

SEED-BORNE MYCOFLORA OF RAPESEED (*BRASSICA CAMPESTRIS* L.) AND ITS SIGNIFICANCE

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One hundred seventy six samples of rapeseed (*Brassica campestris* L.) collected from 21 districts of Rajasthan revealed saprophytic as well as pathogenic fungi belonging to 70 species of 24 genera. *Albugo candida*, *Alternaria brassicicola*, *A. tenuis*, *Cladosporium oxysporum*, *Curvularia lunata*, *C. pallescens*, *Drechslera tetramera*; *Fusarium moniliforme*, *F. oxysporum*, *Myrothecium roridum* and *Trichothecium roseum* were important pathogenic fungi which caused losses in seed germination and seedling symptoms.

Key words : Rapeseed, Seed-borne mycoflora, Phytopathological effects, Rajasthan.

Rapeseed (*Brassica campestris* L.) is an important oilseed crop of India and attacked by a number of fungi, many of which are seed-borne (Richardson, 1979). In India, seed-borne mycoflora of rapeseed has been reported from the states of Haryana (Kadian & Suryanarayana, 1970), Uttar Pradesh (Mishra & Kanaujia, 1973; Jain. *et al.*, 1982), Madhya Pradesh (Agrawal & Khare, 1975; Kanwar & Khanna, 1979) and West Bengal (Mondal *et al.*, 1981). Since there is no systematic study on seed-borne mycoflora of rapeseed grown in Rajasthan and its phytopathological effects, the present study was undertaken.

MATERIALS AND METHODS

One hundred seventy six seed samples of rapeseed were collected from 21 districts of Rajasthan. These samples were subjected to dry seed inspection (400 seeds/samples) were studied using seed washing test (Agarwal, 1981) and potato dextrose agar (PDA) plate method respectively. In seed washing test, two replicates of one g seed/sample were used and spore load/g seed (SL) was calculated. The phytopathological effects of fungi were studied in the blotter test.

RESULTS AND DISCUSSION :

Dry seed inspection : Dry seed inspection of samples, besides bold-symptomless seeds revealed bold-discoloured (0.5-60%) and shrivelled-discoloured (0.5-42%) seeds in 65 and 43 samples respectively. Incubation of seeds showing greyish brown and black discoloration yielded species of *Alternaria*, *Cladosporium*, *Curvularia* and *Drechslera*. White to pink discoloration was generally associated with

Fusarium spp. while seeds with shiny white to pale-yellow discoloration yielded *Trichothecium roseum*. **Seed-borne mycoflora :** Seed washing test revealed fungal spores of 26 species of 9 genera. The important dominant fungi with varied spore load/g seed (SL) were *Albugo candida* (SL, 20-120), *Alternaria brassicicola* (SL, 20-5980), *A. brassicae* (SL, 20-300), *A. dianthicola* (SL, 20-300), *A. raphani* (SL, 20-460), *A. tenuis* (SL, 20-9800), *Curvularia lunata* (SL, 20-100), *C. pallescens* (SL, 20-980) and *Drechslera tetramera* (SL, 20-280) and recorded in 35, 76, 12, 22, 16, 37, 13, 44 and 24 samples respectively. Other important fungi encountered, in a few samples only, included *A. radicina*, *Drechslera longirostrata*, *D. neergaardii*, *D. rostrata*, *Fusarium avenaceum* and *Trichothecium roseum*. *Albugo candida*, an important pathogen was detected in seed washing test only. The test should be included in routine seed health testing (Sharma *et al.*, 1990).

