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DISEASE-FREE JUTE SEED PRODUCTION IN WEST BENGAL

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Abstract

Field experiment was conducted to explore the possibility of disease-free quality jute (*Corchorus olitorious* L.) seed production by altering the sowing dates and fungicide schedule. The data revealed that among seven dates of sowing mid-August sown crop resulted in least seed infection (1.7%) by *Macrophomina phaseolina* and seed discolouraton by various seed fungi. Other quality parameters like germination (88.2 - 91.50%) and seedling vigour also remain above the seed recommended standard (80%). Seed yield (13.2 q/ha) and yield attributes are also higher in mid-August sown crop than other dates of sowing. Foliar spraying of carbendazim 50 WP @ 0.02% at pod setting or pod maturation stage resulted in least seed infection (2.3%) and seed discolouraton which reflected on higher seed yield (11 q/ha) and yield attributes. The quality of seeds also improved due to foliar application of fungicide, carbendazim. Thus sowing of jute seed crop during August followed by foliar spraying of carbendazim 50WP @ 0.2% either at pod maturity or pod setting stage was most effective for maximization of quality jute seed with economic viability.

Introduction

Jute (*Corchorus olitorius* L. and *C. capsularis* L.) is one of the important commercial bast fibre crops in India and plays a vital role in the country's economy, particularly in eastern and north-eastern India with special reference to West Bengal which contributes about 75% (6 million ha) of jute area and 82% (8.4 million bales) of total jute production of the country. Though jute fibre is grown in eastern part of the country, jute seed is mainly produced in the southern states like Andhra Pradesh, Maharashtra and Karnataka. Over the years the jute growers have become exclusively dependent on the external agencies for jute seeds. The timely supplies and procurement of quality seed is a serious handicap to fibre production (Saha 2004, Roy *et al*. 2008, Bera *et al.* 2009, Sarkar *et al*. 2013). The age old varieties, adulteration with old lots and subsequent poor germination are the perennial problems hampering the interest of resource poor jute growers. Of late, the jute seed producing states are opting for more remunerative crops like summer maize etc. necessitating jute seed production in the fibre producing states itself.

Earlier it was believed that it is difficult to produce jute seed in West Bengal because of high rainfall and humidity during flowering stage which is congenial for the seed borne infection of *Macrophomina phaseolina* (Tassi) Goid (causing stem rot and root rot of jute), *Colletotrichum gloeosporioides* (causing jute anthracnose) and seed discolouration by various fungi (Ghosh 1957, Ghosh 1983, Akanda and Fakir 1985, Ghosh 1999, Mandal 2001). Scattered studies were conducted for seed production in West Bengal; mostly attempts were made to harvest seed from fibre crop which resulted in poor seed yield of 3 - 5 q/ha (Bhattacharjee *et al.* 2000). Very little information is available on various important aspects like status of seed infection, seed discolouration, seed quality and economic viability. Under these backdrops, the present investigation was carried out to produce disease free quality jute seed in West Bengal during 2009-2012.

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Materials and Methods

To study the effect of sowing dates (D1= mid-June, D2 = end-June, D3 = mid- July, D4 = end - July, D5 = mid-August, D6 = end-August and D7 = mid-September) and fungicide application schedule (spraying of carbendazim 50WP @ 0.2% at pod setting (S1) and pod maturation stage (S2), field experiment was designed in split plot design with three replications with plot size 7 m × 3 m at ICAR-CRIJAF farm, Barrackpore (88.43^0E and 22.75^0N, soil pH-6.8, soil texture- sandy loam, organic carbon- 1.21%, soil nitrogen - 254 kg/ha, soil phosphorus - 72.3 kg/ha and soil potassium - 351 kg/ha). To raise the crop, normal agronomic practice (seed rate 4 kg/ha, pre-emergence application of butachlor @1.5 kg a.i, one hand weeding at 20 - 25 days after sowing, spacing - 40 cm × 10 cm, topping at 50 days of sowing for first five dates of sowing, NPK application @ 60:40:40, irrigation - as and when required) was followed (Singh *et al*. 1984, Bhattacharjee *et al*. 2000). Observation on yield attributes like bearing nodes, pod/plant and seed/pod were made as per standard procedure at the time of harvesting.

After harvesting the seeds, random sampling was made and incidence of seed borne infection by *Macrophomna phaseolina* (Tassi) Goid was determined by blotter paper method (ISTA 1996). Similarly, the extend of seed discolouraton was estimated by visual observation. Various fungi from discoloured seed were isolated in PDA agar media using standard isolation protocol. Identification of isolated fungi was made on the basis of culture character, sporulation and conidial characters (Subramanian 1971, Ahmed and Reddy 1993). Quality parameters like seed germination and seedling vigour in terms of vigour index [(vigour index = germination × (root length and shoot length)] were tested in standard blotting paper method. The data were analysed using the statistical programme MSTATC.

Results and Discussion

The result indicated that among seven dates of sowing, mid-August and mid-September sown crop resulted in least seed infection (1.7%) by *M. phaseolina* than other dates of sowing (Table 1). Seed discolouration caused by seven different fungi, namely *M. phaseolina*, *C. gleosporioides*, *Aspergillus niger*, *Fusarium* sp. and *Penicillium*, *Curvularia* and *Dresclera* sp. was significantly reduced in later dates of sowing i.e. end, July to mid-September (11.9 to 7.7 discoloured seeds/pod). Germination of seeds developed from different dates of sowing varied from 88.2 - 91.5% do not differ significantly. In all the cases the germination of seeds remains above the recommendation standard level, 80%. No significant difference in seedling vigour which varies from 570 - 636.3 was recorded among various dates of sowing however, seeds of the crop sown during mid-August to mid-September showed better seedling vigour (636.3 - 630). In seed crop initially pod is affected by fungi including *M. phasolina* and *C. gleosporioides* which later on invade the seed inside the pod and causing seed infection as well as seed discolouraton (Sarkar *et al*. 2013, Sakar and Satpathy 2014, Sarkar *et al*. 2014). The extent of infection depends on the existing weather conditions particularly high temperature and relative humidity (RH). With the delaying in sowing time the temperature and RH reduced at pod setting stage (Rao 1979, 1980) which might be reducing the seed infection and discolouration. Bhattacharjee *et al*. (2000) also reported that quality of seed like germination viability as well boldness remains unaffected with delay in sowing.

