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Fertilizer Management of Late Jute Seed Production in Different Agro-Ecological Zones of Bangladesh

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Abstract: Responsiveness of the variety Falgooni Tossa i.e. O-9897 (*Chorcorus olitorius* L.) in late jute seed production to Nitrogen (N), Phosphorus (P) and Potassium (K) was assessed in different Agro-Ecological Zones (AEZ) with increasing dose of N, P and K fertilizers. A highly significant effect was observed for plant height, number of branches/plant, number of pods/plant, pod length, number of seeds/pod, 1000 seeds weight and seed yield with the application of increasing doses of N fertilizer. There was no significant effect of increasing doses of P fertilizer on plant height, number of branches/plant, pod length and number of seeds/pod but a significant effect found for number of pods/plant, 1000 seeds weight and seed yield. No effect towards seed yield and yield contributing characters was observed with increasing doses of K fertilizer. Significantly high seed yields were found with the application of 100-20-20, 75-40-20 and 100-20-20 kg N-P-K/ha at Rangpur (AEZ No. 3b), Manikganj (AEZ No. 8d) and Kishorganj (AEZ No. 8b) respectively.

Key words: Fertilizer, yield contributing characters, late jute seed yield

Introduction

Late jute seed production technology is that where jute crop is grown for the production of seed during mid August to mid September. 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 including plant population, plant height, number of branches, number of pods, pod length, number of seeds in pod and weight of 1000 seeds. The potential of jute seed crop can be improved through effective manipulations of those yield components, which have positive contribution towards seed yield (Talukder and Hossain, 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 50 percent of the total increase in yield comes from the use of fertilizer alone and the rest from all other factors combined together (Mukherjee, 1965). Therefore, efforts have been made to find the effect of N, P and K fertilizer on the yield and yield contributing characters of late jute seed.

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 Kishorganj under AEZ no. 8b (Upper Brahmaputra flood plain) non calcareous gray flood plain soils in Shilomondi soil series in the year 1994 to 1997 with sixteen selective doses of N, P and K fertilizers in randomized complete block design with three replications. The unit plot size was 3.0 x 3.0m^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 N, P and K in kg/ha were (1) 00-00-00 (2) 00-20-20 (3) 25-20-20 (4) 50-20-20 (5) 75-20-20 (6) 100-20-20 (7) 125-20-20 (8) 75-00-20 (9) 75-10-20 (10) 75-30-20 (11) 75-40-20 (12) 75-50-20 (13) 75-20-00 (14) 75-20-10 (15) 75-20-30 and (16) 75-20-40. Full amounts of P and K from triple super phosphate and muriate of potash respectively and 1/3 amount of N from urea were applied as basal dose as per treatment at the time of sowing. Another 1/3 N from urea was applied at 20-25 days after sowing and rest 1/3 amount of N also from urea was applied 40-45 days after sowing. 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 80 percent of the pods were brown in colour at 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 sun dry. The soil samples were collected before setting the experiments by a soil sampler (Augar) at all locations and years from a depth of 0-15 cm. The collected samples were dried and processed for analysis. Particle size analysis 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 Kjeldahl digestion method and that of available P was measured colorimetrically after developing yellow colour (Jackson, 1973). Potassium was determined by ASI method as described by Hunter (1984). Soil organic matter (OM) was determined by wet oxidation method as described by Walkley and Black (1934). Statistical analysis was done after Gomez and Gomez (1983). General characteristics of initial soil samples are presented in Table 1.

Table 1: General characteristics (Range) of initial soil samples of four years.

Properties	Rangpur	Manikganj	Kishorganj
Textural class	Sandy loam	Sandy loam	Loam
pH	5.6-6.1	6.1-6.4	6.1-6.5
O.M . %	1.16-1.28	1.21-1.26	1.12-1.18
Total N (%)	0.07-0.09	0.08-0.11	0.06-0.08
Available P (ppm)	12-14	9-12	10-12
Exchangeable K (meq/100g)	0.18-0.21	0.21-0.24	0.16-0.19

Results and Discussion

Plant population: There was no significant variation in plant population with the increasing dose of nitrogen, phosphorus and potassium fertilizer application on late jute seed production at all locations (Table 2). Ali *et al.* (1990) also reported that application of fertilizers did not have any significant effect on the number of plants/m^2.

