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Effect of variety and sulphur on the yield and seed quality of sesame

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Abstract

An experiment was conducted at the Agronomy Field Laboratory of Bangladesh Agricultural University (BAU), Mymensingh during February to May 2005 with a view to studying the effect of variety and sulphur on the seed yield, oil content and protein content of sesame. The experiment consisted of three sesame varieties (BINA Til-1, BARI Til-2 and Local) and four sulphur levels (0, 9, 18 and 27 kg S ha^{-1}). The experiment was laid out in a randomized complete block design with three replications. The result showed significant variations among the varieties for all the studied crop characters. The highest seed yield, stover yield, oil content and harvest index was recoded with BINA Til-1 and the lowest performance was with local variety. Sulphur fertilization showed significant influence on the studied plant characters except length of capsule, 1000-seed weight and stover yield. The highest seed yield, oil content and protein content were achieved from the application of 27 kg S ha^{-1} which was not significantly different from that of 18 kg S ha^{-1}. On overall consideration, the best performance with respect to seed yield, oil and protein content was obtained from the combination of BINA Til-1 and application of 18 kg S ha^{-1}.

Keywords: Sesame, Yield, Seed quality, Sulphur

Introduction

Sesame (*Sesamum indicum* L.) is one of the important oil seed crop in Bangladesh and it has an area coverage of 38,900 hectares (BBS, 2006). The local production of edible oil meets only 19% of the country's demand (Nag, 2005). The average yield level of sesame is below than that of other countries. Suitable variety and optimum fertilizer management can play an important role for maximizing sesame yield. Many researchers have observed positive response of sesame to S application. Sulphur deficiency of soils and crops is widespread in Bangladesh. Further, oil seed crops are sensitive to S deficiency. Generally, the farmers grow the traditional variety of sesame with imbalanced sulphur fertilization. The yield potentiality of sesame can be increased through adoption of high yielding varieties (HYV) and balanced sulphur fertilization. Information regarding yield potentials of high yielding varieties of sesame and their S requirement in Old Brahmaputra Floodplain Soil is meagre. The present study was therefore carried out to determine the suitable variety of sesame with their S requirement for cultivation in the Old Brahmaputra Floodplain soil.

Materials and Methods

The experiment was conducted at the agronomy field laboratory of Bangladesh Agricultural University, Mymensingh during February to May 2005. The experimental site belongs to Sonatola soil series under the Old Brahmaputra Floodplain agroecological zone (AEZ 9). Before starting the experiment, initial composite soil samples (0-15 cm depth) were collected from the experimental plots and were analyzed. The soil was silty loam with very organic matter content (1.46%) and slightly acidic in nature (pH 6.7). The N (0.08%) and P (7.0 mg kg^{-1}) contents of the soil were low, but the K (0.13 meq%), S (10 mg kg^{-1}), B (0.19 mg kg^{-1}) and Zn (0.7 mg kg-1) contents were low. The Ca (5.87 meq%) and Mg (2.13 meq%) content were high.

Treatment consisted of three varieties namely BINA Til-1, BARI Til-2 and Local, and four levels of sulphur (0, 9, 18 and 27 kg ha^{-1}). The experiment was laid out in a randomized complete block (RCB) design with three replications. The unit plot size was 4 m x 2.5 m.

The land of the experimental plot was opened with a power tiller and then it was prepared by ploughing and cross ploughing followed by laddering. The weeds and stubble were removed after each laddering. Sulphur fertilizer was applied as per treatment specification. A blanket dose (50-32-25-3-2 kg N P K Zn B ha^{-1}) was applied on high yield goal (HYG) basis for sesame. The full amount of phosphorus, potassium, sulphur, zinc, boron and half of nitrogen were applied at the time of final land preparation in the forms of triple superphosphate, muriate of potash, gypsum, zinc oxide and urea, respectively. Remaining half urea was applied as top dress after 24 days of sowing. Seed was sown on February 26, 2005 in line (20 cm apart with continuous seeding) at the rate of 7 kg ha^{-1} and harvested on May 30, 2005. Two weeding and subsequent thinning were done manually using *niri* at 23 and 38 days after emergence of seedlings. One irrigation was given at vegetative stage (23 days after sowing of seed). Other intercultural operations and plant protection measures were taken as and when required.

