EFFECT OF SULFUR ON LATE JUTE SEED PRODUCTION IN DIFFERENT AEZ OF BANGLADESH

M. MONJURUL ALAM[1], A.K.M. MAQSUDUL ALAM[1], S. KHANDKER[1], M.A. ALIM[1] AND SAMIUL HAQUE[1]

Agronomy Division, Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka-1207, Bangladesh.

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ABSTRACT

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A four year field experiment was conducted in Gangachara, Sonatola and Shilmondi soil series of Rangpur, Manikganj and Kishoreganj respectively to asertain the effect of Sulfur (S) fertilizer on late jute seed production with six selective doses S (0, 10, 20, 30, 40 and 50 kg/ha) with the variety O-9897 (*Corcorus olitorius* L.) in three consecutive years. A highly significant effect was observed for plant height, number of pods/plant, pod length, 1000 seed weight and seed yield with the application of increased doses of S fertilizer but no significant effect was observed on plant population, number of branches/plant and number of seeds/pod. However, significant highest seed yield of about 911, 889 and 912g were found with the application of 30, 30 and 40 kg S/ha at Rangpur (AEZ no. 3b), Manikganj (AEZ no. 8d) and Kishoreganj (AEZ no. 8b) respectively.

Key words: ***Sulfur, yield-contributing characters, late jute seed and yield***

INTRODUCTION

Late jute seed production technology is that where jute seed is sown directly in to the field for the production of seed during mid August to mid September and harvested within January of the following year. Seed yield per unit area is the dry matter accumulation in the seeds during their filling period. Moreover, seed yield depends on the response of yield contributing characters such as plant population, plant height, number of branches/plant, number of pods/plant, pod length, number of seeds/pod and weight of 1000 seed. The potential of jute seed crop can be improved through effective manipulations of those yield components, which have positive contribution towards seed yield (Talukder *et al.* 1989). On the other hand, full expression of genetic potentiality of a crop could not be attained unless appropriate management practices are ensured. Fertilizer is one of the most important inputs of management. Seed yield and yield-contributing characters are directly related to the plant growth. The plant growth is directly related to plant nutrition i.e. fertilization. In fact fertilizer alone contributes 50% of yield and the rest from all other factors combined together (Mukherjee 1965). Islam (1988) found that most of the cultivable soils of Bangladesh are deficient in nitrogen, phosphorus, potassium, sulfur, boron, manganese and zinc. Islam (1992) also reported that the soils of different parts of the country are suffering from deficient of S. Jahiruddin *et al.*, (1992) stated that the practice of intensive cropping with high yielding varieties (HYV), low content of soil organic matter, leaching loss of nutrients and sandy soil texture in many areas are likely to favour the emergence of micronutrients deficiency in our soils. Sulphur requirement of seed on an average is quite high in comparison to other nutrients. It plays an important role in seed development. Influence of sulphur is known to hamper N-metabolism in plants as well as synthesis of S-containing amino acid and thus exerts adverse effect on seed yield. Sulphur application not only improves the grain yield but also the quality. This is mainly attributed to its association with S-containing amino acids and quality of proteins. Lack of S containing amino acids is the main factor limiting the biological value of proteins. Application of starter doses of N influenced the protein content but not the content of S-bearing amino acids, whereas S improves both (Saraf, 1988). Therefore, efforts have been made to find the effect on different yield contributing characters and their effectiveness towards seed yield through Sulfur fertilization.

MATERIALS AND METHODS

Experiments were conducted at Rangpur under AEZ no. 3b (Central Tista Meander floodplain) non calcareous brown flood plain soils in Gangachara soil series, Manikganj under AEZ no. 8d (Low Jamuna Flood Plain) noncalcareous gray floodplain soil in Sonatola soil series and at Kishoreganj under AEZ no. 8b (Upper Brahmaputra flood plain) non calcareous gray flood plain soils in Shilomondi soil series (FAO/UNDP. 1988) with six selective doses of S fertilizer in randomized complete block design with five replications in the year 2004, 2005 and 2006.. The unit plot size was 3x3 m^2. Experiments of all three locations and years were conducted within 15 August to 30th August with the variety O-9897 i.e. Falgooni Tossa (*Corcorus olitorius* L.). The treatment combinations of S were 0, 10, 20, 30, 40 and 50 kg/ha. Full amount of Sulfur was applied at the time of final land preparation in the form of gypsum as per treatment. A uniform dose of 90 kg ha^{-1} of N (⅓ amount of N was applied at the time of sowing, another ⅓ N was applied at 20-25 days after sowing [DAS] and the rest ⅓ amount of N was applied at 40-45 DAS) from urea, 20 kg ha^{-1} of P from triple super phosphate and 20 kg ha^{-1} of K from muriate of potash were applied to all plots. Seeds were sown in lines with a spacing of 30 cm apart. Weeding, thinning, insect pest and disease management were done in time. The experiments were harvested within January of the following year when about 80 percent of the pods were brown in colour in all locations and years. During the time of harvest, plant population was recorded. The plant height, number of