Plant height: Significant effect of increasing dose of nitrogen fertilizer application on plant height was observed at all locations. But there was no significant effect on plant height with the application of increasing dose of phosphorus and potassium fertilizer. The highest significant plant height was observed with

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

Treat.#	N- P-K (kg/ha)	Plant population (lac/ha)	Plant height (cm)	Branches/ plant (No)	Pods/Plant (No)	Pod length (cm)	Seeds/pod (No)	1000 seeds wt. (gm)	Seed yield (Quintal/ha)
1	00-00-00	1.989 ab	95.53 e	3.083 f	6.91 f	4.150 g	102.56 h	1.8240 de	2.7724 h
2	00-20-20	1.988 ab	93.41 e	3.033 f	9.91 e	4.207 g	112.52 g	1.8690 cd	2.8710 h
3	25-20-20	1.988 ab	124.79 d	3.333 e	13.65 d	5.093 f	128.95 f	1.8656 cd	4.2973 g
4	50-20-20	1.989 ab	135 .38 c	3.600 d	15.84 c	6.573 e	169.37 de	1.9070 bc	5.9111 f
5	75-20-20	1.988 ab	141.30 b	4.131 ab	16.83 ab	6.877 c	175.92 bc	1.9467 b	7.1215 cd
6	100-20-20	1.988 ab	147.68 a	4.300 a	17.04 a	6.913 bc	179.53 ab	1.9073 bc	7.3374 ab
7	125-20-20	1.993 a	146.87 a	4.133 ab	16.38 b	6.997 a	180.58 a	1.8667 cd	7.3382 ab
8	75-00-20	1.989 ab	140.23 b	3.733 cd	16.62 ab	6.720 cd	175.89 bc	1.8373 de	6.6143 e
9	75-10-20	1.988 ab	140.57 b	3.76 cd	16.53 ab	6.850 c	175.23 bc	1.8397 de	6.7463 e
10	75-30-20	1.988 ab	141.61 b	3.667 d	16.62 ab	6.852 c	175.53 bc	2.0048 a	7.4910 a
11	75-40-20	1.987 ab	142.75 b	3.767 cd	16.98 a	6.887 c	175.97 bc	1.9083 bc	7.2657 bc
12	75-50-20	1.988 ab	140.91 b	3.767 cd	16.86 ab	6.888 c	175.90 bc	1.9075 bc	7.2618 bc
13	75-20-00	1.988 ab	140.61 b	3.733 cd	16.58 ab	6.850 c	175.37 bc	1.8480 de	7.1512bcd
14	75-20-10	1.989 ab	139.72 b	3.667 d	16.59 ab	6.877 c	175.65 bc	1.8381 de	7.1607bcd
15	75-20-30	1.988 ab	140.78 b	3.767 cd	16.78 ab	6.887 c	175.20 bc	1.8452 de	7.1708bcd
16	75-20-40	1.988 ab	139.86 b	3.762 cd	16.85 ab	6.883 c	175.59 bc	1.8679 cd	7.0506 d
CV %	-	2.4	1.5	3.8	1.9	5.2	1.5	1.5	3.8

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).