The data on crop parameters except seed yield, stover yield, oil and protein content were measured from ten randomly selected plants of the sampling area from each plot. Seed and stover yields were recorded from the total area of each plot. Seed yield per hectare was then calculated on 12.0% moisture basis. The oil contents of three varieties were determined following the method developed of Folch *et al.* (1957). The total nitrogen of grain samples were determined by Kjeldahl method (Bremner and Mulvaney, 1982) and the percentage of protein in grain were calculated by multiplying the standard factor (6.25). The collected data were statistically analyzed by using MSTAT software packages and the mean differences for each character were compared by Duncan's New Multiple Range Test (DMRT).

Results and Discussion

The yield contributing characters of sesame were influenced by varieties are presented in Table 1. It was observed that, all the studied characters differed significantly due to the varieties. Plant characters like plant height, length of capsule bearing area, length of capsule, number of seeds $capsule^{-1}$ and 1000-seed weight obtained from BINA Til-1 were significantly higher over BARI Til-2 except the number of capsules $plant^{-1}$. Kathiresan (2002) also reported the variation on yield attributes and yield between two sesame cultivars. The cumulative effect of these characters contributed to higher seed and stover yields of BINA Til-1, and the next of BINA Til-1, BARI Til-2 showed the yield response. All the plant characters except length of capsule and 1000-seed weight responded significantly to the sulphur application (Table 2). The highest plant height was recorded with 27 kg S ha^{-1} which was identical with 18kg S ha^{-1}. The length of capsule bearing area was statistically identical except control. More or less similar trend of response was observed in case of number of seeds $capsule^{-1}$. The maximum number of capsules $plant^{-1}$ was attained in 27 S kg ha^{-1} which was followed by 18 kg S ha^{-1} and 9 kg S ha^{-1} respectively. The interaction effect of variety and sulphur is presented in Table 3. Except the number of capsules $plant^{-1}$ all other plant characters did not differed significantly for interaction effect of variety and sulphur. The highest number of capsules plant-1 was recorded in BARITil-2 with 27 kg S ha^{-1}.

Table 1. Effect of variety on the yield components, seed yield, oil content and protein content of sesame

Variety	Plant height (cm)	Length of capsule bearing area (cm)	Length of capsule (cm)	No. of capsules $Plant^{-1}$	No. of seeds $apsule^{-1}$	1000-seed weight (g)	Seed yield ($t\ ha^{-1}$)	Stover yield ($t\ ha^{-1}$)	Harvest index (%)	Oil content (%)	Protein content (%)
V_1	119.84a	51.71a	4.22a	39.38b	97.54a	3.13a	1.062a	3.88a	21.41a	48.23a	16.94c
V_2	103.29b	44.01b	2.25b	41.43a	65.08b	2.83b	0.963b	3.83a	19.81b	47.02b	17.67b
V_3	88.81c	31.16c	2.15c	24.57c	41.45c	2.79b	0.484c	2.93b	14.25c	46.40b	18.52a
CV%	6.68	7.46	6.17	9.58	6.79	5.58	5.69	11.58	8.41	7.85	5.84
Level of significance	**	**	**	**	**	**	**	**	**	**	**

In a column, figures having dissimilar latter(s) differ significantly
V_1 = BINA Til-1, V_2 = BARI Til-2, V_3 = Local
**=1% Level of significance

Table 2. Effect of S rates on the yield components, seed yield, oil content and protein content of sesame

Rates of Sulphur	Plant height (cm)	Length of capsule bearing area (cm)	Length of capsule (cm)	No. of capsules $Plant^{-1}$	No. of seeds $capsule^{-1}$	1000-seed weight (g)	Seed yield ($t\ ha^{-1}$)	Stover yield ($t\ ha^{-1}$)	Harvest index (%)	Oil content (%)	Protein content (%)
S_0	101.08c	41.19b	2.83	33.60c	66.29b	2.91	0.778c	3.50	17.75c	44.41c	16.25d
S_1	103.44b	42.11a	2.88	35.13b	67.69ab	2.92	0.831b	3.54	18.38bc	46.86b	17.65c
S_2	105.46a	43.00a	2.89	35.47b	68.84a	2.92	0.860a	3.58	18.66ab	48.69a	18.17b
S_3	105.96a	42.88a	2.91	36.33a	69.28a	2.92	0.877a	3.56	19.17a	48.91a	18.76a
CV%	6.68	7.46	6.17	9.58	6.79	5.58	5.69	11.58	8.41	7.85	5.84
Level of significance	**	**	NS	**	**	NS	**	NS	**	**	**

