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Seed Mycoflora of Brinjal (*Solanum melongena* L.)

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Seeds of 15 samples of Brinjal (*Solanum melongena* L.) collected from different parts of Karnataka were tested by standard blotter and agar plating tests to detect the seed mycoflora. In the blotter test, 32 spp of fungi were identified, of which spp of *Alternaria*, *Aspergillus*, *Cladosporium*, *Curvularia*, *Fusarium*, *Rhizopus*, *Stachybotrys*, *Penicillium* and *Phoma* were predominant. Only 20 spp of fungi were noticed in agar plating test, of which *Pestalotia* sps, *Trichoderma lignorum*, *Trichothecium roseum* and *Phoma sorghina* were not observed in blotter test. Blotter test was found to be superior to agar plating test.

Key Words: *Solanum melongena*, **Seed mycoflora, Blotter test, Agar Plating test**

Introduction

Brinjal (*Solanum melongena* L.) an important vegetable crop of India is plagued by many seed-borne diseases (Rout & Rath 1974). Although seed mycoflora of brinjal has been reported earlier (Gangopadhyay & Kapoor 1975, Manoharachary et al., 1975 Puttoo & Sohi 1976), a comprehensive account on mycoflora of the seed samples collected from different parts of Karnataka is lacking.

The paper deals with the mycoflora identified and their per cent incidence.

Materials and Methods

Fifteen seed samples collected from different parts of Karnataka (table 1) were tested by employing the standard blotter and agar plating methods (ISTA, 1966a). The plates were incubated at 20±2°C for a week with alternate light and darkness cycle of 12/12 hours using Philips Near Ultra Violet tubes hung 40 cm above the plates placed 20 cm apart. Observations were recorded using stereo binocular and compound microscopes. Germination of the seed samples were tested employing the rolling paper towel method (ISTA, 1966a).

Results and Discussion

Twenty-two genera of fungi were observed. The per cent and the average per cent incidence of the fungi are represented in table 2.

Table 1 *List of seed samples screened for the mycoflora*

Sample No.	Source	Germination % before storage	Duration of storage at the lab	Germination % after storage
1	Farmer's field, Halekal, Chitradurga	11.0	3 months	7.5
2	Farmer's field, Chitradurga	13.0	4 months	9.0
3	Horticulture Dept., Curzon Park, Mysore	17.5	2 months	16.0
4	Farmer's field, Kollegal	25.0	1 month	24.5
5	Farmer's field, Kollegal	12.0	6 months	4.0
6	Farmer's field, Tumkur	19.0	1 month	18.25
7	Farmer's field, Bhogadhi	16.0	5 months	12.50
8	Farmer's field, Nadehalli, Soraba	3.0	2 months	0.0
9	Farmer's field, Nanjangud	35.0	2 months	33.75
10	Farmer's field, Shimoga	1.5	1 month	0.0
11	Farmer's field, Bangarapet	57.0	6 months	24.75
12	Farmer's field, Kudligi, Bellary	19.0	3 months	11.75
13	Farmer's field, Bidar	86.0	4 months	80.0
14	Private farm, Shikaripura	2.0	1 month	0 0
15	National Seeds Corporation, Bangalore	71.0	5 months	68.25

Incidence of fungi in blotter test

Fungi like *Aspergillus funiculosus*, *Chaetomium* sps, *Choanephora* sps, *Cladosporium herbarum*, *Curvularia intermedia*, *C. lunata*, *C. robusta*, *Colletotrichum dematium*, *Drechslera cynodontis*, *D. rostrata*, *D. tetramera*, *Epicoccum* sps, *Fusariella* sps, *Graphium* sps, *Macrophomina phaseoli*, *Periconia* sps and *Stachybotrys* sps were noticed only on blotters. Fungi like *Fusarium solani*, *Aspergillus flavus*, *Alternaria tenuis*, *Curvularia robusta*, *Cladosporium herbarum* had high incidence. Certain fungi like *Aspergillus ochraceous*, *A. sydowi*, *A. terreus*, *Cephalosporium* sps, *Ceratostomella* sps, *Curvularia brachyspora*, *Fusariella* sps, *Graphium* sps, *Myrothecium rorideum*, *Nigrospora* sps, *Stemphylium* sps and *Trichothecium roseum* had very low incidence (0.25%) and are hence not recorded in table 2. *Choanephora* sps though noticed in one seed sample, had a high per cent incidence.

