

Fertilizer doses for jute cultivation after onion harvest

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Abstract

An experiment was conducted to evaluate the fertilizer dose for jute cultivation at the field after harvesting of onion at Gangabordi and Talma, Faridpur during 2017 with five treatments with different level of Urea, Triple Super Phosphate, Muriate of Potash and Gypsum. The result revealed that the treatment of higher doses of fertilizer gave the statistically significant highest fibre (2.76t/ha) yield whereas treatment of lower doses of fertilizer gave the lowest fibre yield (2.40 t/ha) but the Benefit Cost ratio from different treatment showed statistical non significance. From the view of economic profitability, farmers may use no fertilizer at their field during jute cultivation where previous crop was onion.

Keywords:BCR; Fertilizer Dose; Jute; Onion; Yield.

1. Introduction

Faridpur is mostly a riverine area of the country belongs to Active Ganges River Floodplain (AEZ-10), Low Ganges River Floodplain (AEZ-12), Gopalganj-Khulna Bills (AEZ-14) and Old Meghna Estuarine Floodplain (AEZ-19) (FAO, 1988). Most of the soils of this region are formed from the river deposits. As a result of sedimentations, soils of this region are very fertile and diversified crops can be grown there during the rainy season as well as in winter. This region is well known for good quality onion and jute fibre production. About 1,53,251 ton onion was produced from 46,400 acre and 1,31,338 ton jute was produced from 1,81,927 acre during 2010-11 at Faridpur (District Statistics, 2013). Mostafizur et al., 2017 identified 36 jute based cropping pattern at Faridpur region which covered 43.49% of Net Cropped Area of that region. The Onion - Jute -Fallow covered about 25,960 hectare land in Faridpur region during 2014-15. It is known that a huge amount of fertilizer is used for onion production. But the residual effect of the used fertilizer is unknown. Excess use of fertilizer can hamper the growth of crop through its toxic effects and can deteriorate the water quality. It is reported by Ju et al. (2006) and Hvishtendahl (2010) that redundant water and fertilizers can cause serious environmental problems, such as greenhouse gas emission, soil degradation, freshwater contamination, and natural resource consumption. The use of unwanted fertilizer during jute production at post harvest onion field may cause financial losses to the farmer, on the other hand less fertilizer use may hamper jute yield. Farmers fall in dilemma about the required dose of fertilizer for jute production at onion field as optimum dose of fertilizer is always essential for desired yield of jute fibre. This problem is also faced by the farmers of different regions in Bangladesh as Nasim et al. (2017) reported that Onion - Jute - Fallow cropping pattern covers 54, 184 hectare land covering 39 districts and Onion - Jute - Fallow covers 45,200 hectare land covering 29 districts of Bangladesh. Hence, this experiment was undertaken to determine the fertilizer doses for the production of jute at post harvest onion field.

2. Materials and methods

2.1. Location

The experiment was conducted at Faridpur, Bangladesh which is located at 23° 36' 22"N and 89.50' 26" E and 15m from the sea level. It was trailed at 03 farmer's field located at Gangabordi, Faridpur and Talma, Faridpur during April, 2017. The initial soil status was given at Table 1.

Table 1: Nutrient Status of the Initial Soil

Properties	Amount
pH	7.6
Nitrogen (%)	0.12
Phosphorus (ppm)	21.15
Potassium(ppm)	0.35



Sulphur (ppm)	5.7
Zinc (ppm)	0.675
Boron	0.38

2.2. Design of the experiment

The experiment was laid out in randomized complete block design with five treatments (Table 2) which were replicated at three times. Recommended production practices were followed except fertilizer dose. Unit plot size was 3 x1m with 1m distance from plot to plot. Spacing between the plots and around the field was 1m. Depth of the drain was maintained as 80 cm up to the harvest of the crop.

2.3 Treatments

Five treatment combinations were used related to Urea, TSP, MoP and Gypsum (Table2).

Table2: Treatment Combination of Urea, TSP, Mop and Gypsum

Treatments	Urea (Kg/ha)	TSP (Kg/ha)	MoP (Kg/ha)	Gypsum (Kg/ha)
T ₁ (No fertilizer)	00	00	00	00
T ₂ (25% of RDF)	50	12.5	15	23.75
T ₃ (50% of RDF)	100	25	30	47.5
T ₄ (75% of RDF)	150	37.5	45	71.25
T ₅ (RDF)	200	50	60	95

RDF= Recommended Dose of Fertilizer for Jute.

2.4. Procedure

Half of Urea and total amount of TSP, MoP and Gypsum were incorporated to the experimental plots as per design during final land preparation. Remaining half of Urea was top dressed at time of 45 days after sowing. The name of the jute variety was O-9897. A sample of 10 plants was collected from each replication and then plant height and base diameter was recorded. Plant population was counted just before harvest. Jute plants were harvested at 120 days age during August, 2017. Then fiber and stick yields were recorded after retting and drying of the fibre and stick of the whole plot. The mean differences among the treatments were adjusted as per Duncan Multiple Rang Test (DMRT) (Gomez and Gomez, 1984) with the help of SPSS 14.0. Initial soil nutrient status (Average) of the experimental plots was presented at Table 1 and yield attributes results were shown at Table 3. Economic analysis (Table 4) was done by considering the market value of inputs (Molla et al., 2015) assuming Urea, TSP, MoP and Gypsum as 16, 22, 15 and 10 Taka/Kg respectively and output (fibre as 50 Taka/Kg and stick as 2Taka/Kg).

