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Effect of potassium and sulphur on the productivity, nutrient uptake and quality improvement of jute

S. S. MONDAL, P. MANDAL, A. BAG, S. MAITI AND D. ACHARYA

Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya Mohanpur, Nadia, 741252, West Bengal

ABSTRACT

A field experiment was conducted in the Entisol soil of neutral reaction having 0.065 per cent of total N, 16.80 kg ha^{-1} available phosphorus, 198 kg ha^{-1} available potassium and 16.5 kg ha^{-1} sulphur at the Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, during 1998-2000 under irrigated condition to evaluate the effect of potassium and sulphur on the productivity, nutrient uptake and quality improvement of jute. The crop responded significantly to potassium and sulphur applications. The results showed that the highest fibre yield of jute (3.69 t ha^{-1}) was obtained with 33.3 kg K ha^{-1} alongwith 40 kg S ha^{-1}. Maximum uptake of nurtients (N, P and K ha^{-1}) alongwith higher dose of sulphur (40 kg S ha^{-1}). On the qualitative point of view, the best quality jute (score 84 in 1998 and 82 in 1999) was obtained with the higher doses of potassium and sulphur. Interaction effect between potassium and sulphur was significant regarding productivity, nutrient uptake and quality improvement of jute.

Key words : Jute, Potassium, Sulphur, Productivity, Nutrient uptake, Quality improvement.

INTRODUCTION

Jute is an important fibre crop. It occupies the position next to cotton. It is one of the major foreign exchange earners. But most of the farmers usually cultivate jute in poor soil with minimum fertilizer application. They do not use proper amount of potassium and sulphur alongwith nitrogen and phosphorus. As a result, the yield of fibre as well as quality become poor. Potassium and sulphur improve the fibre yield and fibre quality by increasing the plant height, basal diameter (Sarkar, 2000). So, an investigation was undertaken to study the effect of potassium and sulphur on the productivity, nutrient uptake and quality improvement of jute crop.

MATERIALS AND METHODS

The field experiment was conducted at the Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia (23^0 N latitude, 89^0 E longitude and 9.75 M above mean sea level), during the period from April 1998 to March 2000 in sandy loam soil. The experimental soil was neutral in reaction (pH 7.0). The experiment was laid out in Factorial Randomized Block Design with three levels each of potassium and sulphur with three replications. The treatments comprised 27 combinations : three levels of potassium (0, 20, 40 kg S ha^{-1}). The recommended doses of nitrogen and phosphorus for jute were 40 kg and 20 kg ha^{-1} respectively applied to all the plots. Full dose of P, K and S were applied as basal dose and nitrogen in two splits, i.e., 3 weeks and 6 weeks after sowing. Jute seeds were sown with 20 cm x 10 cm spacing. The sowing was done in the first week of April. The variety was Nabin (JRO 524).

RESULTS AND DISCUSSION

Effect of potassium and sulphur on the productivity of jute

Dry matter accumulation at harvest and fibre yield varied significantly due to the application of different levels of potassium and sulphur, both of which increased significantly with the higher doses of potassium and sulphur (Table 1). The highest fibre yield to the tune of 3.50 and 3.62 t ha^{-1} were obtained during 1998 and 1999, respectively with 33.3 kg potassium ha^{-1} which were significantly higher than no potassium. Similar trend was also obtained in case of application of sulphur during 1998 and 1999 (Table 1). These results revealed that deletion of potassium and sulphur fertilizer drastically reduced the fibre yield. Similar findings were reported by Chowdhury (1998).

Table 1 Effect of potassium and sulphur on the fibre (t ha^{-1}) of jute in 1998 and 1999

Treatmens	Fibre yield (t ha^{-1})	
	1998	1999
Levels of potassium (kg K ha^{-1})		
K_0	2.19	2.19
K_1	3.36	3.51
K_2	3.50	3.62
S.Em. (±)	0.49	0.40
C.D. (P = 0.05)	0.15	0.12
Levels of Sulphur (kg S ha^{-1})		
S_0	2.75	2.87
S_1	3.07	3.12
S_2	3.22	3.34
S.Em. (±)	0.49	0.04
C.D. (P = 0.05)	0.145	0.120

Effect of potassium and sulphur on the nutrient uptake of jute

From the result (Table 2), it was apparent that maximum uptake of nutrient N, P, K and S by jute (104.07 kg, 58.53 kg , 214.79 kg and 13.74 kg respectively) was recorded under the treatment of higher dose of potassium (K_2) receiving 33.3 kg K ha^{-1} for jute, Detection of potassium from the crop in sequence drastically reduced the uptake of nutrients (Salhan *et al.*, 1994).

Similar observations were recorded in case of S application in jute (Table 2). Maximum uptake N, P, K and S (87.44 kg N, 56.53 kg P, 189.0 kg K and 13.08 kg S respectively) was recorded with the treatment receiving higher dose of sulphur (40 kg S ha^{-1} S_2). It was also reported that the uptake of nutrients was drastically reduced when the crop was not fertilized with S alongwith N, P and K. This result is in agreement with findings of Mondal and Chettri (1998).

