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EFFECT OF FUNGICIDAL TREATMENTS ON SEED MYCOFLORA AND GERMINATION OF *SETARIA ITALICA* IN KUMAUN HILLS.

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Five fungicides were employed by dusting seeds (0.3 w/w) against the seed mycoflora and per cent germination of seeds of two varieties of *Setaria italica* viz. VL16 and Arjuna were studied. In VL 16 variety, Agrosan GN and Difolatan showed the best results inhibiting most of the fungi associated with seeds and had no adverse effect on seed germination except Difolatan which decreases the length of root and shoot. Agrosan GN and Dithane Z-78 also had adverse effect on root length. The Agar plate exhibited similar results with little deviation, whereas in Arjuna variety Difolatan completely checked the growth of all fungi and had no adverse effect on seed germination. Agrosan GN, Dithane M-45, Biltox-50 and Dithane Z-78 showed good results inhibiting most of the fungi associated with seeds and Dithane M-45 had adverse effect on root and shoot lengths in comparision to control. However, the germination was found to be increased in all treatments in comparision to control.

Setaria italica is commonly known as 'Kauni' in the hills of Kumaun Himalayas. It is an important minor millet crop of this region. It is generally cultivated, although comparatively in very small amount, all over India. It is used medicinally in rheumatism and is a popular domestic remedy for alleviating pains during pasturation and is also given to the patients of jaundice and measeles.

Seeds play an important role in dissemination of pathogenic as well as non pathogenic micro-organisms. seed-borne diseases pose a potential danger to crops and are of vital importance. Nearly 5-6% loss of major cereal crops in India is due to seed-borne diseases. Among the micro-organisms, fungi are most important organisms which deteriorate the quality of grains. Seed treatment with fungicides is a good method to control seed deterioration and improves seed germination.

Studies on seed-borne fungi have attracted the attention of several workers with various view points (Neergaard, 1965 and Lalithakumari *et. al.* 1971). Fungicidal treatments are known to reduce seed mycoflora and improve seed germination (Grewal and Kapoor 1966 and Dharam Vir *et al*,. 1970). But little work has been done on the test crop so far (Grewal and Mahendra Pal, 1965, and Pandey *et al*, (1981.)

MATERIAL AND METHODS

Two varieties of seeds of *Setaria italica* VL 16 and Arjuna variety, collected from V.P.K. Anusandhanshala Almora, were selected for the present study. The Agar plate and blotter method, (International Seed Testing Association, 1966) were used.

Five fungicides namely Agrosan GN Dithane M-45, Dithane Z-78, Difor latan and Blitox-50 were tested for their

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efficacy against seed-borne diseases at the rate of 0.3% by seed weight. The seeds thus treated were shaken in separate flasks with the help of a mechanical shaker for 15 minutes and then kept in the laboratory at room temperature for 48 hrs. The seeds without fungicidal treatments served as control. Ten seeds from each flasks were transferred to each of the petridishes, having three layered moistened blotting paper and Czapek's medium separately. The treated seeds were then incubated at 25±1°C in intermitting NUV light and darkness for 12 hrs. duration. The mycoflora was analysed after a week of incubation.

To find out the effect of fungicides on seed germination the seeds treated with fungicides were incubated in the petridishes having sterilized three layered moistened blotting paper. Per cent germination was recorded upto a week till the germination of seeds was over.

RESULTS AND DISCUSSION

Table I reveals that in VL 16 Blitox-50 and Difolatan completely checked the incidence of all fungal species, whereas Agrosan GN, Dithane M-45 and Dithane Z-78 showed good results inhibiting most of the fungi associated with the seeds. *Cladosporium cladosporioides* and *Fusarium moniliformae* occurred in Agrosan GN and Dithane Z-78 treated seeds and *Aspergillus flavus* on seeds treated with Dithane M-45 on blotter plates. Agrosan GN and Dithane Z-78 could not control *Aspergillus flavus* and *Cladosporium cladosporioides* on Agar plates in a few instances.

Similarly Agrosan GN and Dithahe M-45 failed to control *Aspergillus fumigatus* and *Cladosporium cladosporioides* on Arjuna var. of the seeds. The results indicates that *Aspergillus fumigatus* was the most tolerant fungus to the fungicidal treatments. However, the fungicides had no adverse effect on seed germination except Difolatan in blotter and Dithane Z-78 in Agar plates.

In Arjuna variety Difolatan completely checked the growth of all the fungi associated with the seeds but per cent germination was also enhanced by this fungicide. Dithane Z-78 and Blitox-50 reduced seed mycoflora considerably but seed germination was affected adversely.

Among all the fungicides Difolatan and Blitox 50 were found to control most of the mycoflora significantly. Earliar workers have reported the control of seed mycoflora of *Setaria italica* and *Eleusine coracana* by Agrosan GN (Grewal and Mahendra Pal, 1963 and 65). Dithane M-15 has been reported to give a complete check of seed-borne infection of *Drechslera* sp. on Barley, Rice and Oat (Dharam-Vir *et al.*, 1970). Agrosan GN, Dithane M-45 and Dithane Z-78 were found to control most of the seed mycoflora of *Seteria italica* significantly (Pandey *et al.*, 1981).

