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Reduction of Production Cost of Jute (BJRI Tossa Pat 5) as Influenced by Urea Top Dressing Does and Period

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ABSTRACT

With a view to identify the effective does and optimum period of top dressing of urea in jute crop for reducing production cost of BJRI Tossa Pat 5 a field experiment was undertaken at Jute Research Regional Station, of Bangladesh Jute Research Institute, Kishoreganj during April to August 2018. The experiment was laid out in RCBD with three replications. The treatments were three Top dressing dose of Urea (gm^{-2}): D. viz. D_1 = 10-14-0 gm^{-2}, D_2 = 12-16-0 gm^{-2} and D_3 = 12-14-10 gm^{-2}., four Top dressing period (DAG): A. viz. A_1 = At Basal time-35-0, A_2 = At Basal time-25-45, A_3 = 05-35-0 DAG and A_4 = 05-25-45 and Control (Recommended dose of fertilizer, line sowing, weeding and other intercultural operations were maintained). In treatment D_1, 10 gm^{-2}, 14 gm^{-2}, 0 gm^{-2} top dressing dose of Urea were applied at the period treatment of A_1: At Basal time, 35 and 0 DAG, respectively. Similarly in treatment D_1, the treatments A_2, A_3 and A_4 were applied. Similarly the D_2 and D_3 dose treatments were applied at the period of A_1, A_2, A_3 and A_4 treatments. Thinning operations were done properly in every treatment, however weeding were not practiced in any treatment plots except control. BJRI Tossa Pat 5 variety was used as study material. Results revealed that plant population, plant height, base diameter and bark thickness were influenced significantly due to top dressing does of urea except fibre yields and stick yields of BJRI Tossa Pat 5. The highest plant population, plant height, base diameter and bark thickness were recorded in D_3 treatment. Numerically higher fibre yields and stick yields were found in D_3 also. The all yield and yield contributing parameters differed significantly due to top dressing period. The highest plant population, plant height, base diameter, bark thickness, fibre yields and stick yields were recorded in A_4 treatment. The treatment A_4D_3 contributed significantly highest plant height of 3.18 m, Base diameter of 15.02 mm, bark thickness of 3.17 mm, fibre yield of 3.05 tha^{-1} and stick yield of 6.97 tha^{-1} in interaction. Total Variable Cost (TVC) of 1,14,220/- $Tk.ha^{-1}$ was recorded the highest in control plot, however 65,490/- $Tk.ha^{-1}$ in A_4D_3 treatments. Benefit Cost Ratio (BCR) was the highest of 2.58 in A_4D_3 and it was higher than every treatments and control. The cost (TVC) was reduced in the treatment A_4D_3 of 48,730/- $Tk.ha^{-1}$ (43%) from the control where all intercultural managements were practiced.

Keywords: *BJRI Tossa Pat 5, urea top dressing, does, period, TVC, BCR*

INTRODUCTION

Jute (Corchorus spp.) is one of the main cash crops of Bangladesh. It plays an important role earning about 5-6% foreign exchange through exporting jute and jute goods. Jute is a common term used both for plant and the fibre obtained from the bark of the plants, *Corchorus capsularis* L. and *Corchorus olitorius* L. It covers about 2.86% of total cropped area. In Bangladesh, annually covering about 0.761 millions ha of land with the production of 1.62 million tons of fibre. The farmers require about 5500 tons of seed to cultivate the said area [1].

Jute fibres are mainly used for making hessians, sacks, bags, wall mats, carpet backing cloths etc. Jute crop enriches the top soil by adding organic matter through dropping leaves and left over roots in the field. Cultural practices are important management factors that affect the yield of a crop. Weeding is one of the most important cultural practices for the crop plants to take nutrients, moistures, light, space and

sometimes controlling many diseases organisms and insect pest [2]. An effective weed management practice is necessary for higher crop production and better economic return [3]. But, most effective and economic cultural practices for weed control in jute crop are not clearly known to our farmers. In Bangladesh, weeds are generally controlled by raking and niri (hand weeding) and weeding and thinning operations involve about 50% or more of the labour cost [4].

Weeding is a must to concern jute cultivation, if not weeded properly yield reduction may incur about 90%. Weeds share nutrient elements from the same soil. Some weeds are voracious and quick growing. These weeds affect light interception and passing of wind and affect photosynthesis in jute plant and ultimately crop will receive stunted growth and in a consequence yield of crop will reduce [5, 6]. There were six families of weed species found to infest the experimental plots of eighteen species.