A perfect stage of an asoomycetous fungus—*Neonectria* sps was noticed in one of the seed samples, whose per cent incidence was low (0.25%) and hence not recorded in table 2.

Incidence of fungi in agar plating test

Fungi like *Fusarium moniliforme*, *F. oxysporum*, *F. solani*, *Aspergillus flavus* and *Trichoderma lignorum* had high per cent

Table 2 *Seed mycoflora of Solanum melongena in blotter and agar tests*

Sl. No.	Fungi identified		Sample number/% incidence														Average % incidence
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1.	*Alternaria kenuis* Auct.	B	3.00	4.50	2.00	1.00	2.50	4.50	6.25	0.50	5.75	2.00	—	2.00	—	1.00	0.50	2.730
		A	3.50	3.00	0.50	1.00	1.00	3.00	3.75	0.25	3.75	1.75	—	0.50	—	0.25	—	1.854
2.	*A. solani* (Ellis & Mart.) Sorauer	B	0.50	—	—	—	—	—	—	—	—	—	—	—	1.00	0.25	0.25	0.500
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.	*Aspergillus candidus* Link ex Fries	B	0.50	1.25	—	—	—	—	—	—	—	—	—	—	—	—	—	0.875
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4.	*A. flavus* Link	B	1.00	15.00	—	—	2.00	10.25	11.25	9.75	11.25	—	0.25	—	11.25	—	17.75	8.975
		A	2.50	8.50	—	—	0.50	6.00	6.50	5.00	3.75	—	—	5.75	—	—	—	4.813
5.	*A. fumigatus* Fres.	B	7.00	6.75	—	—	2.50	7.25	—	0.50	4.50	—	1.25	1.00	—	—	1.25	3.556
		A	5.00	5.00	0.50	—	0.50	4.50	—	1.00	3.25	—	—	1.00	—	—	—	2.594
6.	*A. funiculosus* G. Smith	B	5.00	—	—	0.50	1.50	—	—	—	—	—	—	—	—	—	0.25	1.813
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7.	*A. niger* V. Tiegham	B	12.50	16.25	—	—	—	—	3.50	0.75	4.00	—	1.00	1.00	1.25	0.25	2.75	4.325
		A	8.00	12.00	—	—	—	—	1.00	0.25	1.25	—	—	0.25	0.25	0.75	0.50	2.583
8.	*Chaetomium* sps.	B	1.50	2.00	—	—	0.50	—	7.75	1.25	—	5.25	—	—	—	5.75	—	3.429
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9.	*Choanephora* sps.	B	—	—	—	—	—	—	—	—	—	16.50	—	—	—	—	—	—
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10.	*Cladosporium cladosporoides* (Fres.) de vries	B	—	1.75	—	—	11.00	4.50	—	—	—	—	3.75	6.00	1.75	0.25	—	4.143
		A	—	2.75	—	—	—	3.50	—	1.50	—	—	2.00	0.75	0.25	—	—	1.791
11.	*C. herbarum* Link ex Fries	B	—	—	—	12.50	9.00	—	—	—	—	—	—	—	—	0.25	—	7.250
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12.	*Colletotrichum dematium* (Pers. ex Fries) Grove	B	—	—	—	—	—	—	—	—	—	0.25	0.25	1.00	—	—	—	0.500
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

(Table 2 Contd.)

