Quest Journals
Journal of Research in Agriculture and Animal Science
Volume 10 ~ Issue 6 (2023) pp: 07-12
ISSN(Online) : 2321-9459
www.questjournals.org

Research Paper

Nutrient Requirement of Capsularis Jute (BJC 2236) For Maximum Growth and Yield

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Abstract
A field experiment was conducted at Bangladesh Jute Research Institute in Bangladesh to ascertain the optimal requirement of each of these nutrients to maximize the yield potential of this new advance capsularis breeding line BJC 2236. The experiment consisted of ten fertilizer treatments and was set up using a randomized complete block design with three replications. The treatments were: T_1 – control (no fertilization), T_2- 50:10:30:20 kg N:P:K:S ha^{-1}, T_3- 100:10:30:20 kg N:P:K:S ha^{-1}, T_4- 150:10:30:20 kg N:P:K:S ha^{-1}, T_5- 100:5:30:20 kg N:P:K:S ha^{-1}, T_6- 100:15:30:30 kg N:P:K:S ha^{-1}, T_7- 100:10:60:20 kg N:P:K:S ha^{-1}, T_8- 100:10:90:20 kg N:P:K:S ha^{-1}, T_9- 100:10:60:10 kg N:P:K:S ha^{-1}, T_{10}- 100:10:90:30 kg N:P:K:S ha^{-1}. Different nutrient levels had an impact on the characters that contributed to yield, which ultimately led to an increase in fibre and stick yield over control. The highest fibre and stick yield were obtained by the combined dose of N100 Kg ha^{-1} with 10:60:20 kg P:K:S ha^{-1}. With the same fertilizer combination treatment, the plant's height and base diameter were both found to be at their highest. Therefore, it appeared that this mixture (T_7- 100:10:60:20 kg N: P: K: S ha^{-1}) was best for promoting good development and a high potential for capsularis jute (BJC 2236) for fiber production in Bangladesh.

Key words: *Nutrient, Growth, Fibre Yield, BJC 2236*

***R**eceived 10 June, 2023; **R**evised 20 June, 2023; **A**ccepted 23 June, 2023 © The author(s) 2023.*
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I. Introduction

Jute is the most affordable natural fiber after cotton and is completely biodegradable. Jute is easily grown in tropical countries like Bangladesh and India. Bangladesh's top priority is to improve jute fiber yield and quality. Jute production reached around 82.77 lakh bales from a total of 7.45 lakh hectares of land. [1] However, from 2010-2011 and onwards, the area and development grew dramatically as people became more environmentally conscious and shifted to natural fibers to avoid the harmful effects of synthetic fibers on the environment. As a result, demand for jute fiber has risen in recent years, both domestically and internationally. By carefully manipulating certain yield-enhancing features, the potential of jute fiber can be increased. Management procedures including fertilization, irrigation, weeding, and other similar activities are necessary for the full manifestation of genetic potential. One of the most crucial management techniques is fertilization since fertilization directly affects plant nutrition and growth. The main variables that control the best fertilization procedures are crop yields and crop nutrient uptake. [2]. To prevent loss and improve nutrient use efficiency, it is crucial to apply fertilizers effectively. Research into the development of new, high-yielding jute cultivars and the identification of their fertilizer needs is crucial in this regard. In reality, these specifications differ even among the same type of crop. The *capsularis* line, for example, needs less fertilizer than the *olitorius* line. It is well known that N, P, K, and S are essential for the development, production, and quality of fiber crops. [4], [5], [6],[7]. It's important to find a fertilizer mix that's both cost-effective and delivers yields that are near to their optimum capacity. As a result, much emphasis should be placed on increasing jute fiber yield and quality in order to restore Bangladeshi jute's former glory. In light of the foregoing, The purpose of this study is to establish the optimal nutrient requirements for the breeding line BJC 2236 in order to maximize its yield potential. This new capsularis jute breeding line's yield potential will be explored in relation to the effects of N, P, K, and S fertilizers on the growth, yield, and quality of the plant.

II. Materials and Methods

Experimental site and soil

The experiment was carried out in Bangladesh at the Bangladesh Jute Research Institute. Three replications were used in the randomized complete block design of the experiment.

Table 1. Physio-chemical properties of experimental soil.

