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National Academy of Agricultural Science (NAAS) Rating : 3. 03

Effect of Plant Population Density and Sowing Methods on Stem Rot of Jute (*Corchorusolitorius, C. capsularis*) Caused by *Macrophominaphaseolina* (Tassi) Goid.

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Abstract: *In order to find out optimum plant density with better sowing method to lower the jute stem rot, incited by* Macrophomonaphaseolina *causing high plant mortality, a field experiment was carried out in at CRIJAF main farm at Barrackpore in India with two sowing methods, namely, broadcast and line sowing and varied plant population density (3–10 lakhs/ha) of jute. With increasing plant population density the incidence of stem rot increased reaching peak of 16.3 and 27.4% in highest plant population density of 10 lakh per ha, respectively, in broadcast and line sown crop. Lowest stem rot of 5.4 and 7.4% was observed in line sown and broadcast crops with very low population density of 3 lakh per ha. Under optimum plant population level of 5–6 lakh per ha stem rot incidence was moderate with 7 – 9% in line sown and 10-17% in broadcast crops. With similar level of plant population, jute stem rot was always low in line sown crops than their counter part in broadcast crops. Progress of jute stem rot over the crop growth period in line sown crop with low plant density (3 lakhs /ha) the disease increased from initial low level of 0.2% at 30 DAS to 3.7% at 90 DAS and finally to 5.4% at 120 DAS. But at 5-6 lakhs /ha the disease increased from initial low level of 0.1% at 30 DAS to 3-4% at 75 DAS, 4-6% at 90 DAS and finally reached to 7-9% at 120 DAS. In broadcast crop with highest plant density of 10 lakhs /ha, the jute stem rot began with 0.7% at 30 DAS, increased to 5, 15, 20% at 60, 75, 90 DAS, respectively, and finally reached a peak of 27.4% at the harvest stage of the crop at 120 DAS.*

Keywords: *Stem rot of jute, Corchorusolitorius, C. capsularis, Macrophominaphaseolina, population density and sowing methods.*

INTRODUCTION

Rampant use of hazardous pesticides on crops including food and fruit crops led to rise in level of environmental pollution, pesticide residue in food chain, unusual diseases in human, finally a serious threat to biodiversity. Minor manipulation of traditional agronomic practices often becomes fruitful in order to manage plant diseases. Jute farmers' age old belief that high plant population with broadcasting seeds to save cost of manual labour ultimately take the toll in yield and quality of fibre by increasing plant density and incidence of stem rot caused by *Macrophomonaphaseolina*, thereby causing high plant mortality.

Jute *(Corchorusolitorius* L. and *C. capsularis* L.), also known as 'golden fibre', is one of the important commercial fibre crops of India and grown mostly in its eastern region with an area of 0.91 million hectares and production 11.82 million bales (one bale = 180 kgs) dry fibres with fibre productivity of 2349 kg per hectare. It is cultivated as pre-*kharif* crop mainly in the states of West Bengal, Bihar and Assam with percentage contributions to National production jute fibres are 79.54, 10.80 and 6.22, respectively. Recently jute has emerged with stronger attributes due to its eco-friendliness with more oxygen producing, carbon dioxide absorbing and higher fuel wood producing capabilities, apart from its biodegradable diversified products.

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Out of all disease of jute plant, stem rot of jute caused by *Macrophominaphaseolina* (Tassi) Goid. is economically the most important affecting both yield and quality of fibre in both cultivated species, namely, *C. olitorius* L. and *C. capsularis* L. Although stem rot is the common name but the pathogen attacks any part of the plant at any stage of growth right from germination to harvest producing various symptoms, like, damping-off, seedling blight, leaf blight, stem rot, collar rot, root rot and spot on pod especially in seed crop. The disease is seed, soil as well as air borne and continues to damage the crop in all jute growing areas in India and other countries starting from germination to maturity in both seed and fibre crops. Hence, management of jute stem rot targets manipulation of soil, pre-sowing seed treatment and foliar spraying of fungicides or judicious combination of all. The average loss of yield in jute due to the diseases is around 10-20%.

