on the occurrence of *Abutilon* infectious variegation virus on cotton outside Brazil.

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ASSOCIATION OF CERTAIN FUNGI WITH PADDY SEEDS AND THE EFFECT OF SEED DRESSING CHEMICALS ON THEM

ASSOCIATION of a number of fungi with paddy seeds has been reported by different workers (Baldacci and Picco[1], Hingorani and Prasad[4] Chrestensen and Lopez[3]). Many of these fungi are responsible for the spoilage of seeds during storage or contribute to low percentage of germination of seeds. Bedi and Dhaliwal[2] reported that *Helminthosporium oryzae* associated with rice seeds could reduce the germination of seeds by more than 6%. Similarly paddy seeds infected with *Rhizoctonia solani* and *Fusarium moniliforme* could cause both pre and post-emergence killing of rice seedlings. Fungicidal treatments of seeds have been shown to improve germination and reduce seed infestation (Leukal[5], Nene *et al.*[6]). In Assam, studies on the fungi associated with paddy seeds, so far have not been made and the effective measures to be adopted to reduce spoilage and loss both during storage and in field have also not been investigated. Studies were, therefore, made to identify the seed fungi associated with the seeds of the two high yielding rice cultivars, and the effect of treatment of the seeds with chemicals were tried.

The seeds of two high yielding rice cultivars *viz.*, T.N. 1 and Pusa 2–21, cultivated at the University farm were taken for the studies. Two incubation methods, the blotter and the agar plate, were practised for the detection of fungi. A total of 200 seeds (100 surface sterilized and 100 unsterilized) of each cultivar were sown separately on blotter and agar plates. Surface sterilization was done by dipping the seeds in 0·1% mercuric chloride solution for 2–3 minutes, washed in sterile water and sown on moist blotters and agar plates. After 8 days of incubation, the fungal growth around the seeds was examined under the microscope. Mycelial fragments were transferred to potato dextrose–agar medium and further examined and purified. The efficacy of seven different fungicides, *viz.*, Mercuric chloride (0·1%), Captan (0·5%), Brassicol (0·05%), Agallol (0·25%), Thiram (0·4%), Ceresan (0·5%), and Ceresan (0·33%), on seed treatment was tested. Percentage of disease control was calculated. To find out the significant differences between treatments, the mean values of the two cultivars were compared with their respective CD values.

1. *Report on seed borne fungi.*—The blotter and agar plate techniques revealed that the seeds of T.N. 1 and Pusa 2–21 cultivars were found to be associated with five fungal species. They were *Helminthosporium oryzae*, *Fusarium moniliforme*, *Aspergillus niger* *Curvularia lunata* and *Rhizoctonia solani* (Tables I and II).

TABLE I

Fungi isolated from surface sterilized and unsterilized paddy seeds on PDA

Cultivars	No. of seeds taken	Number of colonies of fungi isolated				
		Hel.	*Asp.*	*Fus.*	*Cur.*	*Rhiz.*
T.N. 1						
S	100	20·0	..	18·0	27·0	..
US	100	22·0	36·0	16·0	25·0	..
Pusa 2–21						
S	100	..	..	16·0	20·0	6·0
US	100	..	19·0	14·0	19·0	8·0

2. *Varietal differences.*—In general, these fungi were detected from both the seed lots (Tables I and II) except *Helminthosporium oryzae* and *Rhizoctonia solani* which were present individually in the seed

samples of T.N. 1 and Pusa 2–21 respectively. This might be due to the varietal differences of paddy used in the experiment.

3. *Influence of pre-treatment.*—Pre-soaking of seeds with mercuric chloride (0·1%), before plating, inhibited the incidence of *Aspergillus niger* while the pre-soaking had no effect on the incidence of other fungi (Tables I and II).

4. *Influence of seed treatment on seed fungi.*—It is evident from Table III that the fungicides gave signi-

TABLE II

Fungi isolated from sterilized and unsterilized paddy seeds on blotter

Cultivars	No. of seeds taken	Number of colonies of fungi isolated				
		Hel.	*Asp.*	*Fus.*	*Cur.*	*Rhiz.*
T.N. 1						
S	100	23·0	..	12·0	25·0	..
US	100	24·0	27·0	14·0	28·0	..
Pusa 2–21						
S	100	..	..	9·0	22·0	9·0
US	100	..	21·0	11·0	27·0	11·0

US—Unsterilized
S—Sterilized

Hel.—Helimintlosporium
Asp.—Aspergillus
Cur.—Curvularia
Fus.—Fusarium
Rhiz.—Rhizoctonia

TABLE III

Effect of different fungicidal treatments on seed infestation of T.N. 1 (*i*) *and Pusa* 2–21 (*ii*) *by agar plate*