Among the total weed vegetation, sedge shared 52%, grass 37% and the broad leaved weeds 11% on the basis of weed population m^{-2} and weed vegetation, sedge shared 66%, grass 24% and the broad leaved weeds 10% on the basis of weed green weight (gm^{-2}) [7]. Among the total weed vegetation in white jute field, sedge shared 68%, grass 26% and the broad leaved weeds 6% on the basis of weed population (m^{-2}). According to total weed vegetation Chandina of Comilla was highly infested where density was $876.57m^{-2}$ and green weight was $632.64gm^{-2}$ [8].

The cost of weeding alone comes to 30% to 40% or even more of the total cost of jute cultivation. Weeds competed with jute crops for water, light and mineral nutrients, which directly reduce the quality and quantity of fibre. Farmers should know the major species of jute weeds and their cost effective and easiest control measures for achieving maximum benefit from jute production. Since the cost as well as availability of agricultural labour is being copped up as problem, more attention in the field of scientific methods of jute weed control and sequence of weed vis-à-vis cropping pattern is warranted [9].

Bangladesh is a major jute producing country and the most important fibre crop as well as cash crop of the country. It is an important eco-friendly bast fibre crop in Bangladesh. Tossa jute can be grown in high land condition. It is a crop of warm and humid climate which is grown in rainfed situation during summer to early rainy season (March to end of August). Cultivation of jute starts from land preparation and ends with retting and extraction of jute. Important practices include ploughing and levelling of field, seed treatment, sowing, fertilization, weeding, retting and extraction of fibre. Weeding and retting are two major field operations in jute cultivation. Therefore, it is more oriented towards intensive use of labour. Around 70 percent of total cost of cultivation is shared by these two operations. Now a day, profit margin of jute growers is gradually declining due to continuous rise of the cost of agro inputs and tough competition from cheaper and durable synthetic materials. There are two or three weeding are needed in jute crop for better production of fibre. The weeds Mutha, Durba, Khudesama, Angulighas, Fuskabegun etc. are normally observed in the jute field. With a null hypothesis urea top dressing management could play a vital role to enhance the growth of jute crop than weed at field condition. Therefore, an experiment was undertaken to identify the effective doses and appropriate time of urea top dressing for higher yield with reducing weeding cost.

MATERIALS AND METHODS

The experiment was conducted at Jute Research Regional Station, Bangladesh Jute Research Institute, Kishoreganj in 2018 followed by RCBD design with three replications in a view to manage jute field weeds through Urea fertilizer top dressing at different days/period after germination (DAG) of jute crop. The treatments were three Top dressing dose of Urea (gm^{-2}): D. viz. D_1 = 10-14-0 gm^{-2}, D_2 = 12-16-0 gm^{-2} and D_3 = 12-14-10 gm^{-2}., four Top dressing period (DAG): A. viz. A_1 = At Basal time-35-0, A_2 = At Basal time-25-45 DAG, A_3 = 05-35-0 DAG and A_4 = 05-25-45 DAG and Control: Recommended dose of fertilizer, line sowing, weeding and other intercultural operations. In treatment D_1, 10 gm^{-2}, 14 gm^{-2}, 0 gm^{-2} top dressing dose of Urea were applied at the period treatment of A_1: At Basal time, 35 and 0 DAG, respectively. Similarly in treatment D_1, the treatments A_2, A_3 and A_4 were applied. Similarly the D_2 and D_3 dose treatments were applied at the period of A_1, A_2, A_3 and A_4 treatments. Thinning operations were done properly in every treatments, however weeding were not practiced in any treatment plots except control. On the other hand weeding, thinning and other

intercultural managements were operated properly in control plots. BJRI Tossa Pat 5 (O-795) was used as study material. The unit plot size 3m X 2.1m. Space between plots, block and around the field was 1m with 20 cm deep drain. Line to line distance was 30 cm.

Only recommended TSP and MoP to the other experimental plots were incorporated at the time of final land preparation. However, recommended dose of Urea, TSP and MoP to the control plot were incorporated at the time of final land preparation. The jute (BJRI Tossa Pat 5) seeds were sown on 2 April, 2018 and harvested at 2 August, 2018. The fibre yield, yield attributes and cost of production data were recorded and analyzed. The mean difference among the treatments were adjudged by the Duncan`s New Multiple Range Test [10].

