https://doi.org/10.29321/MAJ.10.A03150

Madras agric. J. 64 (1) : 35—39, January, 1977

Efficacy of Certain Fungicides and Antibiotics on Seed Mycoflora of Rice

By

R. N. TANDON[1] and R. S. DWIVEDI[2]

ABSTRACT

Twenty-six fungi in all were isolated from the non-disinfected seeds, surface-disinfected seeds and from the cotyledons of rice variety IEI 1991 by agar-plate method and blotter technique. *Choanephora cucurbitarum, Humicola grisea, Mortierella subtilissima, Papulaspora* sp. and *Trichothecium roseum* are the new records as seed-borne fungi on this seed. Seeds were treated with fifteen organic and inorganic fungicides and five antibiotics (antifungal and antibacterial) in different concentrations at the rate of 0.1, 0.2, 0.3 per cent of seed weight and 50, 100 and 200 ppm respectively and it was observed that Agallol '3' at 0.3 per cent and Agrimycin-17 at 200 ppm checked several fungi considerably and enhanced per cent seed germination.

INTRODUCTION

Seed-borne fungi play a vital role in reducing yield and deteriorating quality of crops. In order to control them seed treatment with certain chemicals and antibiotics has been tried (Padmanabhan *et al.*, 1962, Subramanian and Ramaswamy, 1973). The present piece of work was designed to perform comparative study of externally and internally seed-borne fungi by agar plate method and blotter technique and with the evaluation of certain fungicides and antibiotics at different concentrations on seed mycoflora and on seed germination.

MATERIALS AND METHODS

Seeds of rice variety IET 1991 were used. Fungi from the seeds were intercepted by employing the standard techniques as recommended by International Seed Testing Association (Anon., 1966). Non-disinfected and surface disinfected (with 0.1 % $HgCl_2$ aqueous solution for 1 minute and then rinsed with several changes of sterile water and dried between folds of sterilized blotting paper) seeds, and cotyledons after removal of surface-disinfected husks, were sown on potato-dextrose agar (PDA) in Petri dishes and on moistened sterile blotter-wad and incubated at 25±1°C under 12 h_r duration of alternating cycles of light and darkness for a week to allow the growth of fungi.

Fifteen fungicides (Table II) each at 0.1, 0.2 and 0.3 per cent of seed weight were mixed thoroughly and five antibiotics (antifungal and antibacterial) viz. Agrimycin-17, Aureofungin,

1-2 : Department of Botany, Banaras Hindu University, Varanasi - 221005.

Griseofulvin, Mycostatin and Streptocycline were prepared in solution form, by dissolving in their solvents, in concentrations of 50, 100 and 200 ppm and prepared in sterile water in 500 ml Erlenmeyer flasks. For each treatment 250 g of seed was soaked in each concentration and the flasks containing seeds were shaken well for 30 minutes on a mechanical shaker and then kept at laboratory condition overnight and thereafter sown on PDA in Petri dishes as well as on moistened blotter in replicates. Untreated seed lot and the seeds soaked in sterile water served as control. The plates were incubated at 25±1°C for a week and the per cent mycoflora components and seed germination were recorded on an average of 400 seeds each inoculated on agar plate and moistened blotter respectively by both the methods.

RESULTS AND DISCUSSION

Twenty six fungi in all were

TABLE I. Percent incidence of seed-borne mycoflora of rice (in storage condition)

