Vol. XIX (1-2) 1982

FUNGI OCCURRING ON CASTORBEAN AND THEIR CONTROL

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Out of the twenty three seed samples comprising of 2,300 number of seed 1,623 seeds were found infested with fungi. Of the infested 61 to 90 per cent were infested externally and 30 to 65 per cent were infested internally. Twelve species of fungi comprising of *Curvularia, Helminthosporium, Fusarium, Botryodiplodia, Nigrospora, Alternaria, Aspergillus, Rhizopus, Mucor, Thielavia, Sclerotia* and *Penicillium* were isolated. The fungi upon artificial inoculation reduced the germination of seed by 12.50 to 21.25 per cent, whereas treatment of the infested seed with fungicides resulted in enhanced germination.

INTRODUCTION

Castorbean (*Ricinus communis* Linn.) is an important oil seed which contains about 50 per cent oil by weight. Its oil is of immense value in a variety of ways and its cake is a rich nitrogenous fertilizer. The area under castorbean is increasing day by day in Pakistan (Annonymous, 1976) but its yields are low. One of the causes of this low yield in Pakistan, is probably, the attack by fungi on the germinating seeds. McClellar (1944) and Stevenson (1945) found that *Alternaria* sp. caused damping off and seedling blight of castorbean. Pietkiewicz (1958) isolated the fungal species of *Fusarium, Alternaria, Rhizopus, Penicillium* and *Mucor* from castorbean seed. According to Stevenson (1946), these fungi reduced the germination and lowered the yield in affected plants. He (1945) had a good control of these fungi by the application of seed dressing fungicides viz., Semesan and Spergon. It was deemed necessary to isolate and identify the fungi occurring on castrobean seed and observe the germination effect of various seed-dressing fungicides.

MATERIALS AND METHODS

Seed samples were procured from grain markets and stores of Rawalpindi, Jehlum, Faisalabad and Sahiwal. One hundred seeds taken at random from each sample were placed as such on potato dextrose agar (PDA) to obtain all the fungi born on the seed. Another lot of one hundred seeds from each sample

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was surface-sterilized with 0.1 per cent mercuric chloride solution for 2 minutes, and placed on PDA in petri dishes. Five seeds were placed in a pair of petri dishes and kept at room temperature. Fungi coming out were transferred on fresh slants for further studies. The fungi were grown on sterilized paddy in culture flasks incubated at 30 C, and tested for their pathogenicity on castorbean sown in pots. The pots and soil were sterilized with alcohol and formalin respectively. Twenty seeds infested with each fungus were sown in each pot and check pots were sown as such. Each replication had 10 pots and three replications in all. For the experiment on the control of fungi, a total of 160 pots were sown with seeds infested with fungi and treated with Brassicol, Vitavax, Topsin M and Quinolate at the recommended rates of application. Infested seed treated with fungicides and seed uninfested treated with fungicides formed two checks. Twenty seeds were sown in each pot and the experiment was conducted in quardruplicates. Observations on the germination were recorded after 21 days and data were analysed statistically.

The effect of different fungicides on the growth of fungi was studied on PDA. Fungicides were used at half of the recommended rate, the recommended rate and two times the recommended rate. One hundred ml of agar taken in 250 ml flask was sterilized and weighed quantity of the fungicides was put in each flask and stirred well. This medium was poured equally in three petri plates for inoculation with uniform discs of mycelium. Medium without fungicides served as check. The tests were made at 30 C and observations recorded after 7 days.

RESULTS AND DISCUSSION

Twenty three samples of castorbean seed were analysed for the presence of fungi. The external infestation varied from 61 to 90 per cent whereas internal infestation from 30 to 65 per cent. Out of 2300 seeds, 1623 were externally infested (70.56%) and 1143 were internally infested (49.69%). Seed samples collected from different places gave almost the same fungi. Samples comprising of PART-I, PART-II, Faisalabad I, and Vehari-I, carried external infestation from 80-89 per cent. Samples comprising of Burewala-I, PART-IV, Gujranwala-I, and Sahiwal II, carried external infestation from 70-79 per cent while all other samples from Burewala, Chichawatni, Jhelum, Multan, Rawalpindi, Sahiwal and Faisalabad carried infestation from 60-69 per cent.

