J. Mycopathol Res. 30(1) : 51-55 (1992) Printed in India

Effect of potash on stem rot disease of jute caused by *Macrophomina phaseolina*

B. K. DE AND S. B CHATTOPADHYAY*

Department of Plant Pathology, Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia 741 252, West Bengal

The effect of application of potash on the stem rot disease of jute caused by *Macrophomina phaseolina* was studied in three different doses (namely 0, 50 and 100 kg ha) with two varieties (JRO 632 and D-154). There was a gradual decline in the level of stem rot infection when the level of applied K_2O was increased. Significantly lower infection and maximum fibre yield was recorded at 100 kg of K_2O ha for both the varieties. The variety JRO 632 was found to be susceptible to stem rot of jute in comparison to variety D-154.

Key Words : Jute, Potash, Stem rot disease, *Macrophomina phaseolina*

INTRODUCTION

Jute plants suffer from various diseases, of which the stem rot disease incited by *Macrophomina phaseolina* (Tassi) Goid is the most important. The pathogen can attack the jute plants in almost all the stages of growth. In stem rot phase the disease causes loss both in quality and quantity.

Role of nutrition of the host plant can affect host parasite relationships is well known. Potassium has been reported to affect morphology and anatomy of cells and plants as a whole with resulting improvement in resistance to disease. Siebold (1974) reported a reduction in stem rot of grain maize on soil fertilized with potash. Similarly, Abney and Foloy (1972) reported from the U. S. A. a reduction in stem rot on soils adequately supplied with potash. Shaw (1924) noted that deficiency of potash in soil favours the attack of

Present address : 6,1A Beltala Road, Calautta-700026.

Macrophomina corchori. Anonymous (1941) observed that best fertilizers for jute should consist of N, K, and lime which will also reduce stem rot.

This paper reports the results of a study on the effect of potassium nutrition on the stem rot disease incidence on two jute varieties, *Corchorus olitorious* group (JRO-632) and *Corchorus capsularis* (D-154).

MATERIALS AND METHODS

The experiments were conducted in the University Farm located at Kalyani, for two consecutive years. The plots were specially selected at a site previously cropped to potato. Randomized block design was used and each plot size was 3 m×2 m. There were four replication for each treatment. Potassium treatments were 0, 50 and 100 kg K_2O/ha in the form of muriate of potash with basal dose of 50 kg N ha and 40 kg P_2O_5/ha in the form of urea and and single supper phosphate respectively. The soil pH was 6.35. Two jute varieties, JRO-632 and D-154 were used. Jute seeds were sown in the second week of April by seed drill with a spacing of 15 cm between plant to plant and of 20 cm between row to row for both years. Records of stem rot canker were taken from randomly selected four plants in each plots and they were tagged. Data were recorded between the months of June and July when maximum infection occured starting at the age of 50 days and at 10 days interval upto 90 days.

Observalions were also recorded on number plants both healthy and infected in each plot, in each date of recording.

(i) Precentage of infection was determined using the formula :—

$$\text{P. I} = \frac{\text{Number of plants infected (showing canker)}}{\text{Total number of plants in the plot}} \times 100$$

(ii) Size of the canker in length and breadth in each treatment

(iii) Yield of the fibre at the age of 110 days

The statistical analysis of percentage of infection data were done after angular transformation.

RESULTS AND DISCUSSION

At the age of 50 days the stem canker symptoms due to *M. phaseolina* on jute was only observed on the variety JRO-632. No symptom was noted on the variety D-154. On 60 days onward the symptom was observed on

Table 1. Percentage of infection of stem rot of Jute at different age with the application of different doses of potassium fertilizer

Treatments Variety/Level of potassium	Number of plants/Percentage of infection at diffarent plant age (days)									
	1st year					2nd year				
	50	60	70	80	90	50	60	70	80	90
JRO 632 K_0	(5.2)*	(51.4)*	(60.4)	(68.7)	(77.2)	(5.6)	(52.8)	(68.6)	(72.6)	(78.5)
		45.77	53.23	56.0	61.5		46.6	55.9	58.4	62.4
K_{50}	0.0	(20.3)	(34.0)	(57.8)	(62.2)	(0.7)	(26.5)	(42.3)	(59 9)	(63.1)
		26.47	35.53	49.5	51 4		30.7	40.5	50.7	52.6
K_{100}	0.0	(14.7)	(23.3)	(31.8)	(33 0)	0 0	(15.8)	(29.1)	(37.6)	(37.6)
		22.17	28.8	34.3	35.0		23.3	32.6	37.8	37.8
D 154 K_0	0.0	(4.0)	(7.2)	(7.8)	(8.1)	0.0	(4.8)	(9.0)	(9.3)	(10.6)
		11.6	15.5	16.2	16.4		12.7	17.4	17.7	18.9
K_{50}	0.0	(2.7)	(5.9)	(6.5)	(6.5)	0.0	(3.2)	(6.9)	(7.2)	(7.2)
		9.4	13.8	14.7	14.7		10.0	15.1	15.5	15.5
K_{100}	0.0	(1.7)	(4.2)	(4.2)	(4.2)	0.0	(0.9)	(4.1)	(4.6)	(5.0)
		9.2	11.8	11.8	11.8		4.6	11.7	12.3	12.9
S. Em		1.12	1.0	1.24	1.10		1.13	1.12	0.95	0 69
C. D at 5%		3.38	3.02	3.75	3.33		4.00	3.37	2 88	2 09
Potash K_0		114.7	137.5	144.4	156.1		118.6	146.8	152.4	162.8
K_{50}		71.8	98.7	128.6	132.3		81.5	111 4	132.6	136.3
K_{100}		62.6	81.3	92.6	93.5		55.9	88.6	100.2	101.5
S. Em		0.79	0.70	0.88	0.78		0.94	0.79	0.67	0.49
C. D at 5%		2.39	2.13	2.65	2.36		2.83	2.38	2.03	1.48
Variety JRO 632		125.9	156.8	186.5	197.4		134.2	172.1	195.9	203.8
D 154		40.2	54.9	57.0	57.2		36.5	59.1	60.8	63.3
S. Em		0.65	0.57	0.71	0.63		0.77	0.64	0.55	0.40
C. D at 5%		1.95	1.74	2.16	1.92		2.32	1.94	1.66	1.21