Results and Discussion

Results revealed that plant population, plant height, base diameter and bark thickness of BJRI Tossa Pat 5 were influenced significantly due to top dressing does of urea except fibre yields and stick yields (Table 1). The highest plant population, plant height, base diameter and bark thickness were recorded in D_3 treatment. Numerically higher fibre yields and stick yields were found in D_3 also. The plant population differences were found insignificant among the urea top dressing does treatments, however all treatments was significant with control. The lowest records were observed in D_1 treatment for all the attributes studied (Table 1).

Table1. *Yield and yield attributes of BJRI Tossa Pat 5 influenced by top dressing dose of Urea for weed management*

Treatment	PP(sqm^{-1})	PH(m)	BD(mm)	BT(mm)	FY(th^{-1})	SY(th^{-1})
D_1	33 a	2.66 c	11.26 c	2.30 d	2.43	5.74
D_2	32 a	2.78 bc	11.94 c	2.50 c	2.44	5.84
D_3	35 a	2.86 b	12.87 b	2.66 b	2.64	6.12
Control	23 b	3.09 a	15.05 a	3.17 a	2.53	6.04

Legend: *PP=Plant population, PH=Plant height, BD=Base diameter, BT=Bark thickness, FY=Fibre yield, SY=Stick yield*

The all yield and yield contributing parameters of BJRI Tossa Pat 5 differed significantly due to top dressing period (Table 2). The highest plant population, plant height, base diameter, bark thickness, fibre yields and stick yields were recorded in A_4 treatment. The plant population differences were found insignificant among the urea top dressing period treatments, however all treatments was significant with control. The lowest records were observed in A_1 treatment for all the parameters studied (Table 2).

Table2. *Yield and yield attributes of BJRI Tossa Pat 5 influenced by urea top dressing periods for weed management for weed management*

Treatment	PP (sqm^{-1})	PH (m)	BD (mm)	BT (mm)	FY (th^{-1})	SY (th^{-1})
A_1	35 a	2.53 c	10.49 c	2.30 b	2.20 c	4.90 c
A_2	36 a	2.78 b	11.39 b	2.48 b	2.28 c	5.14 c
A_3	36 a	2.73 b	12.01 b	2.55 b	2.58 b	5.61 b
A_4	34 a	3.05 a	14.38 a	3.03 a	2.91 a	6.41 a
Control	24 b	2.39 c	12.05 b	2.27 b	2.43 b	5.64 b

Legend: *PP=Plant population, PH=Plant height, BD=Base diameter, BT=Bark thickness, FY=Fibre yield, SY=Stick yield*

Plant population, plant height, base diameter, bark thickness, fibre yields and stick yields of BJRI Tossa Pat 5 were significantly affected by the interaction of urea top dressing application period (A) and urea top dressing does (D) (Table 3). The highest plant height, base diameter, bark thickness, fibre yields and stick yields were found in A_4D_3 (05-25-45 DAG × 12-14-10 gm^{-2}) treatment. The treatment A_4D_3 contributed significantly highest plant height (3.18 m), Base diameter (15.02 mm), bark thickness (3.17 mm), fibre yield (3.05 tha^{-1}) and stick yield (6.97 tha^{-1}) (Table 3). The results were in agreement with Gaffer *et al.* [3], Hossain *et al.* [7], Hossain *et al.* [8], and Islam, [9].

Total variable cost (TVC) of 1,14,220/- Tk.ha^{-1} was recorded the highest in control plot, however were the lowest (62,425/- Tk.ha^{-1}) in A_1D_1, A_2D_1, A_3D_1 and A_4D_1 treatments (Table).

Cost reduction was found 48,730/- Tk.ha^{-1} (43%) in the treatment of A_4D_3 (05-25-45 DAG × 12-14-10 gm^{-2}) than the control. The TVC of A_4D_3 treatment was observed 65,490/- Tk.ha^{-1}. Gross return, Gross margin and BCR were higher in A_4D_3 treatment. BCR was the highest of 2.58 in A_4D_3 and it was higher than every treatments and control. The lowest BCR of 1.23 was calculated in control treatment (Table 4). Similar results were observed in Gaffer *et al*. [3] reported an effective weed management practice is necessary for higher crop production and better economic return. In a report of Alam [4] found that in Bangladesh, weeds are generally controlled by raking and hand weeding; and weeding and thinning operations involve about 50% or more of the labor cost.

