INDIVIDUAL AND INTERACTION EFFECT OF MACRO AND MICRONUTRIENTS ON JUTE SEED PRODUCTION

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ABSTRACTS

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An experiment was conducted to study the interaction effect of nutrient elements on the growth and yield of late jute seed production at Faridpur, Jessore and Debigonj in RCB design with three replications. Experiment was setup during late jute season (September) and harvested in January. The factors were i) NPK ii).S iii). Zn and iv). B. Their two levels were i. Zero i.e. without fertilizer and ii recommended dose of fertilizer i.e. 90-20-10-20-04-01 NPKSZnB kg/ha respectively. The Zn × B, S × B, S × Zn gave negative interaction and NPK × B, NPK × S showed positive interaction on late jute seed yield in all the locations. Combined effect of three factors did not show same trend of interaction effect in all the locations as that of two factors, rather different respect of locations. Application of four factors (NPK, S, Zn, B) gave significantly higher seed yield than single, two or three factors applications.

Keywords: Interaction, Micronutrient, Macronutrient, Jute Seed

INTRODUCTION

Bangladesh has been facing shortage of jute seed production every year due to natural calamities and lack of appropriate technologies (Annos, 2005). In Bangladesh traditional jute seed production is being replaced with late jute seed production. The term late jute seed refers to the seed cultivation in off-season. The jute growers of the country gladly accepted this technique of jute seed cultivation and coming becoming popular day by day. Balanced application of fertilizer is a prerequisite for harnessing optimum potential yield of any crop (Dhali *et.al*.2007). The interaction effect of nutrient elements (major and minor) on various crops has been reported by numerous authors (Munson'1978, Wagner' 1980; Tisdale and Nelson'1975; Reinbott, 1991; and Murphy, 1980). Cooke (1982) has said, "In a highly developed agriculture large increase in yield potential will mostly come from interaction effect". The importance of different nutrient elements in the production of jute seed can't be ignored. Annos. (1992) reported the quantitative requirement of Nitrogen Phosphorus, Potassium, Sulphur for the production of late jute seed. There is little or on references are available on jute seed related to fertilizers and which is very true for late jute seed. Therefore, keeping above these in mind an attempt has been made to know the interaction and individual effect of some major and minor elements on the growth and yield of late jute seed.

MATERIALS AND METHODS

The experiments were conducted at Faridpur under AEZ No. 12 (Low Ganges River Flood Plain), Debiganj, AEZ No. 1 (Old Himalayan Piedmont Plain), and at Monirumpur, AEZ No. 11 (High Ganges River flood plain). The status of the soil has been presented in Table 1. The 2^4 factorial experiments were conducted in RCB design with three replications in all the locations. The treatment combinations of the factors i) NPK, ii) S, iii) Zn and iv) B.

The experiments were set up (in the month of September 1st week) in a plot size of 3.0 m × 3.0m leaving an space of 1.0 meter between and around each plot. The seeds were sown in line at 30 cm apart. All the fertilizers except urea were applied at the time of final land preparation according to treatments. Total amount of urea fertilizer according the treatment were spitted into three equal parts. The ⅓rd urea was applied at the time of sowing, another ⅓rd at 20-25 DAS (days after sowing), and rest ⅓rd at 40-45 DAS.

The seeds were harvested in the month of January. During harvest plant height, number of capsule per plant, seed weight per plot etc. was taken. Besides, before sowing sample were analyzed for different elements (Table 1) using ASI methods for N, P, K, S, Zn, and B as described by Hunter (1984).

Table 1. Initial analysis of soil at different sites

Locations	pH	OM%	N%	K (meq. 100^{-1})	P (ppm)	S (ppm)	Zn (ppm)	B (ppm)
Faridpur	5.8	1.1	0.07	0.18	12	13	1	0.74
Monirumpur	5.5	1.07	0.06	0.16	14	14	1	0.68
Debiganj	6.2	1.2	0.09	0.22	12	12	Trace	0.57

RESULTS

The results of the experiments are presented in Table 2, 3 and 4. The results were statistically analyzed and found significant treatment difference. The plant height ranged between 0.47 m to 0.93m with different treatments. The number of capsules per plant ranges from 9-19 with different treatments and locations. Significant differences on

seed yield were observed with different treatments. In general seed yield ranged from 377.0 kg/ha-1125 kg/ha with different treatment and locations.

DISCUSSION

The individual application of each factor i.e. Zn, B, S and NPK did not increase the seed yield rather decreased the yield even than the control in all the locations. But single application of S gave slightly higher seed yield than the control at Debiganj and Monirumpur, whereas individual application of NPK increased the seed yield significantly in all the locations (Table 2).

Interaction of two factors showed both negative and positive interaction effect at different locations. At Faridpur, Zn × B, S× B, S × Zn showed negative interaction effect and NPK × S, NPK ×B, NPK × Zn showed positive effect on seed yield. Wagner (1980) reported positive interaction effect on P × Zn on corn. Ellis (1967) also found substantial positive interaction between P x Zn in corn. Meimei *et al* (1988) observed significant effect between B × N on cotton. The seed yield obtained at Monirumpur showed negative interaction with Zn × B, S × B, S × Zn, NPK × Zn but showed positive interaction effect with NPK × B and NPK × S. But the seed yield at Debiganj showed almost the same trend of interaction as that of Monirumpur where all the two factors interacted positively except Zn × B (Table 2).

