International Journal of Agricultural and Biosystems Engineering
2017; 2(5): 44-47
http://www.aascit.org/journal/ijabe

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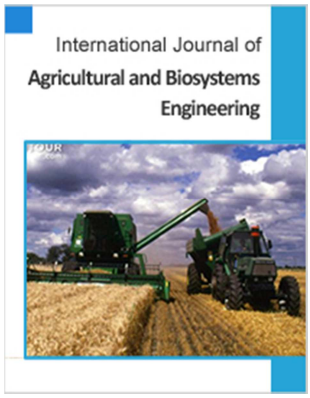

Keywords
Advanced Breeding Line BJC-5105,
NPKS,
Yield,
Economic Performance

Received: October 4, 2017
Accepted: November 1, 2017
Published: November 25, 2017

Nutrient Requirement of NPK&S on Advance Capsularis Breeding Line BJC-5105

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Citation

Md. NasimulGani, Md. Saheb Ali, Md. Mahbubul Islam. Nutrient Requirement of NPK&S on Advance Capsularis Breeding Line BJC-5105. *International Journal of Agricultural and Biosystems Engineering.* Vol. 2, No. 5, 2017, pp. 44-47.

Abstract

A fertilizer assessment trial for cultivation of advanced breeding line BJC-5105 was conducted at Manikganj during the year of 2014-2016. Different nutrient levels influenced the yield contributing characters which ultimately increased the fibre and stick yield over control. Among the nitrogen doses, the rate 100 kg N/ha demonstrated significantly tallest plant (3.10m), highest base diameter (19.60 mm), fibre (2.98 t/ha) and stick (7.10 t/ha) yield. The highest yield of fibre and stick were found with the dose of 5 kg P/ha. There was decreasing trends of yield with higher dose over 5kg of P. The K level up to 90 kg/ha influenced the yield and yield contributing characteristics over the control. The tallest plant was found with 30kg K/ha which was statistically similar with K 90kg/ha. The significant highest fibre yield was induced by K 30kg/ha. In case of S results showed significant yield increase with different rates over the control. Study exposed that 10kg S/ha is enough in producing highest yield of fibre and stick. Study showed that combined dose of NPKS 100-5-30-10 kg/ha may be a suitable dose for the cultivation of advance breeding line BJC-5105. It could be concluded that the three years study evolved a technology as fertilizer recommendation for the advance breeding line BJC-5105.

1. Introduction

Improvement of fiber yield and quality of jute is the prime need of Bangladesh. Jute fibre was produced annually from an average area of 4.50–5.00 lakh ha of land in Bangladesh [1]. But the area and production was increased significantly from 2010-2011 and onwards due to developing more conscious about environment and stepping forward to the natural fibre by escaping from the perilous impact of synthetic fibre to the environment. As a result demand of jute fibre is being increased in the recent years both in home and abroad. In this aspect, research regarding development of new high yielding variety of jute and determination of its fertilizer requirement is very important. In actual fact, these requirements vary within the same type of crop. For example, fertilizer requirement of capsularis line is lower than that of olitorius. The importance of N, P, K and S on the growth, yield and quality of fiber crops is well established [2-12]. It is necessary to find a fertilizer combination which is economically profitable and at the same time gives yield very close to maximum yield potential. Therefore, much attention should be given towards the improvement of yield and quality of jute fiber to bring back the past glory of Bangladeshi jute. Considering the above facts the present study has

been undertaken to observe the effects of N, P, K and S fertilizers on the growth, yield and quality of the advance breeding line, BJC-5105 and to find out the optimum requirement of all of these nutrients to achieve the maximum yield potential of this new advance breeding line, BJC-5105.

2. Materials and Methods

The experiment was carried out at the Jute Agricultural Experimental Station (JAES) of Bangladesh Jute Research Institute, under Sadar Upazila of Manikganj district. The experiment was laid out in randomized complete block design with three replications. A total 10 treatment combinations along with a control were distributed randomly in each plot as one replication (Table 1). The dimension of unit plots was 3.1 m × 3.1 m having 1 m space between the plots, blocks and around the field. There was 20 cm deep drain around each block and plot. Each replication was divided into 10 unit plots and the total land required of 13.3 m × 42 m. At the beginning of the experiment, the land was well prepared and fertilizers were applied as per treatment.