In a column, figures having similar letter(s) do not differ significantly
S_0=Control (0 kg S ha^{-1}), S_1 = 9 kg S ha^{-1}, S_2 = 18 kg S ha^{-1}. S_3=27 kg S ha^{-1}
NS= Not-significant. **=1% Level of significance

Table 3. Interaction effect of variety and sulphur on the yield components, seed yield, oil content and protein content of sesame

Interaction	Plant height (cm)	Length of capsule bearing area (cm)	Length of capsule (cm)	No. of capsules $Plant^{-1}$	No. of seeds $capsule^{-1}$	1000-seed weight (g)	Seed yield ($t\ ha^{-1}$)	Stover yield ($t\ ha^{-1}$)	Harvest index (%)	Oil content (%)	Protein content (%)
V_1S_0	116.61	50.11	4.17	38.08d	95.09	3.12	0.923d	3.50bc	20.93	45.35	15.01f
V_1S_1	119.54	51.46	4.22	38.52d	97.29	3.14	1.057b	3.95a	21.09	47.64	16.96de
V_1S_2	121.32	52.49	4.23	40.01bc	98.76	3.14	1.131a	4.09a	21.49	49.63	17.71cd
V_1S_3	121.89	52.77	4.26	40.92b	99.02	3.13	1.137a	3.97a	22.13	50.29	18.10c
V_2S_0	100.62	42.87	2.21	38.99cd	63.76	2.80	0.949cd	3.82ab	19.55	44.66	17.52cd
V_2S_1	103.28	43.79	2.25	42.51a	64.78	2.84	0.963c	3.83ab	19.75	46.79	17.61cd
V_2S_2	103.93	44.69	2.27	41.14b	65.76	2.86	0.961c	3.84ab	19.78	48.54	17.74cd
V_2S_3	105.35	44.71	2.28	43.07a	66.03	2.84	0.980c	3.83ab	20.14	48.11	17.80cd
V_3S_0	86.02	30.60	2.12	23.71f	40.03	2.81	0.461f	3.19cd	12.75	43.21	16.24e
V_3S_1	87.49	31.09	2.15	24.35ef	41.01	2.79	0.472f	2.83e	14.31	46.15	18.38bc
V_3S_2	91.12	31.81	2.17	25.25e	41.99	2.78	0.486ef	2.82e	14.71	47.91	19.07b
V_3S_3	90.63	31.15	2.18	24.99ef	42.78	2.79	0.515e	2.87de	15.24	48.33	20.39a
CV%	6.68	7.46	6.17	9.58	6.79	5.58	5.69	11.58	8.41	7.85	5.84
Level of significance	NS	NS	NS	**	NS	NS	**	**	NS	NS	**

In a column, figures having similar letter(s) do not differ significantly
V_1 = BINA Til-1, V_2 = BARI Til-2 and V_3; S_0=Control (0 kg S ha^{-1}), S_1 = 9 kg S ha^{-1}, S_2 = 18 kg S ha^{-1}, S_3=27 kg S ha^{-1}
NS= Not-significant, **=1% Level of significance.

All the yield parameters responded significantly to the varieties of sesame. The highest seed yield was recorded from BINA Til-1 which was followed by BARI Til-2 and the lowest from local variety. More or less similar trend of response was observed in case of harvest index. The highest stover yield was recorded in BINA Til-1 which was identical to BARI Til-2. Seed yield and harvest index responded significantly to the sulphur application but stover yield did not respond. The highest seed yield was recorded in application of 27 kg S ha^{-1} which was identical to 18 kg S ha^{-1}. Seed yield obtained from 27 kg S ha^{-1} was 12.72% higher over control. This result is also in agreement with the findings of Sriramchandrasekharan (2004) who observed that the seed yield of sesame progressively increased with the increasing of S levels. Percent harvest index showed the similar response. Interaction effect of variety and sulphur exerted significant effect on seed yield and stover yield of sesame. The highest seed yield was obtained from BINA Til-1 when 27 kg S ha^{-1} was applied and it was statistically identical to 18 kg S ha^{-1} with the same variety. Similar trend of response also observed in stover yield.