The interaction effect due to three factors also showed both positive and negative effect on seed yield irrespective of locations. At Faridpur combined application of S × Zn × BN gave positive interaction and NPK × Zn × B, NPK × S × B and NPK × S × Zn gave negative interaction effect on seed yield, At Debiganj, S × Zn × B, NPK × Zn × B and NPK × S × B showed positive interaction whereas, NPK × S × Zn showed negative interaction. All these combination showed positive interaction effect on seed yield at Monirumpur. Ali *et.al.* (1984) observed 15% higher yield of wheat grain due to the interaction of S to the treatments of NPK.

Combined application of four factors (NPK × S × Zn × B) responded positively and gave significantly higher seed yield in all the locations. Rahman *et.al.* (1984) observed significant higher grain yield of wheat with the application of 30 S and 8 Zn kg/ha in combination of NPK at the rate of 80-60-40 kg/ha at Sara, Amjhupi and Dorsona soil series under rainfed condition.

Significant treatment differences were observed on plant height due to the interaction of one (i.e. single application), two, three and four factors at Faridpur and Monirumpur. The differences in plant height due to different treatments were much pronounced at the initial stage of growth, which become narrower at the later stage of growth.

Data recorded for number of capsules per plant was also significantly varied with different treatments being highest with T_{16} i.e. combination of four factors (N×S×Zn×B) Table 3.

Computation of seed yields due to the interaction of one, two, three and four factors (NPK × S × Zn × B) it was observed that there was significant increased in yield with the increased number of factors. This indicates a balanced application of fertilizer would results a higher seed yield in all these areas under study.

Conclusion: It may be concluded that the jute seed production in off-season, which is known as late jute seed production, is needed S, Zn and B with NPK fertilizer in context of Bangladesh soil. This information will be useful to the researcher, extension workers and jute seed growers.

Table 2. Interaction and individual effect of various elements on the yield of jute seed in different locations

Treatments	Effect of individual factor on seed yield (kg/ha)		
	Locations		
	Faridpur	Debiganj	Monirumpur
NPK	496.28	894.81	384.45
B	311.11	762.95	355.56
Zn	322.22	776.28	343.33
S	359.25	792.59	388.89
Control	377.00	779.35	358.89
LSD 0.05	76.59	172.2	68.3
0.01	103.26	232.4	92.0

Treatments	Interaction of two factors on seed yield (kg/ha)		
	Locations		
	Faridpur	Debiganj	Monirumpur
Zn × B	285.18	719.99	349.99
S × B	296.26	935.55	373.33
S × Zn	287.00	847.39	384.44
NPK ×B	733.32	909.25	586.67
NPK × Zn	488.88	897.03	377.79
NPK × S	808.14	935.18	488.88

Treatments	Interaction of three factors on seed yield (kg/ha)		
	Locations		
	Faridpur	Debiganj	Monirumpur
S × Zn × B	618.51	872.22	378.89
NPK × Zn × B	618.51	924.81	490.00
NPK × S × B	535.17	1048.14	453.33
NPK × S × Zn	305.55	825.18	466.67
	Interaction of four factors on seed yield (kg/ha)		
NPK × S × Zn × B	826.66	1125.55	594.45

Table 3. Interaction and individual effect of various elements on the number of capsule/plant in different locations

Treatments	Effect of individual factor		
	Locations		
	Faridpur	Debiganj	Monirumpur
NPK	15	17	12
B	12	12	10
Zn	12	11	12
S	13	14	11
Control	10	10	9
LSD 0.05	2.0	-	3.0
0.01	3.0	-	4.0

Treatments	Interaction of two factors		
	Locations		
	Faridpur	Debiganj	Monirumpur
Zn × B	14	13	13
S × B	14	12	13
S × Zn	12	14	12
NPK ×B	14	15	13
NPK × Zn	13	13	13
NPK × S	16	15	13

Treatments	Interaction of three factors		
	Locations		
	Faridpur	Debiganj	Monirumpur
S × Zn × B	13	14	12
NPK × Zn × B	13	14	16
NPK × S × B	14	15	18
NPK × S × Zn	13	13	17
	Interaction of four factors		
NPK × S × Zn × B	17	18	19

Table 4. Individual and interaction effect of different elements on the plant height (in meter) in different locations

Treatments	Effect of individual factor		
	Locations		
	Faridpur	Debiganj	Monirumpur
NPK	0.82	0.56	0.50
B	0.84	0.54	0.48
Zn	0.60	0.49	0.59
S	0.63	0.43	0.55
Control	0.47	0.53	0.549
LSD 0.05	0.19	-	0.12
0.01	0.26	-	0.16

Treatments	Interaction of two factors		
	Locations		
	Faridpur	Debiganj	Monirumpur
Zn × B	0.50	0.45	0.54
S × B	0.56	0.51	0.47
S × Zn	0.70	0.56	0.46
NPK ×B	0.88	0.54	0.50
NPK × Zn	0.76	0.51	0.42
NPK × S	0.93	0.46	0.57

Treatments	Interaction of three factors		
	Locations		
	Faridpur	Debiganj	Monirumpur
S × Zn × B	0.67	0.56	0.49
NPK × Zn × B	0.78	0.48	0.67
NPK × S × B	0.77	0.47	0.69
NPK × S × Zn	0.78	0.51	0.63
Interaction of four factors			
NPK × S × Zn × B	0.76	0.56	0.69

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