Soil texture	P^H	OM	Total N(%)	Phosphorus (µg/g)	Potassium (mg/100g)	Sulpher (µg/g soil)
Silt loam	6.7	2.8	0.12	10	0.13	7.0
	Neutral	Low	Very Low	Low	Low	Very low

Weather Condition

In crop growing Season, weather conditions of the experimental site monthly temperature and rainfall are presented in (Fig. 1)

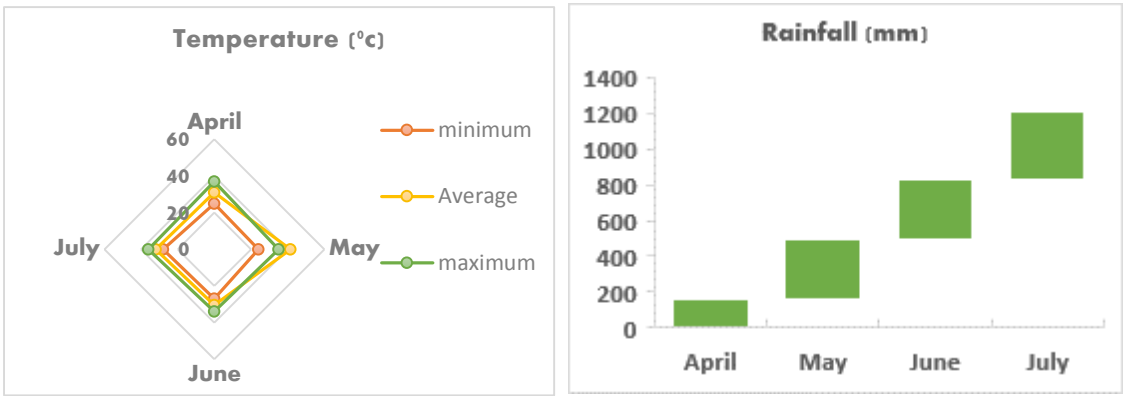

Figure 1. Weather conditions at an experimental site in Bangladesh (1a. monthly mean of minimum, maximum, and average temperature and 1b. rainfall).

Experimental design and treatments

Each plot contained one replication of a total of 10 treatment combinations with a control. The unit plot size was 3.0 mX3.0 m. There was 1.0 m between plots, blocks, and the field itself, and there was a 20 cm deep drain. The following treatments combinations were used in the experiments:

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

Land preparation and seed rate

Jute seeds were broadcasted at the rate of 7 kg/ha. At the beginning of the experiment, the land was well prepared and fertilizers administered according to each treatment. In accordance with the needs, fertilizers (N, P, K, and S) were administered in the form of urea, TSP, MoP, and gypsum.

Method of fertilizer application

As part of the final land preparation, half of the urea and the whole amounts of TSP, MoP, and Gypsum were added to the experimental plot. The other half of the urea was top-dressed 45 days before sowing. Cultural activity was carried out as and when it was required.

Harvesting and statistical analysis

When 80% of the plants had matured, the crop was ready for harvest. Following leaf shedding, the bundles were retted by steeping them plot-wise in pond water for 15 to 20 days, and the fiber was then removed. Ten plants from each plot were randomly chosen at harvest time and marked in the field with tags that recorded plant height (PH), base diameter (BD), green yield (GY), fiber yield (FY), and stick yield (SY). Statistical analysis was done. [8]

III. Results

Nitrogen levels had an impact on yield-contributing characters, increasing the fibre and stick yield over control. Different nutrient concentrations have a substantial impact on production. Among the nitrogen doses, the rate 100 kg N/ha demonstrated significantly tallest plant (3.10 m), highest base diameter (17.46 mm), fibre (2.88t/ha) and stick (6.75 t/ha) yield. The dose of 100kg N/ha might be an effective dose for producing BJC-2236 (Fig. 2&3). The use of nitrogen considerably increases plant height.[9] "Variation of plant height might be occur due to the differences of their genetic make-up.[10]

