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Short communication

Effect of phosphorus on different variety in respect of quality fibre production of Jute

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ABSTRACT

An experiment was conducted at the Agronomy Field Laboratory, Patuakhali Science and Technology University, Patuakhali from May to September 2016, with a view to investigating the effect of phosphorus and different variety on the yield of jute varieties viz. (O-795,O-9897 and O-3820) and four levels of phosphorus (0 kg , 15 kg , 20 kg and 25 kg P ha^{-1}). The experiment was laid out in a randomized complete block design (RCBD) with three replications. The variety had significant influence on plant height, number of internodes per plant, fiber diameter, stick diameter, green weight with and without leaves, fiber weight, fiber yield, stick weight and stick yield. The variety O-3820 produced the highest fiber yield (5.35 t ha^{-1}) due to improved yield components. Due to effect of phosphorus the highest results of all parameter were obtained from 15 kg P ha^{-1}. Similarly the effect of interaction of variety and level of phosphorus had significant influence on plant height, number of internodes per plant, fiber diameter, stick diameter, stick diameter, fiber diameter, green weight with and without leaves, fiber weight fiber yield (6.52t ha^{-1}), stick weight and stick yield. The highest results of all characters were obtained from O-3820 with 15 kg P ha^{-1}. The results of the present experiment showed that the O-3820 was the best among the varieties. On the other hand, 15 kg P ha^{-1} was proved to be better than any other lower and higher levels of phosphorus. Therefore, it can be inferred that jute can produce the highest fiber yield from a combination of variety O-3820 treated with 15 kg P ha^{-1} in field.

INTRODUCTION

Jute (*Corchorus capsularis* and *Corchorus olitorius* L.) is an herbaceous annual plant from the Tiliaceae family, mostly grown in Southeast Asian countries (José et al., 2009). Jute is one of the most important commercial crop of our country. Bangladesh has the second largest area under jute cultivation (1.0 million ha) with the production of nearly 100 lakh bales (Sen, 2007). Jute is an annual herbaceous plant, jute is a long, soft, shiny vegetables fiber. It is produced from plants in the genus corchorus, which has been classified in the family Tiliaceae, or more recently malvaceae. The suitable climate for growing jute (warm and wet climate) is offered by the monsoon climate during the monsoon season. Jute requires 5-8 cm of rainfall weekly and more during the sowing period. Two species of jute *Corchorus capsularis* and *Corchorus olitorius* usually grown by the farmer. Total land area of 14.05 million hectares, total cultivated area of the country is 7.94 million hectares and its cropping intensity is about 182 percent (BBS, 2009) which is the highest in the world. About 80% of the total world jute is produced in Bangladesh and India. Jute is extensively used throughout the world because of its versatility, durability and fineness. Its fibre is mainly used in manufacturing various type of industrial product such as hessian, sacking, carpet backing, cloths, mats, blankets, fabrics, packing materials, etc. Bangladesh earns about 6-7% foreign exchange through exporting raw jute and jute goods. The fibre is also used to prepare ropes and housing materials for domestic uses. Jute sticks are used as fuel and fence. In recent years, the green jute plants are being used as raw materials for paper pulp in the paper mills. Jute is also used for partex and jute geo-textile. Jute is least expensive and most versatile textile fibres. There is an enormous contribution of jute in the economy of Bangladesh. Total demand of jute

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goods in the international market is 0.75 Mt (Uddin et al., 2014). Jute contributes significantly to the economy of Bangladesh, as it is the major source of foreign currency by exporting jute fibre and goods produced from it (BJRI, 2008). Jute plays a very important role in Bangladesh economy as the country earns about 12-13% of total foreign currency by exporting jute and jute product (BJRI, 1998). Bangladesh, the second largest producer of jute, produces the best quality jute in the world and leads the export market (Rayhan et al., 2008).

Jute varietie is one of the key elements for increasing fibre and stick yield. For maximizing yield variety play a vital role. An experiment was, therefore, initiated to study the growth and yield of three varieties of *capsularis* jute and to find out superior variety for fiber yield. Sarkar et al. (2012) found that the fibre yield was significantly influenced by variety. They reported the highest fibre yield (4.65 t ha^{-1}) was obtained from O-9897 and the lowest (2.23 t ha^{-1}) from O-795.Phosphorus is one of the key elements for increasing fiber and stick yield. For maximizing yield appropriate level of phosphorus is essential. Sarkar et al. (2012) reported green weight exhibited significant response to levels of P. Hence, the present study was undertaken with three important mustard varieties, O-795, O-9897 and O-3820 to find out appropriate level of phosphorus.