In incubation tests, 69 fungi of 23 genera saprophytic as well as pathogenic were recorded of which 46 (Table-1) were newly reported from India. Among the saprophytic fungi, *Aspergillus* spp. (0.5-53%), *Chaetomium* spp. (0.5-43%), *Memnoniella echinata* (1-30%), *Penicillium* spp. (0.5-41%), *Rhizopus nigricans* (0.5-46%) and *Stachybotrys atra* (0.5-12%) were dominant (Table-1). The pathogenic fungi with high incidence were *Alternaria brassicicola* (0.5-86%), *A. tenuis* (1-83%), *Cladosporium oxysporum* (0.5-43%), *Curvularia lunata* (0.5-11%), *C. pallescens* (0.5-10%), *Drechslera tetramera* (0.5-8%), *Fusarium moniliforme* (0.5-22%), *F. oxysporum* (0.5-78%),

Table 1: Number of seed samples of rapeseed infected (SSI) with fungi and their percentage range of incidence (PRI) in incubation tests.

Fungi	Standard Blotter Test				PDA Test	
	SSI ¹	PRI ¹	SSI ²	PRI ²	SSI	PRI
Seed Germination	164	3-100	170	1-100	63	1-52
* <i>Actinomucor repens</i>	2	2.5	-	-	10	1-3
<i>Alternaria brassicae</i>	6	0.5-2	2	1	-	-
<i>A. brassicicola</i>	91	0.5-86	70	0.5-74	45	1-61
* <i>A. dianthi</i>	7	1-20	-	1-30	9	1-12
* <i>A. dianthicola</i>	7	1-5	3	0.5-2	4	1-4
* <i>A. raphani</i>	8	1-4	4	1-5	5	1-3
* <i>A. sonchi</i>	6	0.5-3.5	-	-	-	-
<i>A. tenuis</i>	37	1-83	22	1-68	19	1-60
* <i>Aspergillus candidus</i>	44	0.5-6	18	1-10	39	1-10
<i>A. flavus</i>	107	0.5-39	61	1-26	74	1-33
<i>A. fumigatus</i>	104	0.5-19	57	0.5-6	67	1-1
<i>A. funiculosus</i>	31	1-20.5	14	0.5-6	36	1-21
* <i>A. humicola</i>	10	1-4	-	-	16	2-21
* <i>A. janus</i>	13	1-8	3	1-4	24	1-5
* <i>A. nidulans</i>	42	0.5-7	15	0.5-6	44	1-19
<i>A. niger</i>	120	0.5-53	76	0.5-14	83	2-62
* <i>A. ochraceous</i>	11	1-5	6	1-4	16	1-16
* <i>A. okazakii</i>	3	1-2	1	2	12	1-5
* <i>A. sulphureus</i>	22	0.5-8	16	0.5-8	28	1-8
* <i>A. sydowi</i>	37	0.5-14	21	1-24	28	1-17
* <i>A. terreus</i>	8	0.5-4	3	0.5-5.5	3	1-3
* <i>A. varicolor</i>	49	0.5-24	26	1-5	54	1-13
<i>A. versicolor</i>	15	1-8	12	1-2	21	1-11
* <i>A. violaceo-fuscus</i>	8	1-24	2	1.6	8	1-9
* <i>Chaetomium funicola</i>	1	3	2	1.2	9	1-11
<i>C. globosum</i>	39	0.5-43	29	0.5-14	26	1-11
* <i>C. indicum</i>	2	0.5,1	4	1-3	8	1-3
* <i>C. spinosum</i>	8	1-6	4	1-15	9	1-3
* <i>Circinella simplex</i>	11	0.5-4.5	2	1.2	22	1-16
* <i>Cladosporium cladosporioides</i>	12	1-8	11	1-4	12	1-5
* <i>C. herbarum</i>	21	0.5-3	6	1-2	12	1-4
* <i>C. oxysporum</i>	44	0.5-43	23	1-6	27	1-21
* <i>Colletotrichum dematium</i>	1	0.5	2	1	6	1-2
<i>Curvularia lunata</i>	31	0.5-11	16	0.5-26	27	1-11
* <i>C. pallescens</i>	73	0.5-10	45	0.5-6	44	1-8
<i>Drechslera australiensis</i>	9	1-2	9	1-4	6	1-2
* <i>D. hawaiiensis</i>	7	0.5-1.5	3	1	5	1-2
* <i>D. longirostrata</i>	8	0.5-3	3	0.5-1	5	1-2
* <i>D. rostrata</i>	6	0.5-2	3	0.5-1	2	1
* <i>D. tetramera</i>	48	0.5-8	25	0.5-5	23	1-4
* <i>Fusarium moniliforme</i>	72	0.5-22	20	1-30	51	1-25
<i>F. oxysporum</i>	30	0.5-78	5	1-4	32	1-71
<i>Memnoniella echinata</i>	57	1-20	15	1-30	11	1-4
<i>Mucor hiemalis</i>	11	0.5-6	3	1-3	16	1-7
<i>Myrothecium roridum</i>	20	1-8	6	1-2	-	-
<i>Penicillium</i> spp.	99	0.5-39	65	1-21	82	1-41
<i>Phoma</i> sp.	17	0.5-6	13	1-2	8	1-2
<i>Rhizopus nigricans</i>	90	0.5-46	37	1-11	43	1-28
* <i>Stachybotrys atra</i>	49	0.5-12	22	1-10.5	-	-
<i>Trichothecium roseum</i>	28	0.5-38	15	1-12	31	1-17