Table 1. *Treatment combinations (NPKS in Kg/ha).*

T_1: $N_0P_0K_0S_0$	T_6: $N_{100}P_{10}K_{60}S_{20}$
T_2: $N_{50}P_5K_{30}S_{10}$	T_7: $N_{100}P_{15}K_{90}S_{30}$
T_3: $N_{50}P_{10}K_{60}S_{20}$	T_8: $N_{150}P_5K_{30}S_{10}$
T_4: $N_{50}P_{15}K_{90}S_{30}$	T_9: $N_{150}P_{10}K_{60}S_{20}$
T_5: $N_{100}P_5K_{30}S_{10}$	T_{10}: $N_{150}P_{15}K_{90}S_{30}$

Required amounts of N, P, K, S fertilizers were applied in the form of urea, TSP, MoP and gypsum. Half of Urea was applied at sowing and the rest half was top dressed at 45 days after sowing while all other fertilizers were applied at the time of sowing. Jute seeds were broadcasted at the rate of 8 kg/ha. All cultural operations were done as and when necessary. The crop was harvested when 80% of the plants showed the sign of maturity. After shedding of leaves, the bundles were steeped plot-wise in pond water for 15-20 days for retting and fiber was extracted. At harvesting time, six plants were selected at random from each plot and tagged in the field to note plant height (PH), base diameter (BD), green weight (GW), fiber yield (FY) and stick yield (SY). Statistical [13] and economic analyses were also carried out.

3. Results and Discussion

Application of combined chemical fertilizers showed significant positive effect on all the growth parameter like plant height (Figure 1), base diameter (Figure 2), Green yield with leaves (Figure 3). The maximum plant height (3.1 m), base diameter (19.60 mm) and Green yield with leaves (46.10t/ha) were found by the treatment T_5 ($N_{100}P_5K_{30}S_{10}$kg/ha). Application of different treatments showed statistically significant positive effect on fibre yield (FY) and stick yield (SY) of jute. Highest FY (2.98 t/ha) and SY (7.10 t/ha) were reported with T_5 ($N_{100}P_5K_{30}S_{10}$ kg/ha) treatment (Table 2).

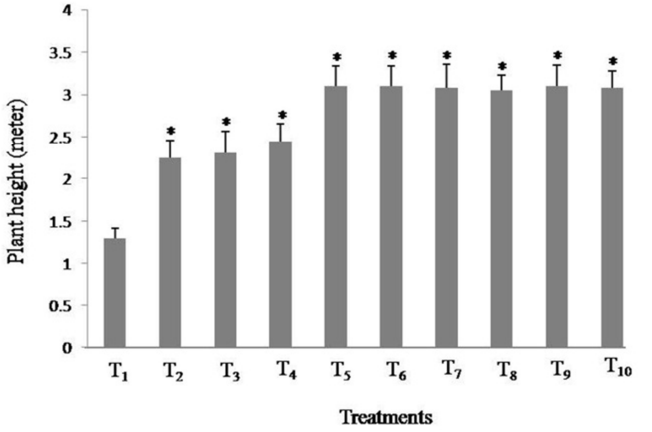

Figure 1. *Plant height of the advanced capsularis breeding line BJC-5105 using different chemical fertilizer treatments. Each datum was calculated from three independent experiments. The results are experssed as the mean ± S.E.M. Asterisks indicate p<0.05 significane by the Student's t-test.*