In the present study *Aspergillus flavus, A fumigatus* and *A. niger* were found to be dominant fungal species which are potent producers of mycotoxins like aflatoxins which are reported to cause cancer in human beings and livestock (Brook and White, 1966).

Table 1—Effect of fungicidal treatments on the percent incidence of fungi Associated with the seeds of *setaria italica* variety VL 16 and Arjuna.

CW—Control in water soaked blotter, CP-Control in Agar medium (Czapek's), A—Agrosan GN, B—Dithane M-45, C—Dithane Z—78, D—Difolatan, E—Blitox-50.

Name of the fungal Species	Blotter method												Agar plate method											
	CW		A		B		C		D		E		CP	A		B		C		D		E		
	VL	A	VL	A	VL	A	VL	A	VL	A	VL	A	VL	A	VL	A	VL	A	VL	A	VL	A	VL	A
Alternaria alternata	10	16	—	—	—	—	—	—	—	-	—	—	20	18	—	—	10	—	—	—	—	—	—	—
A brassicae	7	—	—	—	—	—	—	—	—	—	—	—	12	—	—	—	-	—	—	—	-	—	—	—
A. humicola	—	15	—	—	—	—	—	—	—	—	—	—	—	13	—	—	—	—	—	—	—	-	—	—
Aspergillus niger	35	-	—	—	—	—	—	—	—	—	—	—	30	—	—	—	11	—	15	—	—	—	—	-
A.flavus	45	40	—	—	5	—	—	4	—	—	—	10	20	15	10	7	—	—	—	—	—	—	—	12
A. fumigatus	—	42	—	5	—	7	—	—	—	—	—	—	—	20	—	7	—	8	—	5	—	—	—	10
Cladosporium herbarum	—	14	—	—	—	—	—	—	—	—	—	—	—	15	—	—	—	—	—	—	—	—	—	9
C. Cladosporioides	20	20	5	—	—	—	8	—	—	—	—	7	30	20	—	8	—	—	12	—	—	—	—	—
C. epiphyllum	15	—	—	—	—	—	—	—	—	—	—	—	10	—	—	—	—	—	—	—	—	—	—	—
Curvularia lunata	—	15	—	—	—	—	—	—	—	—	—	—	—	18	—	—	—	—	—	—	—	—	—	—
Epicoccum purescens	12	—	—	—	—	—	—	—	—	—	—	—	40	—	—	—	—	—	—	—	—	—	—	—
Fusarium moniliformae	35	30	8	8	—	10	4	—	—	—	—	—	40	35	—	—	—	5	—	—	—	—	—	—
F. exyspoum	—	28	—	—	—	—	—	—	—	—	—	—	—	31	—	—	—	—	—	—	—	—	—	—
Mucoa sp.	15	—	—	—	—	—	—	—	—	—	—	—	20	—	—	—	—	—	—	—	—	—	—	—
Rhizopus nigricans	23	15	—	—	—	—	—	—	—	—	—	—	25	20	12	—	—	—	—	—	—	—	—	—
Helminthosporium tetramera	—	11	—	—	—	—	—	—	—	—	—	—	—	15	—	—	—	—	—	—	—	—	—	—
Stachybotrys atra	30	—	—	—	—	—	—	—	—	—	—	—	20	—	—	—	—	—	—	—	—	—	—	—
% of seed germination	86	80	80	80	98	96	85	80	60	85	85	96	53	86	86	75	75	80	40	60	95	80	60	65

Table 2. Effect of fungicides on the gtowth of root and shoot systems of *Setarja italica* (cm)

Fungicides	VL 16		Arjuna	
	Length of root	Length of shoot	Length of root	Length of shoot
AgrosanGN	3.50	5.50	4.00	4.50
Dithane M-45	4.00	5.00	3.50	4.50
Dithane Z-78	2.50	4.00	4.00	5.00
Difolatan	2.00	3.50	4.50	4 50
Blitox 50	5.00	4.50	3.00	5.00
Control	4.50	3.50	4.00	5.50

It is evident from the results (Table 2) that Blitox-50 showed stimulatory effects on the growth of root and shoot of variety VL 16. The other four fungicides decreased the root length but enhanced the growth of shoot. In case of Arjuna variety Difolatan enhanced the root length but Dithane M-45 and Blitox-50 inhibited the growth. All the fungicides tested exerted slightly inhibitory activity on the growth of shoot.

The foregoing results conclusivaly indicate that Difolatan and Blitox-50 may be recommended for the control of seed-borne mycoflora of *Seteria italica* in this region because they check the incidence of most fungi but do not adversely affect seed germination and root and shoot growth.

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