Table 2 (*Contd.*)

Sl. No.	Fungi identified		Sample number/% incidence															Average % incidence
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
13.	*Curvularia intermedia* Boedijn	B	—	—	0.50	3.50	0.50	—	—	—	—	6.75	1.00	8.00	3.25	0.25	0.75	2.723
		A	—	—	2.00	0.50	—	—	—	—	—	—	—	1.25	0.25	—	0.25	0.850
14.	*C. lunata* (Wakker) Boedijn	B	6.00	—	—	—	—	—	—	—	—	—	4.00	9.00	6.00	—	—	6.250
		A	4.50	—	—	—	—	0.30	—	—	—	0.75	—	2.00	1.50	—	—	1.810
15.	*C. robusta* Kilpatrick and Luttrell	B	3.00	8.50	—	2.50	10.50	—	—	1.00	12.50	—	2.50	—	—	—	—	5.708
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
16.	*Drechslera cynodontis* (Marig.) Subram. and Jain	B	—	—	—	—	—	—	—	—	—	—	0.25	4.00	—	—	—	2.125
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17.	*Drechslera rostrata* (Drechs.) Richardson and Fraser	B	0.50	—	—	—	0.50	—	—	—	—	—	0.75	—	0.25	—	—	0.500
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18.	*D. tetramera* (Mc Kinney) Subram. and Jain	B	—	1.50	0.50	—	—	—	—	—	—	—	0.25	—	1.00	—	—	0.813
		A	—	2.00	0.50	—	—	—	—	—	—	0.50	—	0.75	0.50	—	—	0.650
19.	*Epicoccum* sps.	B	—	—	—	—	1.50	2.75	—	—	—	0.25	—	2.00	0.50	—	—	1.400
		A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20.	*Fusarium equiseti* (Corda) Sacc.	B	0.50	1.25	—	—	2.00	2.50	3.50	—	—	1.00	0.75	—	—	—	—	1.643
		A	1.00	2.00	0.50	—	—	—	2.00	—	1.50	0.25	—	—	—	—	—	1.208
21.	*F. moniliforme* Sheldon	B	18.50	22.00	—	—	—	—	—	1.00	—	—	—	—	—	0.50	—	10.500
		A	6.50	17.50	0.50	—	1.50	—	—	0.25	—	—	—	—	—	—	—	5.250
22.	*F. oxysporum* Schlecht	B	—	2.00	14.50	14.50	3.00	—	4.75	0.75	4.00	—	—	—	—	1.00	1.75	5.138
		A	—	1.50	8.00	—	—	—	2.50	0.25	1.00	—	—	—	—	—	0.25	2.230
23.	*F. semitectum* Berk. and Rav.	B	1.50	—	—	5.50	3.50	3.00	3.75	—	3.75	1.00	0.25	—	—	0.25	—	2.500
		A	—	—	—	3.50	—	1.50	—	—	0.25	0.50	—	—	0.50	—	—	1.450
24.	*F. solani* (Mart.) Sacci.	B	—	—	2.00	—	14.00	—	—	—	—	—	—	22.00	—	—	—	12.670
		A	—	—	2.00	—	—	—	—	—	—	—	—	3.50	—	—	—	2.750