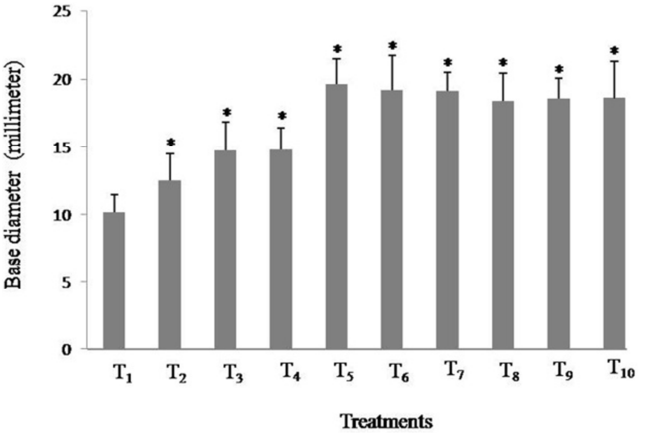

Figure 2. *Base diameter of the advanced capsularis breeding line BJC-5105 using different chemical fertilizer treatments. Each datum was calculated from three independent experiments. The results are experssed as the mean ± S.E.M. Asterisks indicate p<0.05 significane by the Student's t-test.*

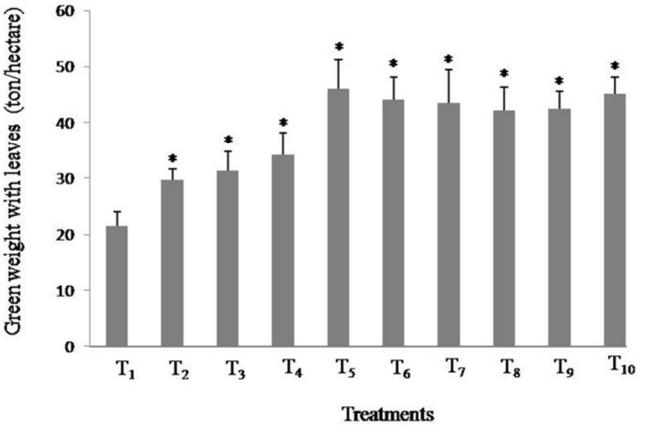

Figure 3. *Green weight with leaves of the advanced capsularis breeding line BJC-5105 using different chemical fertilizer treatments. Each datum was calculated from three independent experiments. The results are experssed as the mean ± S.E.M. Asterisks indicate p<0.05 significane by the Student's t-test.*

3.1. Effect of Nitrogen

Yield contributing characters were influenced by nitrogen levels which ultimately increased the fibre and stick yield over control. Among the nitrogen doses, the rate 100 kg N/ha demonstrated significantly tallest plant (3.1m), highest base diameter (19.6mm), fibre (2.98t/ha) and stick (7.1t/ha) yield. The dose of 100kg N/ha might be an effective dose for producing BJC-5105.

3.2. Effect of Phosphorus

Different P rates influenced to plant height, base diameter, yield of fibre and stick over control. The highest yield of fibre (2.98t/ha) and stick yield (7.1t/ha) found with the dose of 5 kg P/ha. There was decreasing trends of yield with higher dose of P. Results exposed that the dose of 5 kg P/ha will be sufficient to grow BJC-5105.

3.3. Effect of Potassium

The K level up to 90 kg/ha influenced the yield and yield contributing characteristics over the control. The tallest plant (3.1m) was found with K 30 kg/ha (T_5) which was statistically similar with T_7-T_{10}. Significantly highest fibre yield was induced by K 30Kg/ha (2.98t/ha) that was followed by K 60kg/ha (2.94t/ha) and stick yield found significantly identical by K 30 or 60 kg/ha. Taking into consideration the findings that the dose of K 30 kg/ha will be a sufficient to produce the advance breeding line BJC-5105. Study revealed that the advance breeding line BJC-5105 needs lower amount of K.

3.4. Effect of Sulfur

Different rate of S result showed significant increased on the yield and yield contributing characters over control. Study revealed that 10kg S/ha is enough in producing highest yield of fibre and stick. The combination dose of N_{100} P_{05} K_{30} S_{10} kg/ha may be enough for the advanced breeding line BJC-5105 (Table 2).

Fibre yield denotes the rank order T_5> T_6> T_7> T_{10}> T_9> T_8> T_4> T_3> T_2> T_1 (Table 2). The best FY and SY were found with the combination of N_{100} P_{05} K_{30} S_{10}. These findings are strongly supported by the previous research results [2-5, 7].