Treat.#	N- P-K (kg/ha)	Plant population (lac/ha)	Plant height (cm)	Branches/ plant (No.)	Pods/Plant (No.)	Pod length (cm)	Seeds/pod (No.)	1000 seeds wt. (gm)	Seed yield (Quintal/ha)
1	00-00-00	2.088 a	94.30 f	3.167 e	5.81 l	4.063 d	106.16 f	1.7143 f	2.652 l
2	00-20-20	2.084 ab	91.29 f	3.133 e	5.86 l	4.067 d	107.23 f	1.7819 e	2.918 l
3	25-20-20	2.087 ab	122.88 e	3.533 d	8.16 h	5.077 c	122.99 e	1.8780 d	4.605 h
4	50-20-20	2.086 ab	134.17 d	3.767 bc	12.46 g	6.623 b	167.18 d	1.9026 cd	6.020 fg
5	75-20-20	2.086 ab	140.29 c	4.000 a	16.08 c	6.903 b	177.89 abc	1.9147 bcd	7.220 cd
6	100-20-20	2.086 ab	152.13 b	4.033 a	16.09 c	6.963 a	178.61 a	1.9151 bcd	7.524 bc
7	125-20-20	2.087 ab	157.83 a	4.067 a	15.58 e	6.813 b	178.36 ab	1.9162 bcd	7.486 bc
8	75-00-20	2.084 ab	138.03 c	4.033 a	15.78 d	6.743 b	173.19 a-d	1.8868 d	6.663 def
9	75-10-20	2.088 a	138.22 c	4.052 a	15.52 e	6.843 b	176.58 abc	1.9156 bcd	6.735 def
10	75-30-20	2.088 a	140.20 c	4.033 a	16.23 ab	6.870 b	176.16 abc	1.9792 a	7.225 cd
11	75-40-20	2.087 ab	140.22 c	4.000 a	16.29 a	6.937 b	171.66 bcd	1.9870 a	8.319 a
12	75-50-20	2.087 ab	140.73 c	4.000 a	16.12 bc	6.943 b	172.16 bcd	1.9878 a	8.185 ab
13	75-20-00	2.087 a	140.47 c	4.067 a	15.04 f	6.837 b	171.24 cd	1.9567 abc	7.153 cd
14	75-20-10	2.087 ab	141.09 c	4.067 a	15.08 f	6.873 b	172.16 a-d	1.9484 abc	7.161 cd
15	75-20-30	2.089 a	141.19 c	4.103 a	15.49 e	6.947 b	171.48 cd	1.9562 abc	7.150 cd
16	75-20-40	2.090 a	141.31 c	4.133 a	15.58 e	6.903 b	172.34 a-d	1.9598 abc	7.074 cd
CV %	-	2.5	1.5	3.4	1.4	1.1	2.1	1.7	6.3

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 Kishorganj (Pooled over three replications and four years).

Treat.#	N- P-K (kg/ha)	Plant population (lac/ha)	Plant height (cm)	Branches/ plant (No)	Pods/Plant (No)	Pod length (cm)	Seeds/pod (No)	1000 seeds wt. (gm)	Seed yield (Quintal/ha)
1	00-00-00	1.977 ab	87.87 l	3.20 e	5.83 h	3.847 l	98.08 f	1.7073 e	2.342 l
2	00-20-20	1.976 ab	80.84 j	2.93 f	5.83 h	4.057 h	107.86 e	1.7694 de	2.349 l
3	25-20-20	1.976 ab	114.01 h	3.40 e	8.04 g	5.090 g	128.04 d	1.8664 bc	3.640 h
4	50-20-20	1.976 ab	123.91 g	3.77 d	12.29 f	6.707 f	170.69 bc	1.8605 bcd	4.609 g
5	75-20-20	1.976 ab	136.96 def	3.93 a-d	15.77 a-d	6.860cde	172.78 bc	1.8874 bc	5.971 c
6	100-20-20	1.973 b	149.09 b	4.07 ab	16.01 ab	7.020 a	181.18 a	1.9936 a	6.462 a
7	125-20-20	1.976 ab	155.34 a	4.13 a	15.69 a-e	6.980 ab	175.54 abc	1.9613 ab	6.667 a
8	75-00-20	1.976 ab	138.44 c-f	3.90 a-d	15.55 b-e	6.882 b-e	174.34 abc	1.8387 cd	5.734 d
9	75-10-20	1.977 ab	138.90cde	3.83 bcd	15.78 a-d	6.800 ef	173.12 bc	1.8884 bc	5.745 d
10	75-30-20	1.977 ab	134.94 ef	3.80 cd	16.14 a	6.917 a-d	172.01 bc	1.9939 a	6.509 a
11	75-40-20	1.976 ab	136.64 def	3.93 a-d	15.83 abc	6.883 b-e	167.49 c	1.9987 a	6.512 a
12	75-50-20	1.973 b	138.31 c-f	4.03 abc	15.43 cde	6.856cde	167.46 c	1.9954 a	6.510 a
13	75-20-00	1.977 ab	134.42 f	3.97 a-d	15.22 e	6.850cde	172.99 bc	1.9424 ab	5.978 c
14	75-20-10	1.977 ab	139.14 cd	3.90 a-d	15.21 e	6.857cde	173.17 bc	1.9473 ab	6.095 bc
15	75-20-30	1.976 ab	139.62 cd	4.07 ab	15.26 de	6.803 ef	169.38 c	1.9551 ab	6.094 bc
16	75-20-40	1.979 a	141.24 cd	4.10 a	15.22 e	6.840 de	170.87 bc	1.9553 ab	6.092 bc
CV %	-	1.8	1.7	3.5	2.1	5.2	2.6	2.8	4.2

Means followed by a common letter are not significantly different at 5% level by DMRT.
In Table 2, 3 and 4, 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. 1000 seeds weight are presented from an average of 10 samples/plot.

the application of 100, 125 and 125 kg N per hectare along with 20 kg P and 20 kg K per hectare at Rangpur, Manikganj and Kishorganj respectively (Table 2).

