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EFFECT OF SOWING TIME, PLANT GEOMETRY AND TOPPING ON NUTRIENT UPTAKE AND PRODUCTIVITY OF JUTE

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ABSTRACT

A field experiment was conducted at Bahraich (U.P.) during 2011-12 and 2012-13 to evaluate the effect of sowing time, plant geometry and topping on productivity of jute. The experiment was conducted with three dates of sowing viz 15 June, 30 June and 15July; 3 spacing viz. 45 X 10 , 45 X 15 and 60 X 15cm and two dates and topping at 30 and 45 DAS. Results revealed that significantly higher values of plant height (222.50 cm),productive branches per plant (14.15) pods per plant (49.25), test weight (3.82g) seed yield (6.02q ha-^{1}) were recorded under 15 June sowing crop than those of other dates of sowing. Significantly higher net return and B:C ratio and uptake of nutrients were noticed under 15 June sowing crop. Wider spacing (60x15cm) significantly increased plant height, productive branches pods/plant yield and economics and N, P and K uptake as compared to 45x15 cm spacing. Topping at 45 DAS resulted significantly higher yield attributes, yield, economics and uptake of nutrients over topping at 30 DAS. Test weight was not affected significantly with topping.

Keyword: Sowing, plant geometry, topping, yield, economics, nutrient uptake, jute.

INTRODUCTION

Jute (*Carchorus* capsularis) is one of the major cash crop in India contributing significantly to the national exchange. Jute and allied fibre crops are cultivated in around 9 million hectares with an average annual production of 10 lacks bales and generating rural employment to the tune of 10 million mandays. The jute industry contributes to our export earning to about 1500 crores of rupees annually. Seed is a vital agricultural input and gives highest return relative to its cost. Seed being the basic input acts as catalyst and a starting point for realizing the potential for all other inputs in any crop production system and deserves at most care for its production maintaining physical and genetic purity. The sowing time of jute is a major aspect of plant growth and yield of jute crop. Proper or optimum sowing time gave more response in comparison to late sowing. Proper sowing time increased crop growth, yield attributes ulimentally yield was increased. Well spacing and topping time have also great effect on growth of plant and seed yield of jute. As narrow row spacing increased plant competition resulted poor vegetative growth and low seed yield. Topping time of the jute crop play important role in jute seed production. The optimum date of topping increased number of productive branches and capsules per branch thus yield was ultimately increased. Keeping this view in mind, an experiment was conducted to evaluate the sowing time, plant geometry and topping date in jute seed yield.

MATERIALS AND METHODS

The experiment was conducted at Crop Research Station Bahraich (22^0 45 N, 88^0 16" E and 30 m altitude) in soil having sandy loam texture, low organic carbon (0.02 %) N (185 kg ha^{-1}), P (11.5 kg ha^{-1}) and K (240 kg ha^{-1}) contents with neutral reaction (pH 7.5). The experiment was laid out in split plot design with 3 replications. Sowing time was allocated in main plot and combination of spacing and topping dates in sub plot. The Jute (Chorcorus capsularis) variety JRC-212 was test crop. The sowing was done as per treatments viz 15 June, 30 June and 15 July. The crop was fertilized with 80:40:40 kg NPK ha^{-1} through urea, single superphosphate and muriate of potash, respectively. The half dose of N and full dose of P and K was applied at the time of sowing as basal dressing. Remaining dose of N was applied in two equal splits, first at 35 and second at 70 DAS as top dressing. All improved package of practices like weeding, irrigation, intercultural operation and insectpest control were adopted to raise the crop. The growth and yield attributing characters were recorded at full growth stage of crop. The yield of jute crop was recorded after harvesting and threshing of crop. The economics of each treatment was calculated on market price of inputs and outputs. Nitrogen content in jute was determined by modified Kjeldahl method. Phosphorus and potassium was determined by vanadomolybdate yellow colour method and flame photometer, respectively in diacid (HNO_3 $HClO_4$) digest (Jackson 1973). Nutrient uptake in grain and straw was calculated by multiplying the yield with nutrient concentration.

RESULTS AND DISCUSSION

Effect of sowing time

The highest plant height (222.5 cm), productive branches per plant (14.15), pods / plant (49.25) , 1000 seed weight (3.82 g) and seed yield

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(6.02 q ha^{-1}) were recorded under the 15 June sowing which was significantly superior to 30 June and 15 July sowing. The growth, yield attributes and yield decreased significantly with further delay in sowing. Similar results were reported by Kumar et. al (2010), Das *et al.* (1995), Sarkar and Sinha (2004) and Srivastava *et al.* (2011). The crop yield under 15 June sowing (6.02 q ha^{-1}) was found 6.0 and 29.6 % higher over 30 June and 15 July sowing, respectively. This might be due to optimum favorable atmosphere received in 15 June sowing, ultimately yield increased having highest net income of ` 45299 ha^{-1}. This could be attributed to higher economic yield of the jute coupled better market price of jute. The lower net return and B:C ratio were recorded under late sowing (15 July). Highest benefit: cost ratio was observed under early sowing (15 June) which was superior to other dates of sowing.