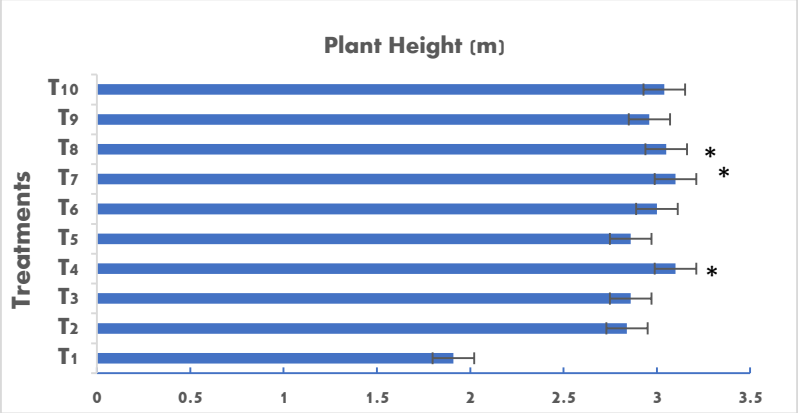

Figure 2. Plant height of *capsularis* jute (BJC 2236) .The mean ± S. E.M. is used to express the results.

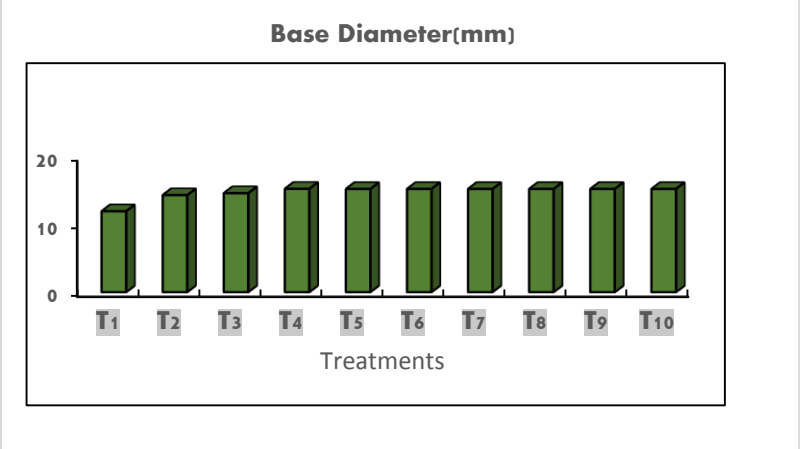

Figure 3. Base diameter of *capsularis* jute (BJC 2236). The mean ± S. E.M. is used to express the results.

Different P rates influenced to plant height, base diameter, Green weight, yield of fibre and stick over control. The highest green yield with leaves (57.96 t/ha), green yield without leaves (44.20 t/ha) was found with the dose of 10 kg P/ha Fig. 4). The highest yield of fibre (2.88 t/ha) and stick yield (6.75 t/ha) found with the dose of 10 kg P/ha. With a higher dose of P, the yield trended downward. Results showed that the dose of 10 kg P/ha will be sufficient to grow BJC 2236 (Fig. 5&6). Although phosphorus stimulates root growth [11], excessive phosphorus fertilizer application lowers the root-shoot ratio. [12], [13],[14].

Potassium (K) is one of the primary as well as the third so called major food element for plant growth and development. Over the control, the K level up to 90 kg/ha had an impact on the yield and features that contributed to the yield. The tallest plant (3.10 m) was found with K 60 kg/ha (T_7). Significantly highest fibre yield was induced by K 60 Kg/ha (2.88 t/ha) that was followed by K 90 kg/ha (2.78 t/ha) and stick yield found significantly identical by K 60 or 90 kg/ha. Taking into consideration the findings that the dose of K 60 kg/ha will be a sufficient to produce the advance breeding line BJC 2236 (Fig. 5&6). Study revealed that the advance breeding line BJC 2236 needs lower amount of K. [4].

Different rate of S result showed significant increased on the yield and yield contributing characters over control. According to a study, 20 kg S/ha is sufficient to produce the best output of fiber and sticks. The combined dose of N100 P10 K60 S20 kg/ha seemed to be optimum for the advanced breeding line BJC 2236 (Fig. 5&6). These findings are strongly supported by the previous research results.[4], [15], [16], [17].