Spraying of carbendazim 50 WP @ 0.2% at pod maturation stage reduces the seed infection (2.3%) as compared to no spraying (3.5%) (Table 1). Similarly seed discolouration reduced significantly when sprayed at pod setting (14.2/pod) and pod maturation (11.8/pod) in comparison to no spraying (16.8/pod). Spraying of fungicide either in pod setting or pod maturation stage significantly improves the germination (91%) and seedling vigour (622.6 - 681.3). In jute, pod

infection lead to seed infection and seed discolouration. The microclimatic condition inside the pod is highly congenial for internal growth and development of fungi, therefore, foliar application of carbendazim 50 WP @ 0.2% at pod setting or pod maturation stage prevent the seed infection

Table 1. Effect of dates of sowing and spraying of carbendazim 50WP@ 0.2% on seed infection, discolouration, germination and seedling vigour of jute seed pool (mean of three years 2009-2012 data).

Treatment	Seed infection (%)	Discolored seeds/pod	Germination (%)	Seedling vigor
Dates of sowing				
D1 = Mid-June	3.8	22.0	88.2	570.0
D2 = End-June	3.1	15.3	90.2	581.6
D3 = Mid-July	2.9	15.1	90.6	575.0
D4 = End-July	2.2	11.9	88.4	599.0
D5 = Mid-Aug	1.7	11.4	89.7	636.3
D6 = End-Aug	1.8	9.9	91.0	630.0
D7 = Mid-Sept	1.7	7.7	91.5	620.0
C.D. (p = 0.05)	**0.3**	**2.6**	**NS**	**NS**
Stage of fungicide (carbendazim 50WP@ 0.2%) spraying				
S1 = Pod setting	3.2	14.2	91.1	622.6
S2 = Pod maturation	2.3	11.8	91.3	681.3
S3 = No spray	3.5	16.8	86.0	583.0
C.D. (p = 0.05)	**1.1**	**2.3**	**1.87**	**26.2**

Table 2. Effect of dates of sowing and spraying of carbendazim 50 W.P @ 0.2% on yield and yield attributes of jute seed (pool mean of three years 2009 - 2012 data).

Treatment	Bearing nodes	No. of pods/plant	No. seeds/pod	Yield (q/ha)
Dates of sowing				
D1 = Mid-June	30.6	33.2	172.8	8.1
D2 = End-June	38.8	37.6	190.3	9.5
D3 = Mid-July	36.2	32.4	200.3	10.03
D4 = End-July	39.6	35.2	205.4	12.2
D5 = Mid-Aug	48.7	44.7	216.4	13.2
D6 = End-Aug	42.2	37.7	208.9	11.8
D7 = Mid-Sept	36.2	30.6	211.1	8.8
C.D. (p = 0.05)	**4.43**	**6.0**	**12.8**	1.3
Stage of fungicide (carbendazim 50 WP@ 0.2%) spraying				
S1 = Pod setting	38.8	39.2	197.6	10.9
S2 = Pod maturation	36.2	38.7	202.4	11.0
S3 = No spray	39.6	35.1	189.8	9.8
C.D. (p = 0.05)	48.7	**2.6**	**6.2**	**0.32**

as well as seed discolouration. In many seed crops, spraying of fungicides at pod bearing or maturation stage not only reduce the seed infection and discoloration but also improve the seed quality like germination and vigour index (Agarwal 2006) but such information are not available in jute crop.

Yield attributing parameters i.e. number of bearing nodes (30.6 - 48.7), number of pod/plant (30.6 - 44.7) and numbers of seeds/pod (190 - 216) were significantly higher in later dates of

sowing than mid-June sown crop (Table 2). In mid-August sown crop the number of bearing nodes (48.7), number of pods/plant (44.7) and numbers of seeds/pod (216) was the highest. The seed yield which varies between 8.1 and 13.2q/ha was significantly differ with sowing dates with maximum yield in mid-August sown crop (13.2 q/ha) followed by end-July (12.2q/ha) and end August (11.8 q/ha) sown crop. Singh *et al.* (1984) and Saha (2004), reported that yield and yield attributes increased with delayed in sowing time but they tried up to July only and that too in clay soil condition which resulted in poor seed yield i.e. 3 - 5 q/ha which is uneconomical.

Significant impact of spraying of fungicide either at pod setting or pod maturation stage was recorded on bearing nodes, pods/plant and seeds/pod which reflected on seed yield (11.0 q/ha) than the control (9.8q/ha) where no fungicide was sprayed (Table 2).

Thus sowing of jute seed crop during mid-August followed by foliar spraying of carbendazim 50 WP@ 0.2% at pod maturity stage was the most effective recommendation for maximization of quality jute seed with higher benefit cost ratio (B:C=2.50) the existing practice of rice cultivation. The recommendation was largely practiced in drier districts (Bankura and Purulia) of West Bengal for large scale production of jute seed and the result was overwhelmed (Kar *et al.* 2014, Bera *et al.* 2014).

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