Both the oil and protein content of sesame were significantly influenced due to the varieties. Percent oil content was significantly highest in BINA Til-1 which was followed by BARI Til-2 and the lowest was found in local variety. But the highest protein content was recorded from local variety and the lowest from BINA Til-1. It might be due to positive response of the yield characters and yield in HYV (BINA Til-1) decreased the percentage of protein. Tiwari and Namdeo (1997) also observed the variation among the sesame cultivars with respect to seed yield, seed oil and protein contents. The highest oil content was attained in 27 kg S ha^{-1} which was identical to 18 kg S ha^{-1}. The highest oil content was attained in 27 kg S ha^{-1} was 10.13% higher over control. The maximum protein content was attained in 27 kg S ha^{-1} which was 15.50% higher over control which differed significantly from that of any other level of sulphur. This result was also supported by Tiwari *et al.* (2000) who reported that oil and protein content of seed enhanced with the increasing levels of S. Raja and Sreemannarayana (1998) also reported that the crude protein content and oil content of sesame seed improved with S application. The protein content of sesame was influenced significantly due to interaction effect of variety and sulphur. The maximum protein content was obtained from local variety with 27 kg S ha^{-1} which was followed by 18 kg S ha^{-1} with the same variety. The oil content was insignificant due to interaction effect of variety and sulphur.

Conclusion

From this study it appeared that, variety and S application had significant effect on the yield and yield contributing characters of sesame. Among the tested varieties, the BINA Til-1 performed the best and the application of 18 kg S ha^{-1} was found promising for maximizing yield. Next to BINA Til-1, the BARI Til-2 performed better yield. Therefore, growing BINA Til-1 with the application of S at the rate of 18 kg ha^{-1} would be better for maximizing higher yield and good quality seed of sesame in the Old Brahmaputra Floodplain soil.

References

BBS (Bangladesh Bureau of Statistics). 2006. Statistical Yearbook of Bangladesh. Stat. Div. Minis. Planning, Govt. People's Repub. Bangladesh. p. 52.

Bremner J.M and Mulvaney C.S. 1982. Nitrogen: Total. In Methods of Soil Analysis, Part 2 (2nd edn.). A.L. Page, R.H Miller and D.R Keeney eds; Inc. Soil Sci. Soc. Amer., Inc., Madison, Wisconsin, USA. pp. 595-622.

Folch, Lees M. and Stanley G.H.S. 1957. A simple method for the isolation and purification of total lipids for animal tissues. J. Biol. Chem. 226: 497-509.

Kathiresan G. 2002. Response of sesame (*Sesamum indicum*) genotypes to levels of nutrients and spacing under different seasons. Indian J. Agron. 47(4): 537-540.

Nag B.L. 2005. Improving productivity of *Oleiferous brassica* in saline soil (Ph. D. Dissertation). Dept. Agron. Bangladesh Agricultural University, Mymensingh. p. 2.

Raja A.S. and Sreemannarayana B. 1998. Sulphur in crop production in Southern Telangana Zone of Andhra Pradesh. Fertilizer News. 43(3): 47-56.

Sriramchandrasekharan M.V. 2004. Integrated sulphur management on sesame. J. Interacademicia. 8(2): 187-190.

Tiwari K.P. and Namdeo K.N. 1997. Response of sesame (*Sesamum indicum*) to planting geometry and nitrogen. Indian J. Agron. 42 (2): 365-369.

Tiwari K.P., Namdeo, K.N., Girish J. and Jha G. 2000. Effect of nitrogen and sulphur on growth, yield and quality of sesame (*Sesamum indicum* L.) varieties. Res. Crops. 1(2): 163-167.