3. Results and discussions

3.1. Yield analysis

Plant height was significantly influenced by different fertilizer doses which ultimately contributed the statistically significant fibre and stick yield. The other yield contributing characters namely plant population, base diameter and bark thickness were changed with different fertilizer doses but those were not statistically significant.

The tallest jute plants (3.42m) were found at T₅ which was statistically identical with other treatments except T₁ (3.04m). Khanom et al., 2012 reported the highest plant height as 3.03m at different fertilizer doses on the white jute variety BJC-2197. Gani et al. found the highest plant height of jute from different fertilizer doses as very near to 3.5 m during 2018.

The result also explored that the highest plant population (42.53 plant/m²), base diameter (15.08 mm) and bark thickness (1.53 mm) were observed at T₅ where as the lowest values were observed at T₁ at all these three parameter but the differences were not statistically significant.

The highest fibre (2.76 t/ha) yield was obtained from T₅ which was statistically identical with T₂, T₃ and T₄. This result was corroborated by Ali et al., 2017 and Gani et al., 2018. The lowest fibre yield was recorded at T₁ (2.40 t/ha). Islam and Silva (2011) estimated average yield of jute was 2.21 t/ha at Faridpur region.

The highest stick yield (5.20 t/ha) was recorded for T₅ and lowest (4.58 t/ha) for T₁ treatment. The plant height, fibre yield of T₂, T₃ and T₄ was statistically identical. The stick yield of T₂ and T₃ was statistically identical.

Table 3: Yield and Yield Contributing Character of Jute from Different Doses of Fertilizer

Treatments	PP (No./m ²)	PH (m)	BD (mm)	BT (mm)	FY (t/ha)	SY (t/ha)
T ₁	40.60	3.04 b	13.40	1.40	2.40 b	4.58 c
T ₂	41.15	3.07 ab	13.53	1.42	2.54 ab	4.71 bc
T ₃	41.63	3.07 ab	14.21	1.47	2.56 ab	4.74 bc
T ₄	41.71	3.24 ab	15.07	1.48	2.58 ab	4.81 b
T ₅	42.53	3.42 a	15.08	1.53	2.76 a	5.20 a
CV (%)	6.2	6.91	7.87	15	7.00	4.78
Level of Significance	NS	5%	NS	NS	5%	5%

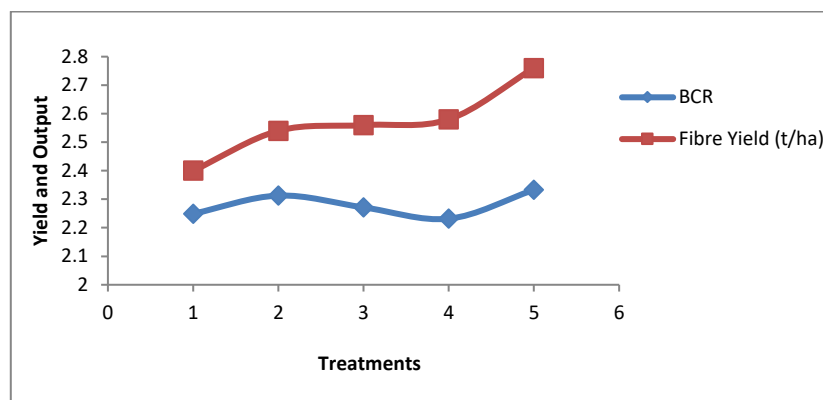
PP = Plant Population, PH = Plant height, BD = Base diameter, BT= Bark Thickness, FY= Fibre Yield, SY = Stick Yield CV = Coefficient of variance.

3.2. Economic analysis

Table 4: Economic Analysis of Jute from Different Doses of Fertilizer

Treatments	Input Cost (Taka/ha)	Output Cost (Taka/ha)	BCR
T ₁	57473	129261 b	2.24
T ₂	59010.5	136476 ab	2.31
T ₃	60548	137537 ab	2.27
T ₄	62085.5	138551 ab	2.23
T ₅	63623	148421 a	2.33
CV (%)	-	6.76	6.53
Level of Significance	5	5	NS

The highest output cost was found from T₅ as 148421 Taka/ha which was statistically identical with other treatments except T₁ (129261 Taka/ha). High input cost is a major constrain of jute production (Sheheli and Roy, 2014). During the experiment it was observed that input cost increased with the increasing of fertilizer amount. At Table 4, it was found that the highest Benefit cost ratio was 2.33 from T₅ followed by T₂, T₃, T₁ and T₄. But the differences of Benefit Cost Ratio (BCR) were not statistically significant. This result was also corroborated by Khanom et al. 2012; Haque et al., 2015 and Pervin et al., 2016. The fibre yield and BCR trend of jute with different fertilizer doses (T₁, T₂, T₃, T₄ and T₅) at post harvest onion field are given at Fig 1.

**Fig. 1:** Fibre Yield and BCR of Jute Cultivation with Different Treatments at Post Harvest Onion Field.

4. Conclusion

It was found that the fibre yield was significantly influenced by different doses of fertilizer during jute cultivation after harvesting of onion but the economic output was not significantly different for different fertilizer doses. The farmers may use 100% of recommended fertilizer dose for jute production to get maximum fiber yield but that yield expansion may not ensure to get maximum economic returns. So, it can be concluded that, in respect to economic output the farmers who cultivate jute after harvesting of onion can use no fertilizer for jute production. Further investigation is needed to establish such recommendation.

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