* *Alternaria chrysanthemii*, * *A. radicina*, * *A. tenuissima*, * *Aspergillus luchuensis*, *A. repens*, *A. tamarisii*, * *Chaetomella atra*, * *Chaetomium murorum*, * *Curvularia penniseti*, & *C. trifolii*, * *Drechslera neergaardii*, * *D. papendorfii*, * *D. sorokiniana*, * *Epicoccum purpurascens*, * *Fusarium avenaceum*, *F. equiseti*, *Nigrospora sphaerica*, * *Rhizoctonia solani*, * *Spicaria silvatica* and *Stemphylium botryosum* (* = New records from India, 1 = Untreated seeds, 2 = Pretreated seeds).

Myrothecium roridum (1-8%) and *Trichothecium roseum* (0.5-38%).

Interestingly, some fungi known to be serious pathogens of other crops namely *Alternaria chrysanthami*, *Colletotrichum dematium*, *Curvularia trifolii* and *Drechslera sorokiniana* were also recorded. Their occurrence on rapeseed may result in their horizontal spread to new areas.

Phytopathological effects : The various fungi associated with seeds affected seed germination adversely. It ranged from 3-100% and 1-100% in 164 and 170 seed samples in untreated and pretreated seeds in blotter test respectively. The major fungi causing losses during seed germination were *A. brassicicola*, *A. tenuis*, *Aspergillus* spp., *Chaetomium* spp., *Cladosporium* spp., *C. lunata*, *C. pallescens*, *D. tetramera*, *F. moniliforme*, *F. oxysporum*, *M. rodium*, *Penicillium* spp. and *T. roseum*. Seedling mortality was also caused by the mycelium and heavy sporulation of *A. brassicae*, *A. raphani*, *D. longirostrata*, *D. papendorfii*, *D. sorokiniana*, *F. avenaceum*, *F. equiseti* and *Macrophomina phaseolina*. *A. brassicicola*, *A. tenuis*, *C. lunata*, *C. pallescens* and *D. tetramera* caused brown spots on the cotyledons and streaks on the hypocotyl and their heavy infection resulted in seedling mortality. *F. moniliforme* and *F. oxysporum* caused rotting and damping off. Kanwar & Khanna (1979), Jain *et al.* (1982) and Tewari & Skoropad (1982) have reported inhibition of seed germination due to *A. brassicae*, *Aspergillus flavus*, *M. roridum*, *Penicillium* spp. and *Phoma* sp. Chirco & Harman (1979) also reported damping off due to *A. brassicicola*. *A. tenuis* was found pathogenic on rape and mustard in Alberta (Vaartnou & Tewari, 1972). *F. oxysporum* caused wilting in *Brassica nigra* (Rai & Singh, 1973; Kanaujia & Kishore, 1981).

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