Tossa jute being most widely cultivated in all the jute growing areas, this investigation has been undertaken to determine the optimum plant density with better sowing methodfor managingstem rot diseasein the field.

MATERIALS AND METHODS

In order to find out optimum plant density with better sowing method to lower the jute stem rot, a field experiment was carried out in randomized block design with three replications with two sowing methods, namely, broadcast and line sowing and varied plant population density (3– 10 lakhs/ha) on a new jute variety, JRO 8432 at main farm of CRIJAF, Nilganj, Barrackpore, India during normal cropping season. Normal jute crop management practices including fertilizers, manual weeding, etc. were followed except plant density and sowing method as per different treatments. Percentage incidence of stem rot was noted at fortnightly intervals starting from 30 days after sowing (DAS) after final thinning of crop. No other plant protection chemical was applied.

RESULTS AND DISCUSSION

It was observed that with increasing plant population density the incidence of stem rot increased reaching peak of 16.3 and 27.4% in highest plant population density of 10 lakh per ha, respectively, in broadcast and line sown crop. Lowest stem rot of 5.4 and 7.4% was observed in line sown and broadcast crops with very low population density of 3 lakh per ha. Under optimum plant population level of 5–6 lakh per ha stem rot incidence was moderate with 7–9% in line sown and 10–17% in broadcast crops.

With similar level of plant population, jute stem rot was always low in line sown crops than their counter part in broadcast crops. In 3 lakh per ha plant density stem rot incidence increased from 5.4% in line sown crop to 7.4% broadcast crops. Stem rot increased from 13.6% in line sown crop to 23.4% broadcast crops in 8 lakh per ha plant density level. With high plant density of 10 lakh per ha stem rot

Table 1
Effect of plant population density and sowing methods on stem rot of jute

Treatments	*Sowing*	*Plant population /ha in lakh method*	*Incidence of stem rot of jute*									
			30 DAS		*60 DAS*		*75 DAS*		*90 DAS*		*120 DAS*	
			% Value	*Arc sin value**	*% value*	*Arc sin value**	*% value*	*Arc sin value**	*% value*	*Arc sin value**	*% value*	*Arc sin value**
T1	Line sowing	3.06	0.22	2.63	2.06	8.24	2.76	9.56	3.73	11.13	5.41	13.45
T2	Line sowing	5.04	0.11	1.55	1.61	7.30	3.23	10.30	4.89	12.75	7.47	15.86
T3	Line sowing	6.00	0.17	2.35	1.94	7.99	4.39	12.08	6.66	14.95	9.57	18.01
T4	Line sowing	8.00	0.21	2.60	2.90	9.79	8.16	16.58	10.88	19.26	13.62	21.65
T5	Line sowing	10.00	0.49	3.95	3.64	10.95	10.22	18.63	13.02	21.14	16.38	23.85
T6	Broadcasting	3.06	0.22	2.63	1.80	7.67	2.71	9.42	4.99	12.90	7.49	15.87
T7	Broadcasting	5.04	0.21	2.62	2.03	8.14	4.22	11.84	6.84	15.16	10.26	18.67
T8	Broadcasting	6.00	0.31	3.14	3.13	10.18	8.24	16.67	12.48	20.67	17.91	25.02
T9	Broadcasting	8.00	0.61	4.41	4.04	11.58	9.06	17.50	15.56	23.22	23.46	28.96
T10	Broadcasting	10.00	0.74	4.91	5.57	13.63	15.54	23.21	20.95	27.23	27.41	31.55
	CD (P = 0.05)		–	1.32	–	1.45	–	1.37	–	1.19	–	1.87
	SEm+		–	0.63	–	0.69	–	0.65	–	0.57	–	0.89

*Figures in this column represent Arc sin angular conversion values.

