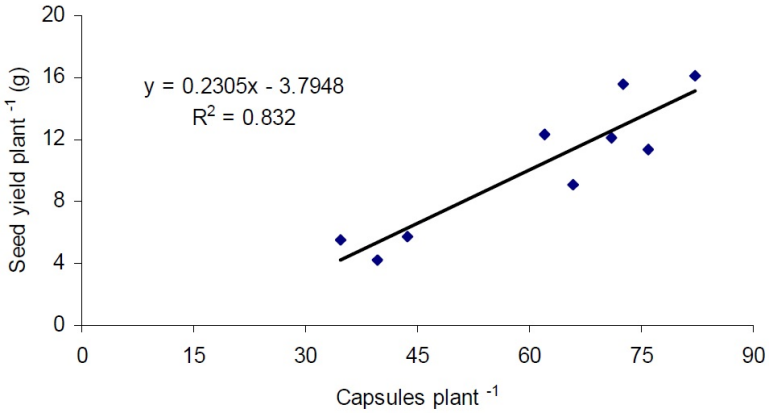

Fig. 1: Functional relationship between capsules plant^{-1} and seed yield plant^{-1} (g).

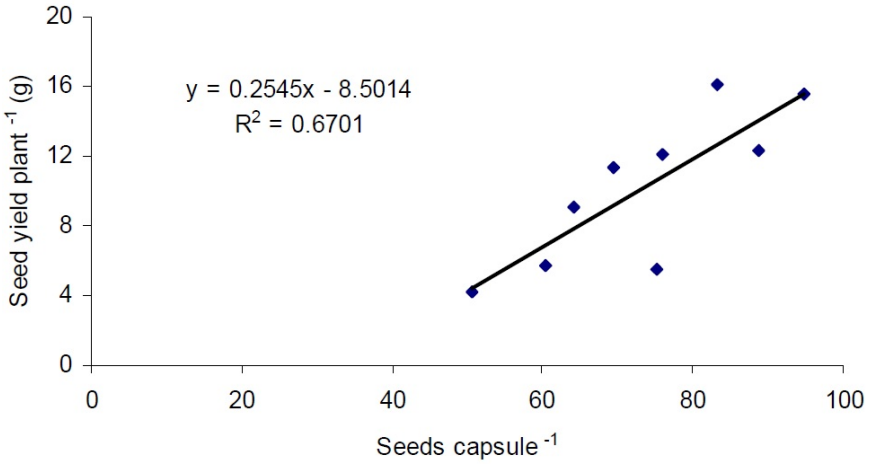

Fig. 2: Functional relationship between seeds capsule^{-1} and seed yield plant^{-1} (g)

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