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EFFICACY OF SOME FUNGICIDES ON INCIDENCE OF SEED-BORNE FUNGI OF *Eruca sativa* GROWN IN TARAI REGION OF NAINITAL

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Seed mycoflora of Taramira (*Eruca sativa*) was examined by employing two methods (Potato Dextrose Agar Plate and Blotter) in relation to seed storage up to two years and seed treatments with fungicides for their control. The most common and dominent seed-borne fungi under storage were recorded to be *Aspergillus flavus*, *A. fumigatus* *A. niger* and *Alternaria alternate*. *A. flavus* was noted to be constantly present on seed in good population irrespective of seed treatments and storage. Six fungicides were employed by dusting the seeds (0.3% w/w) to observe their effect against the seed mycoflora. The per cent germination of the seeds treated with all the fungicides increased as compared with control but was lower at longer storage periods. The per cent incidence of some harmful fungi such as *A. flavus* and *A. niger* increased with storage period.

Taramira is an important crop of *'tarai'* region of Nainital. Seed-borne diseases transmitted through seeds pose a potential danger to crops and also act as deteriorating agents in seed germination (Dwivedi and Tandon, 1976). The selective infestation by storage fungi depends upon the nutritional status of the grains, moisture content, temperature, O_2 and CO_2 of the atmosphere and the extent to which the grains are already invaded (Christensen, 1978). The quality and standard of seeds and grains may be improved after seed treatment with fungicides (Pandey *et al.*, 1981 and Singh *et al.* 1982). Investigations on screening of seed mycoflora and the effect of fungicides on the control of fungal incidence of Taramira seeds in Tarai region of Nainital have not yet been carried out. Therefore, the present piece of work will quantify our knowledge on the said aspects.

MATERIALS AND METHODS

Seeds of Taramira (*Eruca sativa*) were collected from different villages situated in Tarai area of Nainital and also from different seed stores. The seeds were stored in polythene bags under laboratory conditions upto 2 years. The room temperature of the laboratory remained below 15° C throughout the year, excepting a few months in summer, because of temperature climate of the hilly region. The seed mycoflora was isolated by agar plate method and blotter technique for externally seed-borne fungi. For the isolation of endophytic seed-borne mycoflora the seeds were surface sterilized with 0.1% mercuric chloride and then were plated on potato dextrose agar as well as on sterilized blotters (ISTA, 1966).

For the control of seed-borne fungi six fungicides viz., Agrosan GN,

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Benlate, Blitox 50, Dithane M-45, Dithane Z-78 and Difolatan were applied at the rate of 0.3% by seed weight. The seeds thus treated were shaken for 15 min. and then kept in the laboratory for about 48 hr. at room temperature. The seeds treated with sterilized water served as control. Ten seeds were transferred into each petri plate containing PDA medium and were incubated at 25±1° C for 7 days, thereafter, seed mycoflora and seed germination were recorded.

RESULTS AND DISCUSSION

The results are presented in Tables 1 and 2. In all 15 seed-borne fungi were isolated from Taramira seeds. The dominant seed-borne fungi recorded in freshly stored seeds were *Alternaria alternata*. *A. brassicicola*, *Aspergillus flavus*, *A. niger*, *Fusarium oxysporum*, *Helminthosporim tetramera* and *Rhizopus nigricans*. In one year and two years old seeds *Aspergillus terreus* and *A. fumigatus* frequently occurred in addition to the above mentioned mycoflora. It is evident from the Table 1 that the number of seed-borne fungi increased with the increase in storage period. The common seed-borne fungi which were isolated from all the stages of storage were *Alternaria* spp., *A. flavus*, *A. fumigatus*, *A. niger*, *H. tetramera* and *R. nigricans*. Similar results were also reported by Tandon and Dwivedi (1977). The nature of mycoflora changed both quantitatively and qualitatively with prolongation of storage periods. In stored seeds the Aspergilli occuired more frequently partially replacing the field fungi. The occurrence of these fungi is mostly dependent on the climatic conditions at the time of maturation of crop and the moist weather during crop ripening, harvesting and threshing. *A. flavus* was isolated from every stage of stored seeds in good population. In our investigation we noted that *A. flavus* and *F. oxysporum* were more tolerant against fungicidal treatments. It is clear from the Table 2 that none of the fungicidal treatments could eliminate the associated fungi completely at the concentration used though they reduced the per cent incidence of mycoflora at 3%. Agrosan GN appears to be more effective in controlling the seed-borne fungi of the test crop. In case of one year stored seeds the per cent incidence of mycoflora was invariably reduced by the fungicidal treatments. There was mild effect of the fungicides on per cent indidence of some harmful fungi such as *A. flavus*, *C. harbarum* and *F. oxysporum*. Our results are corroborating with the observations of Rai and Singh (1976), and Tandon and Dwivedi (1977).