Table 1: Effect of date of sowing, spacing and topping on growth and yield attributes of jute (mean of two years)

Treatments	Plant height (cm)	Productive branch /plant	Pods/ plant	1000 seed weight (g)	Seed yield (q ha^{-1})	Net profit (Rs ha^{-1})	B:C ratio	Total Nutrient uptake (kg ha^{-1})		
								N	P	K
Date of sowing										
D1- 15th June	222.50	14.15	49.25	3.82	6.02	45299	4	75.80	28.5	85.8
D2- 30th June	190.63	13.05	44.8	3.68	5.66	41458	3.77	70.6	25.7	81.4
D3- 15th July	105.37	10.8	35.3	3.25	4.24	20408	2.27	68.8	21.8	75.4
SEm ±	3.35	0.12	1.2	0.07	0.25	1210	0.15	0.70	0.52	0.92
CD(P=0.05)	9.7	0.5	2.88	0.21	0.6	2904	0.36	2.12	1.58	2.78
Spacing										
S1- 45 X 10 cm	219.32	13.05	42.05	3.48	5.3	36741	3.32	63.8	20.4	73.5
S2- 45 X 15 cm	225.4	12.8	43.0	3.58	5.45	37880	3.43	71.5	24.5	78.5
S3- 60 X 15 cm	237.57	14.4	48.4	3.81	5.83	38363	3.41	73.7	27.6	84.5
SEm ±	2.3	0.1	0.75	0.08	0.015	1020	0.02	0.66	0.47	0.88
CD(P=0.05)	7.05	0.3	1.85	0.197	0.045	3103	0.04	2.0	1.42	2.65
Topping										
T1- 30 DAS	221.42	12.2	43.4	3.73	5.32	36592	3.32	72.5	24.5	78.5
T2- 45DAS	234.42	13.1	42.9	3.73	5.5	39064	3.4	75.5	27.5	85.6
SEm ±	1.95	0.07	0.10	0.011	0.01	1090	0.076	0.82	0.55	0.86
CD(P=0.05)	4.81	0.17	0.24	0.027	0.024	2692	0.078	2.02	1.35	2.12

Effect of spacing

Data on plant growth, yield attributes and seed yield as affected by various treatments are presented in Table 1. A perusal of the data indicated that highest plant height (231.5 cm) productive branch /plant (14.4), pods/ plant (48.4), test weight (3.81 g) and seed yield (5.83 q ha^{-1}) was recorded under plant geometry of crop having 60 X 15 cm which was found superior than other two plant geometry of 45 X 10 cm and 45 X 15 cm, respectively. The highest yield (.83 q ha^{-1}) was 9.0 and 6.5 % higher over 45 X 10 and 45 X 15 cm spacing respectively. Higher net income of ` 38363 ha^{-1} was recorded under spacing of 60 X 15 cm which was 4.2 and 1.2 % more over the spacing of 45 X 10 and 45 X 15 cm, respectively. The higher profit was due to higher yield under this (60.x 15 cm) treatment. Similar findings were also reported by Kumar *et al.* (2010), Dass *et al.* (1995) and Sarkar and Sinha (2004). The B:C ratio decreased under close spacing (45x10 cm) particularly due to relatively lower yield: However, wider spacing might prove beneficial and highest B:C ratio of 3.43 was recorded under 45x15 spacing.

Effect of topping date

The data (Table 1) revealed that the highest plant height (234.42 cm), productive branch /plant (13.1), pods/plant (42.9), test weight (3.73 g) and grain yield (5.5 q ha^{-1}) were recorded under the topping date of 45 DAS which was significantly superior to the topping at 30 DAS. This might be due to optimum period of topping in jute crop. Data (Table 1) revealed that highest net income of `39064 ha^{-1} was obtained under the topping at 45 DAS which was 6.3 % higher over the topping at 30 DAS. Similar findings were reported by Singh *et al.* (2011), Krishnamurty *et al.* (1994). The higher B:C ratio (3.40) was noted under the topping data 45 DAS as compared to 30 DAS. The higher net return and B/C ratio noted at 45 DAS may be attributed to higher yield under this treatment.

Nutrient uptake

In comparisons to late sowing (15 July), early sowing tended to significantly enhance nutrient uptake by the crop. Amongst sowing dates, significantly higher N,P and K uptake were recorded under early sowing (15 June). These results were followed by sowing on 30 June for uptake of nutrients. Nutrient uptake is the function of content and yield. Therefore, increase in yield due to early sowing (15 June) can be reasoned for enhanced uptake of N,P and K by the crop. The significant difference was recorded in nutrient uptake among spacing (Table 2). The differences in nutrient uptake were recorded to yield performance of the crop due to various spacings. The crop sown at 60x05 cm produced higher yield which resulted in higher uptake. Lowest uptake values of nutrients were recorded under spacing of 45x10 cm. Topping of the crop at 45 DAS resulted in higher uptake of nutrients than that of topping at 30 DAS.

On the basis of results, if may be concluded that sowing of crop at 15 June with spacing of 60 X 15 cm and topping at 45 DAS was more productive and remunerative as compared to other date of sowing, spacing and topping date. Therefore, it may be recommended to the jute growers to follow the above practice for higher seed production.

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