The effect of potassium and S fertilizer management on potassium and sulphur contents of jute plant has already been presented in Table 3. In both the years (1998 and 1999), potassium content showed positive correlation with total score of jute. Application of potassium with N, P and S improved the K content in plant. The higher K content (0.594% and 0.614% in 1998 and 1999 respectively) of jute plant fertilized with K and S in conjunction with N and P showed better quality of jute fibre TD-2. When the crop was not fertilized with potassium, the quality of jute fibre was deteriorated due to the low content of potassium in plant. Such views corroborated with the findings of Tamang (1975) who found that the levels of potassium had very strong correlation with strength of fibre of jute.

The best quality of fibre (TD-2) was obtained when the maximum sulphur content was associated with higher dose of potassium content. When the crop was fertilized with N, P without K and S, the sulphur content was very low (0.039 and 0.045 in 1998 and 1999 respectively) exhibiting low quality of jute fibre. The magnitude of improvement of quality of jute fibre was better with the S content as compared to the potassium content in jute crop (Mondal *et al.*, 1998).

Table 2 Pooled data of nutrient uptake of jute (1998-1999 and 1999-2000) (kg ha^{-1})

Treatments	Nutrients (kg ha^{-1})			
	N	P	K	S
Levels of potassium (kg K ha^{-1})				
K_0	57.82	43.44	102.64	9.24
K_1	84.74	52.73	172.36	11.41
K_2	104.07	58.53	214.79	13.74
S.Em. (±)	0.36	0.37	4.67	0.23
C.D. (P = 0.05)	1.07	1.10	14.14	0.68
Levels of Sulphur (kg S ha^{-1})				
S_0	74.51	45.29	137.36	9.43
S_1	84.64	52.99	162.49	11.94
S_2	87.44	56.53	189.94	13.03
S.Em. (±)	0.36	0.37	4.67	0.23
C.D. (P = 0.05)	1.07	1.10	14.14	0.68

Interaction effect of potassium and sulphur on fibre yield (t ha^{-1}) of jute

The fibre yield differed significantly due to the interaction effect of potassium and sulphur during both the years (Table 4). At all the levels of potassium the fibre yield increased significantly with the increasing level of sulphur. Similarly, at all the levels of sulphur the fibre yield significantly increased with

Table 3 Quality of jute fibre and their total scores in relation to potassium and sulphur contents of total plant of jute in 1998 and 1999

Treatments	1998			1999		
	K content %	S content %	Total score	K content %	S content %	Total score
K_0S_0	0.434	0.039	53	0.0418	0.045	53
K_0S_1	0.458	0.038	65	0.444	0.043	65
K_0S_2	0.472	0.040	65	0.467	0.040	69
K_1S_0	0.493	0.035	65	0.519	0.031	65
K_1S_1	0.526	0.042	73	0.554	0.037	77
K_1S_2	0.567	0.035	84	0.581	0.035	81
K_2S_0	0.552	0.033	73	0.573	0.032	78
K_2S_1	0.579	0.039	84	0.596	0.038	82
K_2S_2	0.594	0.039	84	0.614	0.040	82

the increasing level of potassium. The highest fibre yield (3.68 t ha^{-1}) was obtained with 33.3 kg K ha^{-1} alongwith 20 kg S ha^{-1} in 1998. In 1999, maximum fibre yield (3.74 t ha^{-1}) was recorded when the crop was fertilized with the highest level of potassium (33.3 kg K ha^{-1}) and sulphur (40 kg S ha^{-1}).

Interaction effect of potassium and sulphur on the nutrient uptake of jute

Data presented in Table 4 showed that nutrient uptake varied significantly with the different levels of potassium alongwith different levels of sulphur. Higher nitrogen uptake (108.97 kg ha^{-1}), phosphorus uptake (60.83 kg ha^{-1}) and S uptake (15.46 kg ha^{-1}) were obtained when the crop received 33.3 kg K ha^{-1} (K_2) alongwith 40 kg S ha^{-1} (S_2) which were significantly higher than the treatments comprising without the application of potassium and sulphur.

Table 4 Interaction effect of potassium and sulphur and fibre yield (t ha^{-1}) of jute in 1998 and 1999

Potassium (kg K ha^{-1})	Fibre yield					
	Potassium (kg K ha^{-1})					
	1998			1999		
	K_0	K_1	K_2	K_0	K_1	K_2
S_0	1.83	3.27	3.17	1.80	3.34	3.47
S_1	2.16	3.38	3.68	2.16	3.56	3.67
S_2	2.59	3.42	3.65	2.66	3.63	3.74
S.Em. (±)		0.084			0.07	
C.D. (P = 0.05)		0.25			0.21	

Table 5 Pooled data on interaction effect of potassium and sulphur on nutrient uptake of jute (kg ha^{-1}) (1998-99 and 1999-2000)

Potassium (kg K ha^{-1})	Nutrient uptake of jute (kg ha^{-1})								
	N			P			K		
	Sulphur (kg ha^{-1})								
	S_0	S_1	S_2	S_0	S_1	S_2	S_0	S_1	S_2
K_0	47.87	60.44	65.15	34.11	45.91	50.61	7.91	8.92	10.89
K_1	79.42	86.45	88.26	46.79	53.26	58.16	9.53	11.96	12.74
K_2	96.26	107.02	108.97	54.96	59.80	60.83	10.85	14.92	15.46
S.Em. (±)		0.62			0.64			0.41	
C.D. (P = 0.05)		1.85			1.97			1.22	

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