TABLE 1. *Per cent (averages) of infestation of castorbean with fungi*

S. No.	Fungus	Infestation	
		External	Internal
1	*Aspergillus*	7.33	5.51
2	*Helminthosporium*	10.33	11.52
3	*Fusarium*	8.68	10.60
4	*Curvularia*	10.40	10.61
5	*Alternaria*	8.23	9.14
6	*Rhizopus*	2.89	1.60
7	*Mucor*	2.75	1.20
8	*Nigrospora*	3.53	2.76
9	*Botryodiplodia*	4.81	4.03
10	*Sclerotium*	2.50	2.41
11	*Thielavia*	3.19	2.49
12	*Penicillium*	1.70	1.37

Fungi infesting castorbean seed

External infestation, in order of abundance, comprised of spp. of *Curvularia*, *Helminthosporium*, *Alternaria*, *Aspergillus*, *Fusarium*, *Botryodiplodia*, *Nigrospora*, *Rhizopus*, *Mucor*, *Thielavia*, *Sclerotium* and *Penicillium* (Table 1).

The same fungi were noted from surface sterilized seeds but with minor difference in frequency of occurrence. *Curvularia* spp. were isolated from most of the samples whereas *Helminthosporium* sp. was recorded from 19 samples. Other fungi comprised of the species of *Alternaria*, *Fusarium* and *Aspergillus* and were isolated from 19, 18 and 18 samples respectively. The species of *Botryodiplodia*, *Thielavia*, *Rhizopus*, *Mucor*, *Nigrospora*, *Penicillium*, and *Sclerotium*, occurred in 12, 11, 11, 11, 8, 6 samples respectively.

Pathogenicity of fungi occurring on castorbean seeds

The germination of seed infested with isolates of *Helminthosporium*, *Fusarium*, *Curvularia*, *Alternaria*, *Botryodiplodia*, *Aspergillus* and *Thielavia* sown in infested soil was 61.25, 63.75, 65.0, 66.25, 67.50, 68.25, and 72.50 per cent respectively as compared to 81.25 per cent of the check. Likewise, the germination

of seed infested with *Helminthosporium*, *Fusarium*, *Alternaria*, *Curvularia*, *Botryodiplodia*, *Aspergillus* and *Thielavia* sown in uninfested soil was 63.75, 64.00, 65.00, 67.50, 70.00, 72.50, and 72.50 per cent respectively as against 85.00 per cent of the check. Germination of infested seed sown in uninfested and infested soil was reduced by 13-18 per cent and 9-20 per cent respectively as compared with the check plots. This indicates that the infestation carried by the seed is of major significance in lowering the germination. Species of *Helminthosporium* were the most harmful. The species of *Fusarium*, *Curvularia*, and *Alternaria* were comparatively more pathogenic than *Aspergillus*, *Botryodiplodia* and *Thielavia*.

Effect of seed dressing fungicides

Brassicol proved to be the best and gave highest germination (Table 2). The other fungicides in descending order were Vitavax, Quinolate and Topsin M. *Helminthosporium* was more harmful, whereas species of *Fusarium*, *Curvularia* and *Alternaria* were comparatively more pathogenicy than the others.

TABLE 2. *F values for germination of castorbean infested with fungi and treated with fungicides*

S. O. V.	ANOVA	
	D.F.	F. Ratio
Replications	3	–
Fungi (F)	4	27.57**
Error-I	12	–
Treatments (T)	7	27.18**
F × T	28	1.39 N.S.
Error-II	105	–

**Significant at 1% probability level.

N.S. Non-significant.

S.E. for fungicides	= 0.71	S.E. for fungi	= 0.55		
Brassicol	= 63.13	Check	= 68.67	*Alternaria*	= 60.10
Vitavax	= 63.05	*Thielavia*	= 61.00	*Curvularia*	= 59.82
Quinolate	= 62.96	*Botryodiplo-*		*Fusarium*	= 52.62
Topsin M	= 61.86	*dia*,	= 60.71	*Helminthos*	
		Aspergillus	= 60.37	*porium*	= 59.09

Effect of fungicides on the growth of fungi in the laboratory

The growth of all the fungi was significantly reduced by all the four fungicides as compared to check even when the fungicides were used at half of the recommended dose. The fungi did not grow when the dose of the fungicides was doubled than the recommended except *Helminthosporium* and *Curvularia* which showed poor growth. Brassicol proved to be the best fungicide in checking the growth, followed by Vitavax, Quinolate and Topsin M. *Helminthosporium* attained maximum colony diameter on an average basis followed by *Curvularia*, *Fusarium*, *Aspergillus* and *Alternaria*.

Species of *Alternaria*, *Fusarium*, *Rhizopus*, *Mucor* and *Penicillium* have already been reported on castorbean seed by McClellan (1944), Pietkiewicz (1958), Stevenson (1946) and Kumari *et al.* (1973) which confirm our results. However, sp. of *Curvularia*, *Aspergillus*, *Nigrospora*, *Botryodiplodia*, *Thielavia* and *Sclerotium* were not reported by the previous workers.

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