Fungi intercepted	Agar Plate Method			Blotter Technique		
	ND	SD	CT	ND	SD	CT
Aspergillus flavus Link	60.0	—	20.8	40.3	—	20.0
A. fumigatus Fresenius	20.9	—	—	—	—	—
A. nidulans (Eidam) Winter	60.3	—	—	—	—	—
A. niger Van Tieghem	60.6	—	12.0	48.3	—	12.0
A. sydowi (Bainier and Sartory) Thomand Church	20.3	—	12.0	25.0	—	2.0
A. terreus Thom	15.5	—	—	—	—	—
A. violaceo fuscus Gasperini	5.1	—	—	—	—	—
Alternaria tenuis Nees	60 0	—	34 0	54.0	22.0	12.0
Chaetomium globosum Kunze	20.3	—	5.0	40.0	—	15.0
Choanephora cucurbitarum (Berkely Ravenel Thaxter)	10.8	—	—	80.0	—	—
Curvularia lunata (Walker) Boedijn	60.0	14.0	30.0	60.8	4.0	14.0
C. pallescens Boedijn	12.0	20.0	3.0	50.0	—	5.1
Drechslera oryzae (Breda de Hann) Subrm. and Jain	30.0	12.0	20.0	30.0	10.8	10.0
Fusarium oxysporum Schlecht.	60.0	—	20.0	40.4	—	10.0
F. poae (Peak) Wollenweber	40.3	20.0	20.0	40.0	2.1	10.0
Helmithosporium tetramera McKinney	30.0	—	—	40.1	—	—
Humicola grisea Traaen	5.1	—	—	—	—	—
Mortierella subtilissima Oudemans	10.6	—	—	—	—	—
Mucor hiemalis Wehmer	20.0	—	—	15.0	—	—
Nigrospora oryzae (Berk. & Br.) Petch	15.3	—	10.0	20.0	—	—
Penicillium rubrum Stoll	50.1	10.0	30.0	20.9	—	18.0
Papulaspora sp.	20.3	—	—	—	—	—
Rhizopus nigricans Ehrenberg	60.0	—	40.0	40.0	—	20.0
Trichoconis padwickii Ganguly	40.4	—	23.2	44.3	—	20.0
Thielavia sp.	2.5	—	—	—	—	—
Trichothecium roseum Link	20.0	12.0	5.0	12.8	—	—
Mean percent infection	30.0	3.3	10.9	25.0	1.4	6.4
Total No. of species intercepted	26	6	15	18	4	13

ND=Non-disinfected; SD=Surface-disinfected; CT=Cotyledons.

isolated from the seeds by agarplate method and blotter technique from the non-disinfected, surface-disinfected seeds and from the cotyledons and their number was noted to be 26, 6, 15, 18, 4, 13 respectively by both the techniques (Table I). *Choanephoro cucurbitarum, Humicola grisea, Mortierella subtilissima, Papulaspora* sp. and *Trichothecium roseum* are the new records as seed-borne fungi having 530 per cent infection. The maximum per cent infection (40-60%) was observed by the species of *Alternaria, Curvularia, Fusarium, Penicillium, Rhizopus, Trichoconis* and some aspergilli.

TABLE II. Mean incidence of seed-borne mycoflora after treatment with fungicides

Fungicides	% seeds yielding fungi		
	Concentration of fungicides in %		
	0.1	0.2	0.3
Agallol '3'	0 92	0.46	0.00
Agrosan GN	5.12	3.21	1.50
Blitox-50	11.31	5.22	1.82
Ceresan-Dry	0.11	0.03	0.00
Cupramar	7.09	4.55	2.21
Dithane M-45	2.66	1.56	0.07
Fermate	3.53	0.53	0.07
Miltox	10.18	7.64	4.14
Orthocide	4.26	1.97	0.28
Phygon XL	3.08	1.82	0.10
Thylate	2.26	1.50	0 07
Unizeb	5.23	2.60	1.46
Vitavax	6.06	3.61	1 26
Zincop	2.73	1.58	0.96
Dithane Z-78	5.43	2.39	0.72
Control 30.4			

Although nearly all the fungicides and antibiotics tested showed the reducing effect on seed mycoflora yet the most effective one amongst them was Agallol '3' at 0.3 per cent and Agrimycin-17 at 200 ppm respectively, which checked several fungi. The range of effectiveness of other fungicides and antibiotics was noted to be in descending order of: Thylate, Fermate, Ceresandry, Dithane M-45, Phygon XL, Blitox-50, Orthocide, Zincop, Dithane Z-78, Agrosan GN, Unizeb, Vitavax, Cupramar and Miltox at 0.3 per cent (Table II) and Mycostatin, Streptocycline, Griseofulvin and Aureofungin at 200 ppm respectively (Table III).