* Figures within the bracket are the percentage of infection data

both the varieties. Percentage of infection gradually increased with the increase of the plant age irrespective of variety and levels of potassium.

At 60 days in the treatment K_0 in JRO-632 the percentage of infection in the first year was 51.4 and it increased upto 77.2 at the age of 90 days. Similarly in the second year at 60 days infection percentage was 52.8 and it increased upto 78.5 at the age of 90 days. From the data presented in the Table 1 it may be observed that increase in the level of potassium upto 100 kg K_2O/ha significantly reduced the canker development in JRO-632 but in case of D-154, which was resistant to stem rot was not significant though the decreasing trend was observed. Higher percentage of infection at 90 days of plant age were 77.2 and 8.1 in the first year, 78.5 and 10.6 in the second year in JRO-632 and D-154 varieties respectively at "0" level of potassium (Table 1). The variety JRO-632 was more susceptible to stem rot of jute in comparison to D-154. Significant of potassium on percentage of infection at any plant age in both the years was obtained. The effect of potassium fertilizer was more pronounced on the veriety JRO-632 than the variety D-154.

Table 2. Effect of different doses of potash fertilizer on canker size and yield of fibre in qtls/ha

Treatments		Average canker size on stem in cm		Average yield of fibre in qtls/ha	
		Length	Breadth	1st year	2nd year
JRO 632	K_0	4.2	3.7	26 35	25.85
	K_{50}	3.9	3.3	34 25	32.75
	K_{100}	3.2	3.0	36.85	35.50
D 154	K_0	2.5	2.1	21.70	20.60
	K_{50}	2.2	1.8	25.55	24.80
	K_{100}	1.8	1.7	26.00	25 35
S. Em (Tr)				0 54	0.76
C.D at 5%				1.64	2.32
Potash	K_0			24.0	23.0
	K_{50}			29 9	28 5
	K_{100}			31.3	30.0
S. Em (K)				0.38	0 54
C. D at 5%				1.16	1.64
Variety JRO 632				32 45	31.35
D 154				24.40	23.55
S. Em (Var)				0 30	0 44
C. D at 5%				0.94	1.20

The size and the number of canker on the stem varied with the level of potassium and the varieties also. Large size and more number of cankers were noticed on JRO-632 (Table 2). At "0" level of potassium the larger size and more number of cankers obtained in both the varieties. The canker symptoms were gradually less in number and smaller in size in plots receiving treatment K_{50} and K_{100} (Table 2) Size and number of the cankers were reduced when the dose of the potassium fertilizers was increased (Table 2).

From the data represented in the Table 2 it can be seen that higher fibre yield was obtained in both the varieties at 100 kg K_2O/ha and same trend was observed in both the years among the three levels of potassium (0, 50 and 100 kg/ha) was significant in case of JRO-632. But in case of D-154 significant difference of yield of fibre was noted between 0 and 50 kg K 0/ha in both the years. The significant yield difference of fibre was obtained between the two varieties at any level of potassium. The variety JRO-632 gave higher fibre yield than the variety D-154.

The results of this investigation show the trend similar to the findings of Shaw (1924) and Annonymous (1941) regarding role of potassium in reduction of infection and severity in stem rot of jute. Increasing the level of potassium to 100 kg/ha resulted in significant gain in resistance with corresponding increase in fibre yield of both the jute varieties. Potassium fertilizers are known to encourage thicker cell wall development, heavier cuticle and stronger mechanical tissues resulting improvement in resistance to disease penetration. McNew (1953) reported that dificiency of potassium under most circumstances implies an excess uptake of nitrates and phosphorus, thinner cell walls in epidermal tissues, which may facllitate penetration of the epidermis by plant parasite. Shaw (1924) noted a deficiency of potash in soil to favours the attack of *M. corchori*.

REFERENCES

Abney, T. S. and Foloy, D. C. (1972). Einfluss der Ernahrung ouf die Entwicklung der Stengelfaule Von Zea Mais Bor. *Biochemic Biolo* , 362.

Anonymous (1941). Indian Central Jute Committee. *Annual Report Agric. Res. Sch.* for the year 1940-41. 56 pp.

McNew, G. L. (1953). The effect of soil fertility. *Plant disease yearbook of Agric.* U.S. Dept. Agric. P-100.

Siebold, M. (1974). The influence of potash on stem rot in grain maize. *Gesunde Pflanzen* **26**(4), 65-68.

Shaw, F. J. F. (1924). Studies in disease of the Jute Plant(2) *Macrophomina corchori* Saw. *Mem. Dept Agric. India. Bot. Ser.* **13**, 193-199.

(Accepted for publication 14 November 1991)