Table 2. *Yield of advance breeding line BJC-5105 using different treatment combinations.*

Treatment	Fibre yield (t/ha)	Stick yield (t/ha)
T_1: $N_0P_0K_0S_0$	1.22f	2.50b
T_2: $N_{50}P_{05}K_{30}S_{10}$	2.02e	4.75ab
T_3: $N_{50}P_{10}K_{60}S_{20}$	2.08de	4.60ab
T_4: $N_{50}P_{15}K_{90}S_{30}$	2.13cde	4.84a
T_5: $N_{100}P_5K_{30}S_{10}$	2.98a	7.10a
T_6: $N_{100}P_{10}K_{60}S_{20}$	2.94ab	7.0a
T_7: $N_{100}P_{15}K_{90}S_{30}$	2.91ab	6.93a
T_8: $N_{150}P_{05}K_{30}S_{10}$	2.80b	6.86a
T_9: $N_{150}P_{10}K_{60}S_{20}$	2.88ab	7.0a
T_{10}: $N_{150}P_{15}K_{90}S_{30}$	2.90ab	7.08a
CV (%)	5.25	5.45

3.5. Economic Analysis

Cost and return analysis was done considering the cost of fertilizer, seed, labour and process of fibre and stick. The highest gross return (Table 3) and benefit cost ratio were obtained with the treatment T_5 (Figure 4).

Table 3. *Gross return and variable cost of the experiment of capsularis breeding line BJC-5105.*

Treatment	Gross return (TK/ha)	Variable Cost (TK/ha)
T_1: $N_0P_0K_0S_0$	60020	60750
T_2: $N_{50}P_{05}K_{30}S_{10}$	101820	85930
T_3: $N_{50}P_{10}K_{60}S_{20}$	103680	88760
T_4: $N_{50}P_{15}K_{90}S_{30}$	106690	91590
T_5: $N_{100}P_5K_{30}S_{10}$	150580	88030
T_6: $N_{100}P_{10}K_{60}S_{20}$	148540	90860
T_7: $N_{100}P_{15}K_{90}S_{30}$	147030	93690
T_8: $N_{150}P_{05}K_{30}S_{10}$	142240	90130
T_9: $N_{150}P_{10}K_{60}S_{20}$	146080	92960
T_{10}: $N_{150}P_{15}K_{90}S_{30}$	147220	95790

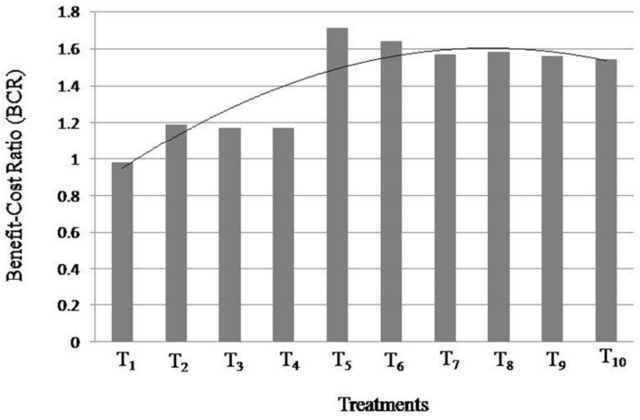

Figure 4. *Benefit-cost ratio for the production of advanced capsularis breeding line BJC-5105 using different chemical fertilizer treatments.*

4. Conclusion

It could be concluded that combined dose of NPK and S 100-5-30-10 kg/ha would be a suitable dose for the cultivation of advanced breeding line BJC-5105. The three years study evolved a technology which ultimately recommendation of fertilizer (NPK & S 100-5-30-10 Kg/ha) for the advance line BJC-5105.

Authors' Contribution

All the authors contributed equally

Conflict of Interest

The authors declare no conflict of interest exists.

Acknowledgements

The author profoundly uttered gratefulness to Mrs. Suraiya Khandker-CSO, Dr. AKM Maqsudul Alam-CSO and finally Dr. Md. Monjurul Alam, Director General, BJRI for their

brand support and encouragement for implementation of the research.

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