Number of branches/plant: Number of branches/plant increased significantly with increasing doses of N fertilizer up to a certain limit and beyond that it was not increased significantly at all locations (Table 2). Application of increasing doses of P and K fertilizer affects the number of branches/plant significantly only at Rangpur. Highest number of branches/plant were observed with 100, 125 and 125 kg N per hectare along with 20 kg P and 20 kg K per hectare at Rangpur, Manikganj and Kishorganj respectively.

Number of pods/plant: N fertilizer application affects significantly the number of pods/plant at all locations. Seventy five kg N (T_6) per hectare along with 20 kg P and 20 kg K gave the significant

highest number of pods/plant having no significant difference with 100 kg N (T_6) per hectare at all locations. A significant effect of P fertilizer application was observed on number of pods/plant at all locations. 40 (T_{11}), 40 (T_{11}) and 30 (T_{10}) kg P per hectare along with 75 kg N and 20 kg K per hectare showed highest number of pods/plant at Rangpur, Manikganj and Kishorganj respectively. Das (1982) and Juan *et al.* (1988) observed an increase in pods number of peanut by applying phosphatic fertilizer. No significant effect was found on number of pods/plant with the application of increased doses of K fertilizer.

Pod length: Significant effect of increasing doses of N fertilizer application on pod length was observed at all locations. But there was no significant effect of increasing doses of P and K fertilizer application on pod length. Significant highest pod length i.e. 6.997, 6.963 and 7.020 cm was observed with the application of 125, 100 and 100 kg N per hectare along with 20 kg P and 20 kg K per hectare at Rangpur , Manikganj and Kishorganj respectively. Kundu *et al.* (1959) reported that *Corcorus olitorius* L. fruits are elongated 6 to 10 cm long and 0.3 to 0.8 cm in diameter. Alim *et al.* (2001) found 4.96 to 6.09 cm pod lengths with this variety.

Number of seeds/pod: Application of increasing doses of N fertilizer affect significantly the number of seeds/pod at all locations. Application of 125, 100 and 100 kg N per hectare along with 20 kg P and 20 kg K per hectare produced the highest number of seeds/pod at Rangpur (180.58), Manikganj (178.61) and Kishorganj (181.18) respectively. Kundu *et al.* (1959) again reported 127 to 200 seeds in each fruit of *Corcorus olitorius* L. Alim *et al.* (2001) found 146.55 to 198.55 seeds/pod with this variety. There was no significant effect of increasing doses of P and K fertilizer application on number of seeds/pod was found at all locations.

1000 seeds weight: Significant effect of N and P fertilizer application on 1000 seeds weight was observed. The highest 1000 seeds weight was obtained with the application of 75 kg N and 30 kg P along with 20 kg K per hectare at Rangpur and Manikganj respectively. But at Kishorganj, it was obtained with 100-20-20 kg N-P-K per hectare, which was statistically identical with that of 75-30-20 kg N-P-K per hectare. No effect of increasing doses of K fertilizer application was observed on 1000 seeds weight at all locations.

Seed yield: Significant effect of N and P fertilizer application on seed yield were observed at all locations. With increasing doses of N and P fertilizer application, seed yield increased up to a certain limit and beyond that it was decreased or statistically identical. In case of increasing doses of N fertilizer application, significantly high seed yield was observed with 100, 75 and 100 kg N per hectare along with 20 kg P and 20 kg K per hectare at Rangpur, Manikganj and Kishorganj respectively and beyond that it did not increase significantly. In case of increasing doses of P fertilizer, significantly high seed yield was observed with 30, 40 and 30 kg P per hectare along with 75 kg N and 20 kg K per hectare at Rangpur, Manikganj and Kishorganj respectively and beyond that it did not increase significantly. In case of increasing dose of K fertilizer application significant effect on seed yield was not observed at all locations. Sen and Benarjee (1960) reported that P & K application without N , had little effect on jute. In presence of P and K without N, fibre yield markedly decreased below the yield obtained without fertilizer (Alam *et al.*, 1988). The results indicated that the plant height, number of branches per plant, number of pods per plant, pod length, number of seeds per pod and weight of 1000 seeds had influence on seed yield. Hossain and Wahhab (1980), Rahima Khatun and Sobhan (1985) and Talukder and Hossain (1989) also reported higher seed yield from crops having higher number of branches per plant, number of pods per plant, number of seeds per pod and weight of 1000 seeds.