TABLE III. Incidence of seed-borne mycoflora after treatment with antibiotics

Antibiotics	% seeds yielding fungi		
	Concentration of Antibiotics in ppm		
	50	100	200
Agrimycin-17	0.46	0.39	0.00
Aureofungin	6.41	3 27	1.71
Griseofulvin	6.54	4.20	1.13
Mycostatin	2.26	0.08	0 08
Streptocycline	7.77	4.36	2.38
Control 30.4			

Cent-percent germination was recorded in Dithane M-45 and in Thylate as compared to 75 per cent in control. Agallol '3', Blitox-50, Ceresandry, Fermate and Phygon XL encouraged seed germination considerably at 0.3 per cent whereas Cupramar and Miltox showed detrimental effect even at the lowest concentration (Figs. 1-4). Among the antibiotics used, Agrimycin-17 showed cent-percent germination at 200 ppm whereas the same was recorded in Griseofulvin at 50 and 100 ppm as compared to others (Fig. 5).

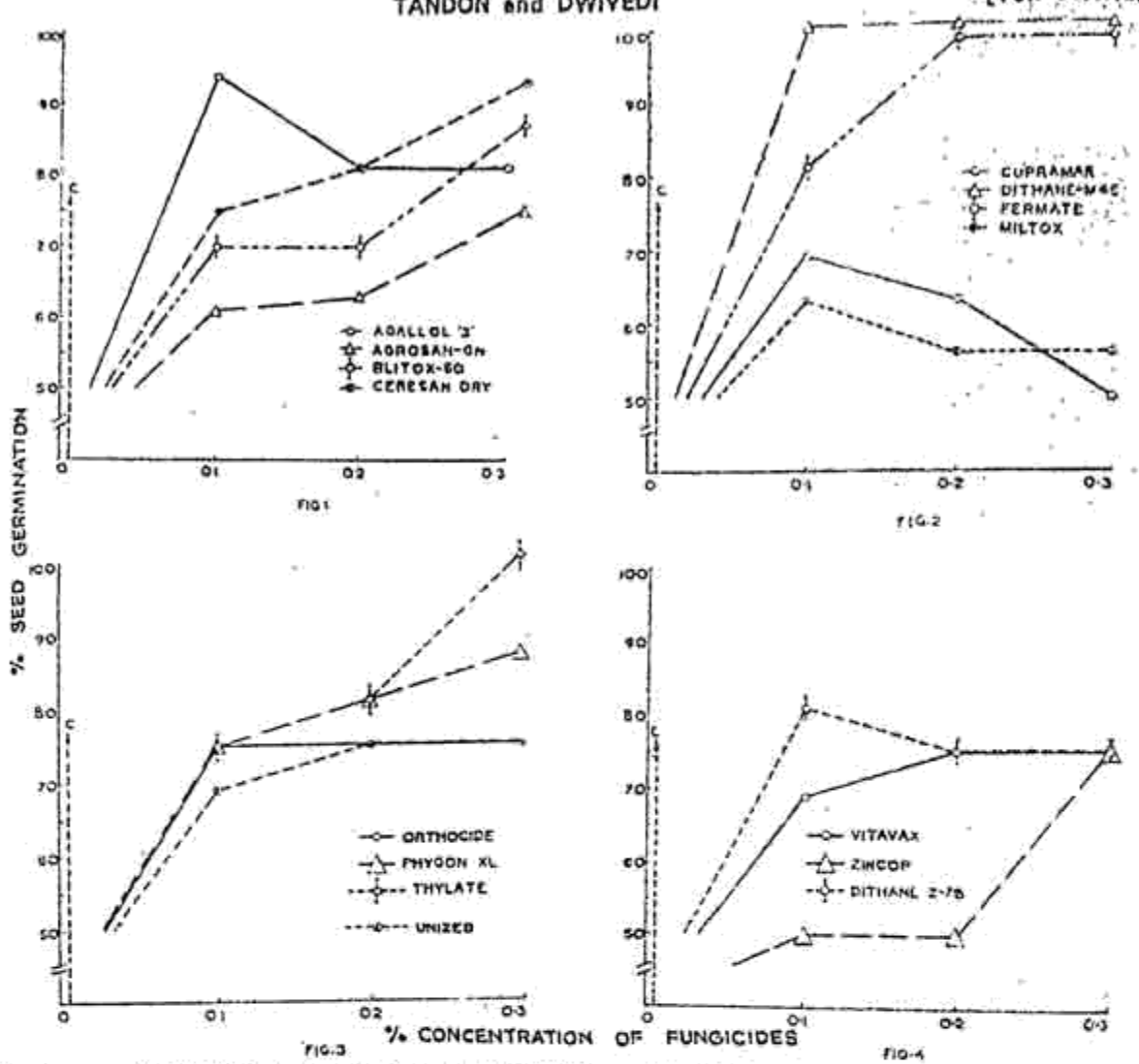

Fig. 1—4. EFFECT OF FUNGICIDES IN DIFFERENT CONCENTRATIONS ON THE GERMINATION OF PADDY SEEDS

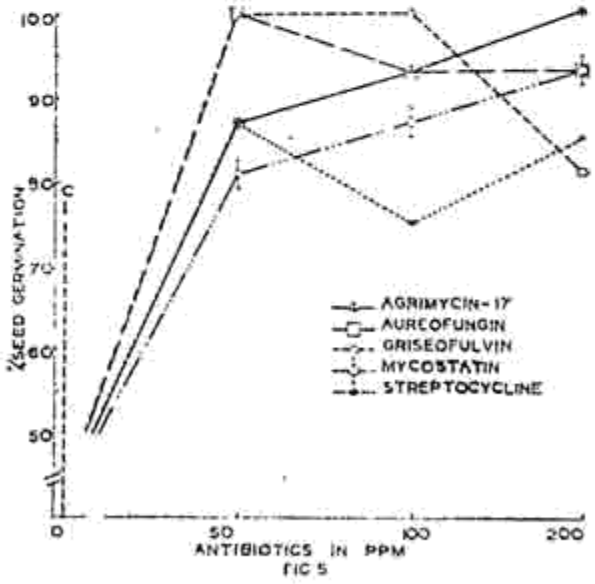

Fig. 5. EFFECT OF ANTIBIOTICS IN VARIOUS CONCENTRATIONS ON THE GERMINATION OF PADDY SEEDS

It is known that certain storage fungi invading seeds cause deterioration by damaging seed germination and seedling vigour (Christensen, 1964, 1967; Mathur and Sehgal, 1964; Christensen and Kaufmann, 1965) and cause rot of seedlings and seedling blight by producing fungitoxic substances (Subramanian *et al.*, 1964). To eliminate such organisms for improved seed health, seed treatment with fungicides and antibiotics is recommended. The increase in germination percentage in seeds with fungicides and antibiotics may be attributed to the fact that either they might have

(i) checked the seed mycoflora or (ii) neutralised the metabolic products detrimental to the seed or (iii) changed the physiology of seeds during germination.