MATERIALS AND METHODS

An experiment was conducted at Field Laboratory of the Department of Agronomy, Patuakhali Science and Technology University, Dumki, Patuakhali during the kharif season. Three varieties of jute O-795, O-9897 and O-3820 were taken as experimental crop. The experimental treatments were 4 phosphorus levels viz. 0, 15, 20 and 25 kg ha^{-1}. The experiment was laid out in a RCBD design with 3 replications. The unit plot size was 3.0m × 2.0m. Seed were sown in properly prepared land. Recommended fertilizers were used Urea, MOP and gypsum, respectively and TSP used as per treatment. Necessary intercultural operations were done as and when necessary. The jute was harvested at proper maturity. Data were collected on plant population at harvest, number of internodes per plant, plant height (cm),plant diameter (mm),green weight with leaf (kg),green weight without leaf (kg),fibre weight per plant (g),fibre weight per plot (kg),stick weight per plant (g),stick weight per plot (kg),bark diameter (mm) and stick diameter (mm).The collected data were analyzed using computer package MSTAT-C and mean differences were adjudged by using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Varietal performance

Green weight with leaf, green weight without leaf, bark diameter(mm),stick diameter(mm), fiber weight per plant (g), fiber yield(t ha^{-1}), stick weight per plant (g) and stick yield(t ha^{-1}) were highest in O-3820. Plant height (m) and No. of internodes $plant^{-1}$ were highest in O-795 (Table 1). Sarkar et al. (2012) found that the plant height (m) and no. of internodes $plant^{-1}$,green weight with leaf, green weight without leaf, bark diameter(mm),stick diameter(mm), fiber weight per plant (g), fiber yield(t ha^{-1}), stick weight per plant (g) and stick yield(t ha^{-1}) was significantly affected by jute variety.

Effect of phosphorus on the yield and yield attributes of jute

The effect of phosphorus on yield and yield contributing characters was statistically significant. Results revealed that plant height(m),green weight with leaf, green weight without leaf, bark diameter (mm),stick diameter(mm), fibre weight per plant (g), fibre yield(t ha^{-1}), stick weight per plant (g) and stick yield(t ha^{-1}) were highest in 15 kg P ha^{-1} and the lowest values of above parameters were recorded from control (Table 2). Sarkar et al. (2012) found that the plant height (m) and no. of internodes $plant^{-1}$,green weight with leaf, green weight without leaf, bark diameter(mm),stick diameter(mm), fiber weight per plant (g), fiber yield(t ha^{-1}), stick weight per plant (g) and stick yield(t ha^{-1}) was significantly affected by phosphorus.

Table 1
Effect of variety on growth and yield characteristics of jute.

Variety	Plant height (m)	No. of internodes Plant^{-1}	Green weight with leaf (kg)	Green weight without leaf (kg)	Bark diameter (mm)	Stick diameter (mm)	Fibre weight per plant (g)	Fibre yield (t ha^{-1})	Stick weight per plant (g)	Stick yield (t ha^{-1})
O-795	4.26 a	94.25 a	3.99 b	3.54 b	2.83 b	14.50 b	20.93 c	4.96 c	70.60 b	13.38 b
O-9897	4.17 c	90.7 c	3.94 c	3.50 c	2.63 c	14.18 c	26.30 b	5.26 b	67.55 c	13.18 c
O-3820	4.24 b	91.97 b	4.08 a	3.61 a	3.18 a	14.95 a	26.78 a	5.35 a	73.60 a	14.20 a
Level of significance	**	**	**	**	**	**	**	**	**	**
LSD value	0.40	7.51	0.35	0.25	0.46	1.06	5.05	0.95	7.90	1.87
CV(%)	4.74%	4.07%	4.40%	3.55%	7.35%	3.67%	8.73%	8.72%	5.58%	6.87%

Values denoted by different letters within the column differ significantly;
** = Significant at 1% level of probability,* = Significant at 5% level of probability and NS = Non Significant

Table 2
Effect of phosphorus on growth and yield characteristics of different varieties of jute.

Treatments	Plant height (m)	No. of internode per plant	Green weight with leaf(kg)	Green weight without leaf(kg)	Bark diameter (mm)	Stick diameter (mm)	Fibre weight per plant (g)	Fibre yield (t ha^{-1})	Stick weight per plant (g)	Stick yield (t ha^{-1})
P_0	3.51 d	85.03 d	3.50 d	3.07 d	2.47 d	13.96 d	20.90 d	4.18 d	63.13 d	12.30 d
P_{15}	4.62 a	97.03 b	4.28 a	3.83 a	3.22 a	14.97 a	29.93 a	5.98 a	78.83 a	14.20 a
P_{20}	4.24 c	88.33 c	3.98 c	3.55 c	2.76 c	14.17 c	24.33 c	4.84 c	70.16 c	13.76 b
P_{25}	4.51 b	98.83 a	4.24 b	3.76 b	3.09 b	14.95 b	28.70 b	5.74 b	70.20 b	14.06 c
Level of significance	**	**	**	**	**	**	**	**	**	**
LSD value	0.40	7.51	0.35	0.25	0.46	1.06	5.05	0.95	7.90	1.87
CV (%)	4.74%	4.07%	4.40%	3.55%	7.35%	3.67%	8.73%	8.72%	5.58%	6.87%

Values denoted by different letters within the column differ significantly;
P_0=Control, P_{15}=15 Kg P ha^{-1}, P_{20}=20 Kg P ha^{-1}, P_{25}=25 Kg P ha^{-1}
** = Significant at 1% level of probability,* = Significant at 5% level of probability and NS = Non Significant

Table 3
Interaction effect of variety and Phosphorus (P) growth and yield characteristics of jute.