It may be concluded that the application of increasing doses of N and P fertilizer has significant effect on seed yield and yield contributing characters but application of increasing doses of K fertilizer has no effect on them. However, the highest seed yield may be obtained with the application of 100-20-20, 75-40-20 and 100-20-20 kg N-P-K per hectare at Rangpur, Manikganj and Kishorganj respectively.

References

Alam, A.K.M.M., M.M. Alam, P.B. Mandal and M.A.K. Majlis, 1988. Responsiveness of newly released Fulgoni Tossa (*Chorcorus olitorius* L.) variety to N, P and K fertilizer application. Bangladesh J. Jute Fib. Res., 13: 35-38.

Ali, M.M., M.I. Ali and M.K. Khan, 1990. Effect of fertilizer on the growth and yield of wheat in red brown terrace soils of Bangladesh. Bangladesh J. Soil Sci., 21: 13-17.

Alim, M.A., M.M. Alam, S. Khandker, S.A.A. Ahsanul Haque and N. Akhter, 2001. Impact of crop residues on soil organic matter content and the production of late jute seed. J. Biol. Sci., 1: 1124-1126.

Das, H.N., 1982. Effect of nitrogen, phosphorus, potassium and calcium on growth and yield of groundnut. J. Res. Assam. Agric. Univ., 3: 15-18.

Day, P.R., 1965. Particle Formation and Particle Size Analysis. In: Methods of Soil Analysism, Agronomy Monograph, Part-1, Black, C.A., D.D. Evens, J.L. White, L.E. Enswinger and F.F. Clark (Eds.). Academic Press, New York, pp: 545-567.

Gomez, K.A. and A.A. Gomez, 1983. Statistical Procedure for Agricultural Research. 2nd Edn., International Rice Research Institute Manila, Philippines, pp: 1-207.

Hossain, M.A. and M.A. Wahhab, 1980. Effect of intercropping aus and kaon (*Foxtail millet*) with capsularis jute seed crop on yield and return. Bangladesh J. Jute Fib. Res., 5: 35-40.

Hunter, A.H., 1984. Agro Service International Consultancy Report on Soil Fertility. BARC, Dhaka, pp: 90.

Jackson, M.L., 1973. Soil Chemical Analysis. 1st Edn., Prentice Hall Ltd., New Delhi, India, Pages: 498.

Juan, A.R., L.J. Curayag and H.M. Pava, 1988. Influence of phosphorus fertilizers on pod yield and seed quality of three peanut varieties (*Arachis hypogaea* L.) CUM. J. Agric. Food Nutr., 1: 33-62.

Khatun, R. and M.A. Sobhan, 1985. Correlation between fibre yield and other plant characters in white jute (Corchorus capsularis of Bangladesh). Bangladash J. Agric., 10: 9-16.

Kundu, B.C., K.C. Basak and P.B. Sarcar, 1959. Jute in India. Jute Agriculture Research Institute, Calcutta, India.

Marshall, C.E., 1951. Proportion of Sand, Silt and Clay in the Basic Soil Textural Classes. U.S. Dept. Agric. Handbook, USA., pp: 503.

Mukherjee, J.N., 1965. The Role Fertilizer in Resolving the Critical Food Situation in India. Thorns Publication, India.

Sen, P.K. and K.I. Banerjee, 1960. Physiological studies in jute:1. Effect of N, P and K on the growth of jute (*C. olitorius* var. C.G.). Indian Agric., 4: 121-121.

Talukder, F.A.H. and M.A. Hossain, 1989. Response of Chorcorus capsularis L. to seed yield. Bangladesh J. Jute Fib. Res., 14: 31-35.

Walkley, A. and I.A. Black, 1934. An examination of Degtjareff method for determination soil organic matter and a proposed modification of the chromic acid titration method. Soil Sci., 37: 29-38.