Table3. *Interaction of Urea top dressing periods and Urea top dressing does on BJRI Tossa Pat 5 of fibre yield and yield attributes for weed management*

Treatment	PP (sqm^{-1})	PH (m)	BD (mm)	BT (mm)	FY (th^{-1})	SY(th^{-1})
A_1D_1	35 a	2.43 e	9.34 d	2.06 d	2.02 e	4.78 f
A_1D_2	33 a	2.57 de	10.90 bcd	2.15 cd	2.29 cde	5.18 cdef
A_1D_3	36 a	2.58 de	11.22 bcd	2.39 cd	2.28 cde	5.35 bcdef
A_2D_1	32 a	2.70 cde	11.47 bcd	2.22 cd	2.01 e	5.03 def
A_2D_2	35 a	2.76 bcde	10.63 cd	2.32 cd	2.11 de	4.91 ef
A_2D_3	33 a	2.87 abcd	12.08 bc	2.29 cd	2.41 bcde	5.48 bcdef
A_3D_1	34 a	2.63 de	11.14 bcd	2.27 cd	2.44 bcde	5.54 bcdef
A_3D_2	33 a	2.77 bcde	11.76 bc	2.30 cd	2.54 bc	6.21 abcde
A_3D_3	32 a	2.78 bcd	13.14 ab	2.47 cd	2.76 ab	6.28 abcd
A_4D_1	32 a	2.86 abcd	13.10 ab	2.66 bc	2.64 abc	6.41 abc
A_4D_2	33 a	3.02 abc	13.84 ab	2.93 b	2.83 ab	6.64 ab
A_4D_3	34 a	3.18 a	15.02 a	3.17 a	3.05 a	6.97 a
Control	29 b	2.19 ab	13.05 b	2.57 b	2.53 bcd	6.04 abcdef

Legend: *A_1= At Basal time–35–0, A_2= At Basal time–25–45, A_3=5–35–0, A_4=05–25–45; Dose of urea (g/m^2): D_1=10-14 0, D_2=12–16–0, D_3=12–14–10, PP=Plant population, PH=Plant height, BD=Base diameter, BT=Bark thickness , FY=Fibre yield, SY=Stick yield*

Table4. *Cost and return analysis of BJRI Tossa Pat 5 variety on urea top dressing period (A) and urea top dressing does (D) for weed management*

Treatment	TVC (Tk.ha^{-1})	Gross return (Tk.ha^{-1})	Gross margin (Tk.ha^{-1})	Benefit cost ratio (BCR)
A_1D_1	62,425	1,11,500	53,075	1.85
A_1D_2	64,210	1,24,970	60,760	1.95
A_1D_3	65,490	1,25,580	60,090	1.92
A_2D_1	62,425	1,12,590	50,165	1.80
A_2D_2	64,210	1,15,970	51,760	1.81
A_2D_3	65,490	1,31,690	66,200	2.01
A_3D_1	62,425	1,33,280	70,855	2.14
A_3D_2	64,210	1,41,400	77,190	2.20
A_3D_3	65,490	1,50,840	85,350	2.30
A_4D_1	62,425	1,46,700	84,275	2.35
A_4D_2	64,210	1,55,870	91,660	2.43
A_4D_3	65,490	1,69,270	1,03,780	2.58
Control	1,14,220	1,39,970	25,750	1.23

Legend: *Urea = 16/- Tk.kg^{-1}, TSP = 22/- Tk.kg^{-1}, MoP = 15/- Tk.kg^{-1}, Fibre = 41/- Tk.kg^{-1}, Stick= 6/- Tk.kg^{-1}, Labor wage rate = 450/- Tk.day^{-1}, Seed = 190/- Tk.kg^{-1}, TVC = Total variable cost, BCR = Benefit cost ratio*

With a null hypothesis, urea top dressing management could play a vital role to enhance the growth of jute crop than weed at field condition. Here in this experiment the hypothesis confirmed, where in the treatment of A_4D_3 (05-25-45 DAG × 12-14-10 gm^{-2}), the production cost of BJRI Tossa Pat 5 was observed reduced at 43% from control.

Conclusion

The treatment A_4D_3 (05-25-45 DAG × 12-14-10 gm^{-2}) contributed significantly the highest fibre yield and yield contributing parameters. Gross Margin and BCR were higher in A_4D_3 treatment also. In A_4D_3, the production cost was reduced at 43%. Therefore, It could be concluded that cost and return analysis of urea fertilizer top

dressing for weed management at different period of plant age of jute crop was analyzed highly profitable.

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