Fungicides used	*No. of seeds tested	*No. of seeds showing infestation		Mean % of seeds showing infestation		Percentage of disease control	
		(i)	(ii)	(i)	(ii)	(i)	(ii)
Control (without chemical treatment)	40	30	28	75·0 (60·0)	70·0 (56·79)	..	..
Mercuric chloride	40	21	22	52·5 (46·43)	55·0 (47·87)	30·0	21·6
Captan	40	14	13	35·0 (36·27)	32·5 (34·76)	53·3	55·0
Brassicol	40	13	13	32·5 (34·76)	32·5 (34·76)	56·6	55·0
Thiram	40	12	12	30·0 (33·21)	30·0 (33·21)	60·0	57·2
Agallol	40	9	11	22·5 (28·32)	27·5 (31·63)	70·0	60·0
Ceresan	40	7	7	17·5 (24·73)	17·5 (24·73)	76·6	75·0
Agrosan GN	40	5	5	12·5 (20·70)	12·5 (20·70)	83·3	82·5

* Total of 5 replicate each containing 8 No. of seeds.
SEm for (i) — 1·86, SEd for (i) — 2·62
C.D. for (i) — at 5% level — 5·13
20·70 24·73 28·32 33·21 34·76 36·27 46·43 > 60·00

Diff. in parentheses indicated corresponding angular values.
SEm for (i) — 1·77, SEd for (ii) — 2·49
C.D. for (ii) at 5% level — 4·88
20·70 24·73 31·63 33·21 34·76 34·76 47·87 > 56·70

ficant reduction of fungi in both the cultivars. Amongst the seven different fungicides, Agrosan G.N. and Ceresan at 0·33% and 0·5% proved superior in reducing the microflora of the two cultivars. The others then followed in she order Agallol, Thiram, Brassicol, Captan and Mercuric chloride.

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HORIZONTAL SPREAD OF SHEATH BLIGHT TO RICE PLANTS IN RELATION TO SPACING AND NITROGEN APPLICATION

TWO phases of development of sheath blight infection to rice plants have been recognised—horizontal spread, *i.e.*, infection to contiguous plants, and upward *spread, i.e.*, infection to upper leaf sheaths of the same plant (*See* Ou[6]). Although, basidiospores of the causal fungus, *Coricium sasakii* (Shirai) Matsumoto, are known to develop under field conditions. they occur rarely. Therefore, horizontal spread by direct contact is considered to be the chief mode of spread of the disease in field. High doses of fertilizers, particularly nitrogen, are supposed to be conducive for the development of the disease. The present work aims at monitoring horizontal spread of the disease to rise plants under two spacings with two doses of nitrogen.

Experimental

Rice, cv. 'Pusha 2–21' was raised in nursery beds and 28 days later were transplanted in rectangular plots (4·25 × 2·25 c) under two spacings, 25 × 25 cm (S_2) and 15 × 15 cm (S_1), each in two nitrogen doses, 200 (N_2) and 50 kg (N_1) urea/ha, on 20 July 1976. Each of the treatments was replicated eight times under completely randomized design. There were 17 × 9 rows in each plot under S_2 and 25 × 13 rows in those under S_1. At the time of transplanting, the entire quantity of the phosphatic and potassic fertilizers were applied to the plots as basal dressing in forms of single superphosphate @ 240 kg and muriate of potash @ 60 kg/ha, respectively, and a part of nitrogen in form of urea @ 18·6 kg/ha was also added. Rest of the quantity of urea was applied 20 days after transplanting in a single instalment in plots receiving low dose of nitrogen and in two equal instalments 20 and 32 days after transplanting in plots receiving high dose of nitrogen.

Two seedlings were transplanted per hill except in the case of two per plot where 5 seedlings were put. These two hills were located equidistantly from the three sides as well as from the centre and were artificially inoculated on 16 August 1976, *i.e.*, 55 days after sowing. *C. sasakii* was grown on sterilized rice grains[2] in 500 ml Erlenmeyer flasks for 13 days. All the sheaths of all the tillers of these two hills were inoculated by inserting the grains (inocula) in between sheaths and stems. Observations were taken 35 days after inoculation.

Results and Discussion

Under both the spacings of 15 × 15 and 25 × 25 cm, more number of plants were infected in plots receiving high lose of nitrogen but the spread was greater under close spacing than wide spacing (Table I). When analysis of variance was done, effect of nitrogen was found to be significant (F ratio = 6·73) in the spread of the disease and that of spacing narrowly failed to be significant (F ratio = 3·75).

TABLE I

Percentage of rice plants (Pusa 2–21) infected by sheath blight in different treatments of spacing and nitrogen application

Treatment	% of plants infected per lot
S_1N_2 (15 × 15 cm, 200 kg urea)	10·18 *a*
S_2N_2 (25 × 25 cm, 200 kg urea)	8·67 *a*
S_1N_1 (15 × 15 cm, 50 kg urea)	7·95 *ab*
S_2N_1 (25 × 25 cm, 50 kg urea)	5·22 *b*

S.Ed. = 1·55
C.D. (5%) = 3·17.

Loo *et al.*[5] stated that sheath blight was favoured by close planting and high nitrogen application; Hashioka[1] and Kōzaka[4] also emphasized about positive relationship of high nitrogen content of soil and severity of sheath blight. Spread of the disease was found