The results also indicate that the storage period of seeds should not be exceeded for more than a year. And we may conclude that even in temperate climate such as in the Kumaun Himalaya is sufficient to induce the growth of storage fungi.

Amongst the fungicides only Agrosan GN and Dithane M-45 may be suggested to control the seed-borne fungi of the test crop. Higher percentage of seed germination was recorded in treated seeds than control. Agrosan GN and Dithane M-45 were

Table 1 : Per cent incidence of seed-borne mycoflora of Taramira *(Eruca sativa)* in relation to storage. (UT = Untreated; T = Surface sterilised with 0.1% mercuric chloride)

Fungal species	Agar plate technique						Blotter technique					
	Fresh seeds		1yr. seeds		2yr. seeds		Fresh seeds		1yr. seeds		2yr. seeds	
	UT	T	UT	T	UT	T	UT	T	UT	T	UT	T
Alternaria alternata	10	8	32	22	20	15	16	4	20	15	10	8
Alternaria brassicicola	22	18	18	13	12	8	6	2	10	3	12	12
Aspergillus terreus	0	0	12	12	10	8	0	0	10	9	16	12
Aspergillus flavus	5	4	10	6	28	24	2	1	4	2	20	18
Aspergillus fumigatus	1	1	10	4	8	8	0	0	8	4	12	10
Aspergillus niger	6	2	16	16	13	12	2	1	16	12	11	11
Chaetomium indicum	0	0	6	4	0	0	0	0	8	6	0	0
Cladosporium herbarum	0	0	5	3	0	0	0	0	2	1	0	0
Fusarium oxysporum	7	3	0	0	0	0	2	2	0	0	0	0
Helminthosporium terramera	8	6	6	4	6	5	4	4	2	2	6	4
Mortierella subtilissima	0	0	3	2	0	0	0	0	4	2	0	0
Rhizopus nigricans	8	6	8	6	10	8	4	2	6	2	8	6
Sterile mycelium	0	0	0	0	2	1	0	0	0	0	2	2
Torula graminis	0	0	4	2	0	0	0	0	2	0	6	4
Trichoderma spp.	4	0	0	0	0	0	1	0	0	0	0	0
Per cent germination	70	75	60	60	50	50	70	75	60	60	50	50

Table 2 : Effect of fungicides on per cent incidence of seed mycoflora of one year stored seeds of Taramira *(Eruca sativa)*. A = Agar plate method; B = Blotter method.

Fungal species	Control	Agrosan GN		Blitox 50		Benlate		Difolatan		Dithane M-45		Dithane -78	
		B	A	B	A	B	A	B	A	B	A	B	A
Alternaria alternata	32	0	0	0	2	0	0	0	0	0	0	0	0
Alternaria brassicicola	18	0	0	0	0	0	0	0	0	0	0	0	0
Aspergillus terreus	12	0	1	0	1	1	2	0	2	0	0	0	0
Aspergillus flavus	10	2	5	0	0	1	1	2	4	6	8	6	8
Aspergillus fumigatus	10	1	2	0	0	0	0	0	0	0	0	0	0
Aspergillus niger	16	0	0	0	1	0	0	1	2	0	0	0	0
Chaetomium indicum	6	0	0	0	0	0	0	0	0	0	0	0	0
Cladosporium herbarum	5	0	1	0	1	0	0	0	0	0	2	2	3
Fusarium oxysporum	0	0	0	1	2	1	1	2	2	0	0	0	0
Helminthosporium tetramera	6	0	0	0	0	0	0	0	0	0	0	0	0
Mortierella subtillisima	3	0	0	0	0	0	0	0	0	0	0	0	0
Rhizopus nigricans	8	0	0	0	0	0	1	0	4	0	0	0	0
Torula graminis	4	0	1	0	0	0	0	0	0	0	0	0	0
Sterile mycelium	0	0	0	0	0	0	0	1	2	0	0	0	0
Per cent seed germination	60	80	78	75	72	74	70	80	76	70	68	71	72

also examined to be more effective fungicides which increased per cent seed germination. Reduced germination of the seeds after prolonged storage period may be attributed to the effect of temperature, microbial infestation and microbial toxins produced by them. Upadhaya and Singh (1978) reported their work on seed mycoflora of mustard in relation to storage and treatments with fungicides.

Freshly harvested seeds associated with different types of field and storage fungi which grow on the coat of seeds as long as food and the micro-ecological conditions are adequate. Low temperature (7-10° C) storage of grains can be as effective as low moisture content in preventing damage by storage fungi prior to storage provided the grain is not already moderately to heavily invaded by fungi prior to srorage (Christensen and Kaufmann, 1969). Christensen (1978) has further pointed out that *Aspergillus halophilicus* has been isolated from seeds stored for more than 6 months at moisture content in equilibrium with relative humidity of 65-70%. In our experiments increase in per cent of seed germination is an indication that seed treatment with fungicides exert favourable effect on the viability of seeds. Therefore, such fungicides may be recommended for the treatment of seeds before crop sowing.

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