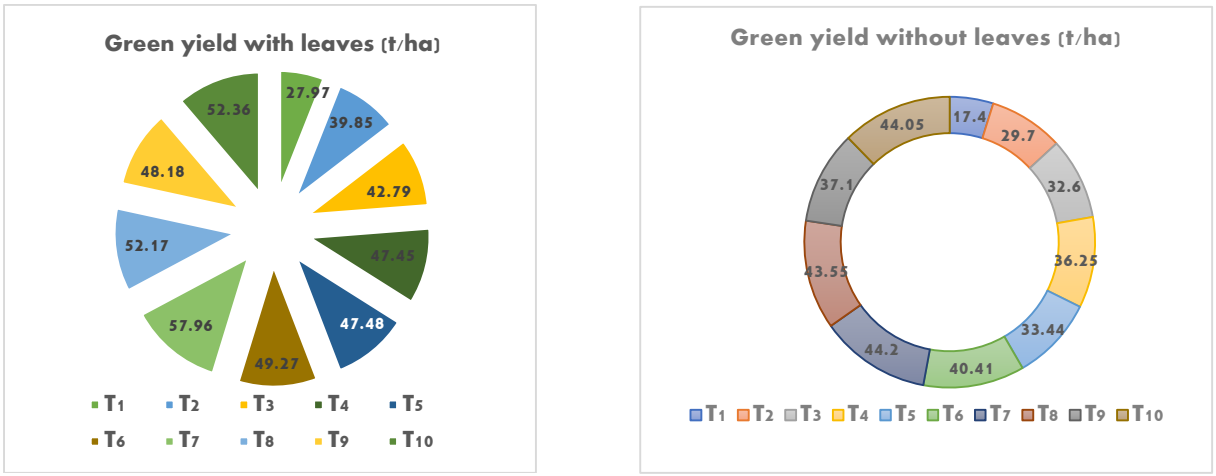

Figure 4. Green yield with (A) and without (B) leaves of *capsularis* jute (BJC 2236). The mean± S. E.M. is used to express the results.

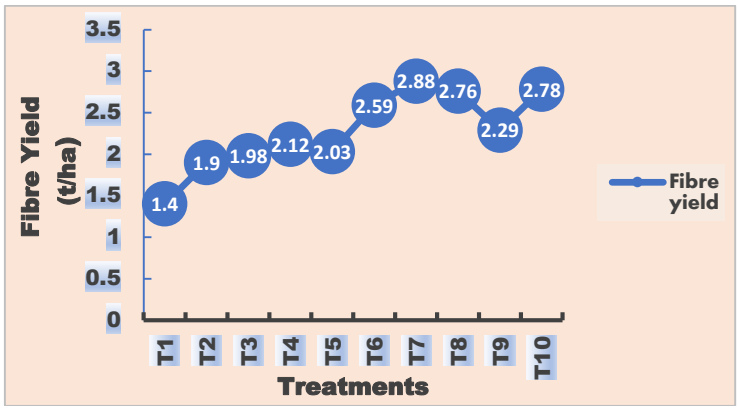

Figure 5. Fibre yield of capsularis jute (BJC 2236). The mean±S. E.M. is used to express the results.

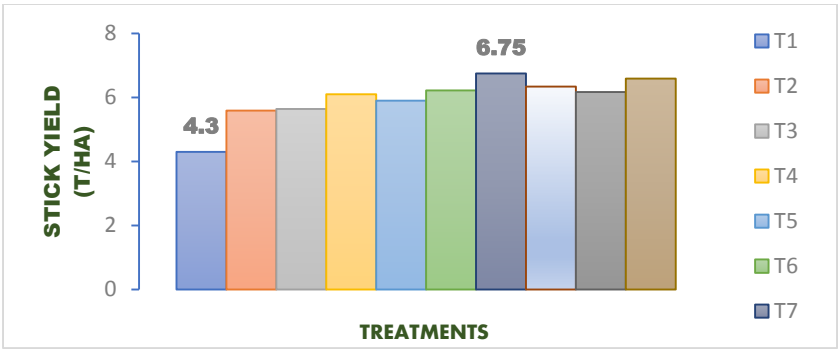

Figure 6. Stick yield of capsularis jute (BJC 2236). The mean ±S. E.M. is used to express the results.

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Figure 7. Pictorial view of the experimental plot at different stages e.g. Seedling stage, vegetative stage and harvesting stage.

IV. Conclusion

Combined chemical fertilizers had a considerable favorable impact on all yield contributing metrics as well as yield. So, we can evolved that fertilizer recommendation dose of NPK & S is 100-10-60- 20 Kg/ha for capsularis jute (BJC 2236)

Conflict of Interest

There are no conflicts of interest, according to the authors.

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