25. *Macrophomina phaseoli* (Maubl.) Ashby	B	0.50	1.25	—	0.50	—	—	—	—	—	—	—	—	—	—	—	0.750
	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
26. *Penicillium* sps.	B	—	1.25	1.50	—	3.00	2.00	1.00	8.00	4.75	—	0.50	—	0.75	0.25	6.25	2.660
	A	—	0.25	—	—	—	—	0.50	2.25	0.50	—	3.75	—	0.25	0.25	0.75	1.062
27. *Periconia* sps.	B	2.00	2.25	—	1.00	1.50	—	—	0.75	—	0.25	—	—	2.50	0.25	—	1.312
	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
28. *Pestalotia* sps.	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	A	—	—	13.75	—	—	0.75	—	—	—	—	—	—	—	—	—	7.250
29. *Phoma glomerata* (Corda) Wollenweber and Hochapfel	B	8.00	16.75	—	—	3.50	—	8.00	0.50	4.75	1.00	0.50	6.00	2.25	—	—	5.125
	A	—	6.25	—	0.25	—	—	4.50	0.25	1.25	0.75	—	0.75	0.75	—	—	1.843
30. *P. sorghina* (Sacc.) Boerema, Dorenbosch and Van Kest	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	A	1.00	—	—	—	—	—	3.50	—	—	3.00	—	—	0.25	—	—	1.107
31. *Plenodomus* sps.	B	—	1.25	1.00	—	—	—	6.50	—	—	0.75	—	—	0.25	—	—	1.950
	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32. *Rhizopus nigricans* Ehrenb.	B	1.50	—	—	—	—	—	—	10.50	—	1.25	—	—	2.50	0.50	0.75	2.834
	A	0.50	1.50	—	—	—	—	1.00	3.50	—	0.50	—	—	0.25	0.50	—	1.107
33. *Stachybotrys* sps.	B	—	—	—	—	—	7.75	—	10.25	—	—	—	—	0 25	0.25	—	4.625
	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
34. *Trichoderma lignorum* (Tode) Harz.	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	A	—	—	26.50	—	—	—	0.50	—	—	—	—	—	—	0.50	—	9.167
35. *Trichothecium roseum* Link	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	A	—	—	—	—	3.00	2.00	—	1.50	—	—	—	—	—	0.75	—	1.813

B=Blotter test; A=Agar plating test

incidence. *Phoma sorghina* and *Pestalotia* sps were noticed only in agar plating test.

Germination percentage of the seed samples

In most of the seed samples, poor germination was noticed even before storage and in a few cases, the germination percentage decreased with the increase in storage period (table 1). Most of the seeds infected by *Fusarium moniliforme*, *F. oxysporum*, *F. solani*, *Macrophomina phaseoli* and *Plenodomus* sps failed to germinate. In some cases, the germinated seedlings were stunted and died prematurely as evident in the case of *F. moniliforme* and *F. solani* infected seeds. The reduction in germination was to the tune of 80–100%. Seeds infected by *Aspergillus flavus*, *A. fumigatus* and *A. niger* showed a decline in germination to an extent of 75%. Whereas those infected by *Alternaria tenuis*, *Curvularia* sps and *Drechslera* sps had reduction in germination up to 40%.

Discussion

From the results it is evident that the samples collected from different parts of Karnataka had considerable mycoflora. The per cent incidence of the fungi was higher in the blotter test than in the agar plating test.

Most of the seed samples had poor germination prior to storage in the lab. Because many of these seed samples were collected directly from farmers' fields, where the seeds were not given any seed treatment. Conventional ash coating of the seed samples was practised by a few farmers. This method was found to be a novel practice and could preserve the germinability of the seeds and also avoid contamination of the seeds. Ripe fruits were found to be sun dried on the soil, before collecting the seeds. This practice can lead to contamination of the seeds by soil fungi.

Poor germination of the seeds may be due to lack of seed treatment or selection of immature seeds or by infection. Species of fungi like *Fusarium semitectum* are known to produce toxins which can reduce seed germination (Khar'kova et al. 1974). Species of *Aspergillus* are also known to produce toxins which may hasten the reduction in germination. The same authors have noticed considerable decline in germination. Percentage of brinjal seeds, soaked in the culture filtrate of *Fusarium solani*. Production of unhealthy, stunted seedlings by infected seeds may be due to such toxins.

Wrong seed extraction process that is in practice may be in part responsible for heavy contamination of the seeds. Soaking of ripe, dried fruits in water to extract seeds (Agrawal 1980), provides a congenial atmosphere to many fungi to attack the seeds. Seeds contaminated with debris, promote the growth of fruit rot pathogens. Hence proper seed cleaning and seed dressing are essential to avoid storage losses and for the control of seed-borne fungi.

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