Variety and Treatments	Plant height (m)	No. of internode per plant	Green weight with leaf(kg)	Green weight without leaf(kg)	Bark diameter (mm)	Stick diameter (mm)	Fiber weight per plant (g)	Fiber yield (t $ha^{-1)}$	Stick weight per plant (g)	Stick yield (t ha^{-1})
V_1P_0	3.58 bc	84.66 c	3.56 c	3.08 c	2.36 bc	14.26 bc	20.9 c	4.18 bc	64.46 bc	11.26 c
V_1P_{15}	4.55 ab	94.4 ab	4.00 b	3.65 ab	3.20 ab	14.96 ab	25 bc	5 b	80.33 a	13.66 ab
V_1P_{20}	4.10 b	95.06 ab	4.06 ab	3.60 b	2.80 b	14.40 b	23.4 bc	4.68 bc	78.06 ab	14.14 ab
V_1P_{25}	4.80 a	103.26 a	4.35 ab	3.85 ab	3.06 ab	14.53 ab	30 ab	6 ab	71.73 ab	14.63 ab
V_2P_0	3.53 bc	83.93 c	3.50 c	3.09 c	2.26 bc	13.80 bc	21.8 bc	4.36 bc	61.86 c	11.8 bc
V_2P_{15}	4.63 ab	98.06 ab	4.39 ab	3.90 ab	3.00 b	14.60 ab	32.6 a	6.52 a	79 ab	14.6 a
V_2P_{20}	4.12 b	85.4 c	3.78 bc	3.38 bc	2.16 c	13.56 c	23.53 bc	4.70 bc	60.73 c	12.56 b
V_2P_{25}	4.42 ab	95.5 ab	4.10 ab	3.65 ab	3.10 ab	14.86 ab	27.33 ab	5.46 ab	68.73 bc	13.86 ab
V_3P_0	3.42 c	86.6 bc	3.46 c	3.05 c	2.80 bc	13.96 bc	20 c	4 c	63.2 bc	13.96 ab
V_3P_{15}	4.70 ab	98.73 ab	4.46 a	3.94 a	3.46 a	15.43 ab	32.2 a	6.44 a	77.2 ab	14.43 ab
V_3P_{20}	4.50 ab	84.6 c	4.10 ab	3.68 ab	3.33 ab	15.76 a	26.13 b	5.22 ab	71.8 ab	14.76 a
V_3P_{25}	4.32 ab	98.06 ab	4.28 ab	3.78 ab	3.13 ab	14.86 ab	28.86 ab	5.77 ab	70.2 b	13.86 ab
Level of significance	*	**	*	*	*	**	**	**	**	**
LSD value	0.40	7.51	0.35	0.25	0.46	1.06	5.05	0.95	7.90	1.87
CV (%)	4.74%	4.07%	4.40%	3.55%	7.35%	3.67%	8.73%	8.72%	5.58%	6.87%

Values denoted by different letters within the column differ significantly;
** = Significant at 1% level of probability,* = Significant at 5% level of probability and NS = Non Significant

Interaction effect of variety and phosphorus on the yield and yield attributes of jute

The effect of variety and phosphorus phosphorus on yield and yield contributing characters was statistically significant. Results had showed that plant height (m) and no. of internode per plant were highest in V_1P_{25} and green weight with leaf (kg), green weight without leaf (kg) and bark diameter (mm) were highest in V_3P_{15} and fiber weight per plant (g) and fiber yield were highest in V_2P_{15} and stick yield were highest in V_3P_{20}.

CONCLUSIONS

All the treatments of variety and phosphorus had significant impact over control on growth parameters and yield parameters and effect of combined fertilizers on them were explained by simple and multiple regression analysis. Interaction between variety and level of P showed significant variation in relation to all physical parameters. All the physical parameters were found highest from 15 kg P ha^{-1} and the lowest in control. From the above results of the present study it may be concluded that 15 kg P ha^{-1} individually along with recommended rate of N, K and S fertilizers significantly increased different physical parameters. Highest fibre yield was recorded from O-3820 variety.The most important parameter, fiber yield were recorded highest with V_3P_{15} treatment.

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