ACKNOWLEDGEMENTS

The authors are thankful to the Head of Botany Department for providing laboratory facilities and to the various pharmaceutical companies for the sample supply of chemicals. The senior author is thankful to the Ministry of Health, Government of India, for financial assistance.

REFERENCES

ANONYMOUS. 1966. International rules for seed testing. *Proc. Internal. Seed Testing Assn.* 31 : 1-152.

CHRISTENSEN, C. M. 1964. Effect of moisture content and length of storage period upon germination percentage of seed of corn, wheat and barley free of storage fungi. *Phytopathology* 54 : 1464-66.

CHRISTENSEN, C. M. 1967. Germinability of seeds free of and invaded by storage fungi. *Proc. Assoc. Off. Seed Analysts* 57: 141-43.

CHRISTENSEN, C. M. and H. A. H. KAUFMANN. 1965. Deterioration of stored grains by fungi. *Annu. Rev. Phytopath.* 3 : 69-84.

MATHUR, R. L. and S. P. SEHGAL. 1964. Fungal mycoflora of Jowar *(Sorghum vulgare)*, its role in reduced emergence and vigour of seedling and control. *Indian Phytopath.* 17 : 227-33.

PADMANABHAN, S. Y., D. GANGULY, G. H. CHANDWANI, J VEERARAGHAVAN and C.S. KRISHNAMURTHI. 1962. Control of blast disease of rice with copper, organosulphur and organomercurials. *Indian Phytopath.* 51: 28-36.

SUBRAMANIAN, C. L. and R. RAMASWAMY. 1973. Efficacy of some chemicals for the control of rice blast. *Madras agric. J.* 60 : 576-77.

SUBRAMANIAN, C. L., N. SHANMUGAM and C. S. KRISHNAMURTHY, 1964. Studies on the seed borne mycoflora of cereals. I. Effect of some seed-borne fungi and their culture filtrates on germination and seedling vigour of rice and jowar. IV Ann. Session Acad. Agri. Sci., Coimbatore