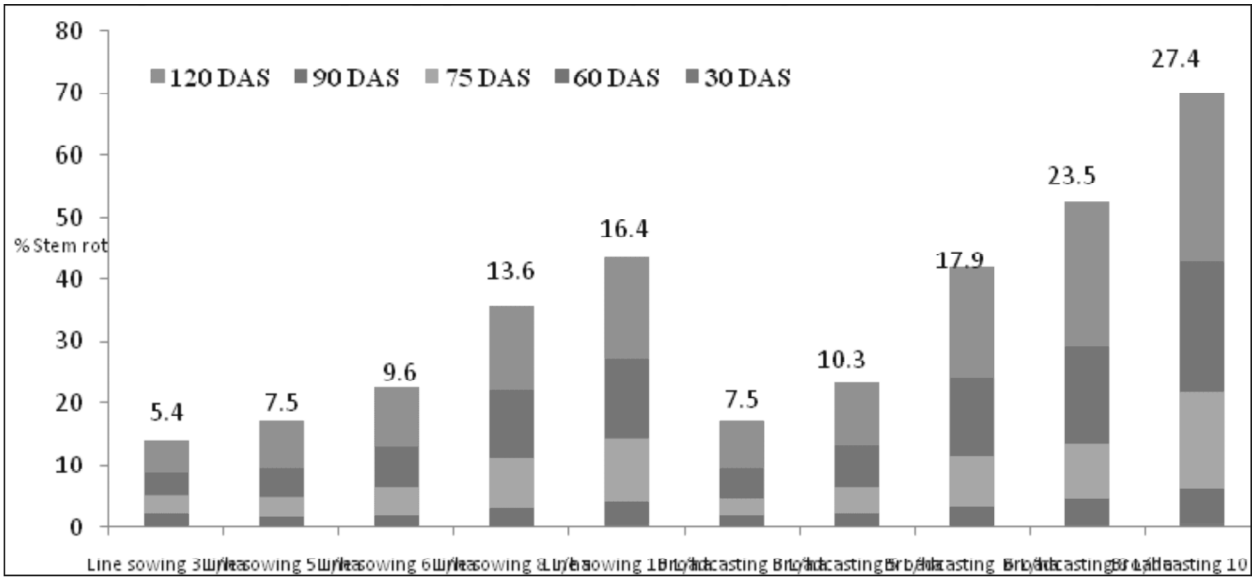

Figure 1: Effect of plant population density and sowing methods on stem rot of jute

incidence reduced to 16.3% in line sown crop from 27.4% broadcast crops (Table 1, Figure 1). When the progress of jute stem rot over the crop growth period was considered, it was observed that in line sown crop with low plant density of 3 lakhs /ha the disease increased from initial low level of 0.2% at 30 DAS to 2.7% at 75 DAS, 3.7% at 90 DAS and finally to 5.4% at 120 DAS. But at 5-6 lakhs /ha the disease increased from initial low level of 0.1% at 30 DAS to 3-4% at 75 DAS, 4-6% at 90 DAS and finally reached to 7-9% at 120 DAS. In broadcast crop with highest plant density of 10 lakhs /ha, the jute stem rot began with 0.7% at 30 DAS, increased to 5, 15, 20% at 60, 75, 90 DAS, respectively, and finally reached a peak of 27.4% at the harvest stage of the crop at 120 DAS.

Reports of use of various methods for reducing jute stem rot are available. Among different methods of management of jute stem rot, use of botanicals (De [2]; Choudhury *et al*., [1]), fungicides (De, [4, 8]; De *et al*.,[14]), bleaching powder or calcium hypochlorite [$Ca(OCl)_2$] (De *et al*., [13]), host resistance (De and Mandal, [10 , 11]), wild relatives (De, [7]), balanced NPK fertilizer (De, [6, 9]), and manipulation of date of sowing (De, [3, 5]) were most important. Seed infection and its management in jute were reported by De and Mandal [12].

By shifting sowing method to line sowing from traditional broadcasting and adjusting the plant population up to 5-6 lakhs /ha by thinning, the stem rot of jute may be managed to some extent. It may be proved beyond doubt that line sowing with similar level of plant population density reduced stem rot due to better aeration or ventilation and allowing more space per plant. CRIJAF developed multi row jute seed drill and it optimized both plant population (up to 5-6 lakhs/ha without thinning)andseed rate of 2–3 kg/ha (instead of traditional 5-6 kg/ha) with free additional benefit of decreasing stem rot thereby reducing the cost of jute fibreproduction.

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