branches per plant, number of pods per plant, pod length and seeds per pod were recorded from each plot. The weight of 1000 seeds and seed yield per plot was recorded after sundry. The soil samples were collected before setting the experiments by a soil sampler (Augar) in all locations and years from a depth of 0-15 cm. The collected samples were dried and processed for analysis. Particle size analyses of the soils were made by combination of sieving and hydrometer method as described by Day (1965) and textural classes were determined by Marshall's (1951) triangular coordinate curve. Soil pH was measured electrochemically by combined glass/calomel electrode with a corning pH meter from a soil suspension (Soil:Water = 1:2.5). Total N (Nitrogen) was measured by Kjeldhal digestion method and that of available P was measured colorimetrically after developing yellow color (Jackson, 1973). K (Potassium) and S (Sulfur) were determined by ASI method as described by Hunter (1984). Soil organic matter (OM) was determined by wet oxidation method as described by Walkly and Black (1934). Statistical analysis was done after Gomez and Gomez (1983). General characteristics of initial soil samples are presented in Table 1. The growth and yield data i.e. plant population, plant height, number of branches/plant, number of pods/plant, pod length, number of seeds/pod, 1000 seed weight and seed yield of Rangpur, Manikganj and Kishoreganj are presented in Tables 2, 3 and 4 respectively. Plant height, number of branches and number of pods/plant are presented from an average of ten randomly selected plants/plot. The pod length and number of seeds/pod are presented from an average of 25 pods/plot. The seed index i.e. 1000 seed weight is presented from an average of 10 samples/plot.

Table 1. General characteristics (Range) of initial soil samples of average of four years from three locations

Properties	Rangpur	Manikganj	Kishorganj
Textural class	Sandy loam	Sandy loam	Loam
pH	5.7-6.1	6.2-6.3	6.1-6.4
Organic Matter (OM) %	1.15-1.29	1.22-1.25	1.13-1.17
Total N (%)	0.06-0.08	0.07-0.10	0.07-0.08
Available P (µg /ml soil)	12-14	10-12	9-12
Exchangeable K (meq/100g)	0.19-0.22	0.22-0.24	0.19-0.21
S (µg /ml soil)	5-7	5-6	4-5

RESULTS AND DISCUSSION

Plant population

There was no significant effect on plant population with the increased dose of Sulfur fertilizer application on late jute seed production in all locations. Ali *et al.* (1990) reported that application of fertilizers did not have any significant effect on the number of plants/m^2 in wheat.

Plant height

A significant effect on plant height was observed with the application of increasing doses of Sulfur fertilizer at all locations. The highest plant height 131.38, 140.29 and 135.56cm were observed with the application of 30, 30 and 20 kg S per hectare at Rangpur, Manikganj and Kishorganj respectively. Ali *et al*. (1990) also reported that the effect of S was spectacular as indicated by reduction of plant height significantly due to omission of S in wheat.

Number of branches/plant

There was no significant effect was observed with increased doses of S fertilizer application on number of branches/plant. However, highest number of branches/plant i.e. 4.053, 4.057 and 3.943 were observed with the application of 30, 30 and 20 kg S per hectare at Rangpur, Manikganj and Kishoreganj respectively. Alam *et al*. (2002) found 3.033-4.300, 3.133-4.103 and 2.93-4.10 number of branches per plant with different doses of NPK fertilizers with this variety at Rangpur, Manikganj and Kishoreganj respectively.

Number of pods/plant

Number of pods/plant increased significantly with the application of increasing doses of S fertilizer at all locations up to a certain limit. The 30 kg S per hectare gave the highest number of pods/plant i.e. 19.580, 18.663 and 18.907 at Rangpur, Manikganj and kishoreganj respectively. Laurence (1982) reported that the increase in pod yield of peanut by the addition of S fertilizer. Khan *et al.* (1990) observed that 20 kg S per hectare give more pods and pod weight in peanut. Hago and Salama (1987) observed a significant increase in number of pods per plant of the crop by applying S fertilizer.

Pod length

Significant effects of increased doses of S fertilizer application on pod length were observed at all locations. Significant highest pod length i.e. 6.959, 6.933 and 6.958 cm were observed with the application of 30 kg S per hectare at all locations and beyond that it was not increased significantly. Kundu *et al.* (1959) reported *Corcorus olitorius* L. fruits are elongated 6 to 10 cm long and 0.3 to 0.8 cm in diameter.

Number of seeds/pod

Significant effect was observed with the application of increasing doses of S fertilizer on the number of seeds/pod at all locations. However, application of 30 kg S per hectare produced highest number of seeds/pod at Rangpur (176.74), Manikganj (178.42) and Kishoreganj (176.98). Kundu *et al.* (1959) again reported 127 to 200 seeds in each fruit of *Corcorus olitorius* L.

Seed Index (1000 seed weight)

Significant effect of S fertilizer application on 1000 seed weight was observed. Significant highest 1000 seed weight i.e. 1.9324 and 1.9315g were obtained with the application of 30 kg S per hectare at Rangpur and Manikganj respectively but at Kishorganj it was 1.9387g, obtained with the application of 40 kg S per hectare.

Seed yield

Significant effect of S fertilizer application on seed yield was observed at all locations. With amplified doses of S fertilizer application, seed yield increased up to a certain limit and after that it was decreased or statistically identical. In case of increased doses of S fertilizer, significant highest seed yield were observed with 30, 30 and 40 kg S per hectare at Rangpur, Manikganj and Kishoreganj respectively.

The results indicated that sulfur fertilizer had an impact on the plant height, number of pods per plant, pod length, number of seed per pod, and weight of 1000 seed, which, influenced on seed yield. Hossain and Wahhab (1980), Rahima khatun and Sobhan (1985) and Talukder *et al.* (1989) also reported higher seed yield from crops having higher number of branches per plant, pods per plant, seed per pod, and weight of 1000 seed.

In conclusion it may be said that application of increasing doses of S fertilizer has significant effect on seed yield and yield contributing characters.

Table 2. Growth and yield data of late jute seed experiment at Rangpur (Pooled over three replications and four years)

Treatment no.	S (kg/ha)	Plant population (Mill/ha.)	Plant height (cm)	Branches /plant (Nos.)	Pods/Plant (Nos.)	Pod length (cm)	Seeds/pod (Nos.)	1000 seeds wt.(g)	Seed yield (Q/ha)
1	00		131.21 c	4.053	16.853 d	6.761 d	170.79 d	1.8982 d	7.5280 e
2	10	0.19240	131.26 b	4.052	18.713 bc	6.796 c	172.85 c	1.9193 c	8.5963 d
3	20	0.19260	131.27 b	4.050	18.753 b	6.915 b	175.94 b	1.9318 b	9.1073 b
4	30	0.19247	131.38 a	4.053	19.132 a	6.959 a	176.74 a	1.9324 a	9.1140 a
5	40	0.19233	131.36 a	4.043	19.131 a	6.942 a	176.71 a	1.9326 a	9.1123 a
6	50	0.19243	131.31 ab	4.042	18.850 b	6.937 ab	176.71 a	1.9313 bc	9.1060 bc
CV%		3.6	3.4	-	2.8	4.3	3.9	1.9	3.7

Means followed by a common letter are not significantly different at 5% level by DMRT

Table 3. Growth and yield data of late jute seed experiment at Manikganj (Pooled over three replications and four years)

Treatment	S (kg/ha)	Plant population (Mill/ha.)	Plant height (cm.)	Branches/ plant (Nos.)	Pods/Plant (Nos.)	Pod length (cm.)	Seeds/pod (Nos.)	1000 seed wt. (g)	Seed yield (Q/ha.)
1	00	0.20753	140.16 c	4.053	16.090 e	6.773 c	173.98 d	1.9089 d	7.0260 e
2	10	0.20743	140.18 c	4.053	17.563 d	6.787 c	17499 c	1.9208 c	7.6487 d
3	20	0.20740	140.27 b	4.073	18.150 b	6.897 b	177.99 b	1.9268 b	8.8591 b
4	30	0.20743	140.29 a	4.057	18.663 a	6.933 a	178.42 a	1.9315 a	8.8863 a
5	40	0.20757	140.25 ab	4.087	18.587 a	6.925 ab	178.23 a	1.9318 a	8.8740 ab
6	50	0.20743	140.25ab	4.083	18.107 c	6.923 ab	177.96 b	1.9265 b	8.8100 c
CV %		3.9	4.6	-	2.6	3.1	3.5	1.8	4.1

Means followed by a common letter are not significantly different at 5% level by DMRT.

Table 4. Growth and yield data of late jute seed experiment at Kiahorganj- (Pooled over three replications and four years)

Treatment no.	S (kg/ha)	Plant population (Mill/ha.)	Plant height (Cm.)	Branches /plant (Nos.)	Pods/Plant (Nos.)	Pod length (Cm.)	Seeds/pod (Nos.)	1000 seeds wt.(Gm.)	Seed yield (Quintal/ha.)
1	00	0.20717	135.41 c	3.940	15.517 d	6.760 d	172.89 d	1.9244 e	7.5363 e
2	10	0.20717	135.51 b	3.941	17.370 c	6.787 c	174.92 c	1.9284 d	8.5238 d
3	20	0.20717	135.56 a	3.943	18.248 b	6.947 ab	176.56 ab	1.9285 d	8.9198 c
4	30	0.20723	135.56 a	3.930	18.907 a	6.958 a	176.98 a	1.9365 b	8.9982 b
5	40	0.20713	135.56 a	3.937	18.905 a	6.943 ab	176.95 a	1.9387 a	9.1173 a
6	50	0.20727	135.56 a	3.927	18.225 b	6.937 b	176.62 ab	1.9318 c	8.9197 c
		3.6	4.5	-	2.9	4.6	4.7	2.8	4.3

Means followed by a common letter are not significantly different at 5% level by DMRT

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