

Original Research Article

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Seed Mycoflora of Chilli Fruit Rot Infected Fruits Collected from Major Chilli Growing Areas of Telangana, India

K. Venkata Ramesh^{1*}, R. Sarada Jayalakshmi Devi², K. Gopal³, B. K. M. Lakshmi⁴,
T. Murali Krishna⁵ and B. Ravindra Reddy⁶

¹Department of Plant Pathology, (SKLTSHU), Rajendranagar, Hyderabad – 500030, India

²Department of Plant Pathology, S.V. Agricultural College, Tirupati - 517 502, India

³Controller of Examinations, Administrative Office, Dr.YSR Horticultural University,
Venkataramannagdem - 534 101, India

⁴Department of Plant Pathology, Vegetable Research Station (SKLTSHU), Hyderabad – 500030,
India

⁵Department of Entomology, Institute of Frontier Technology, RARS, Tirupati – 517502, India

⁶Department of Statistics and Computer Applications, S.V. Agricultural College,
Tirupati - 517 502, India

*Corresponding author

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ABSTRACT

Chilli fruit rot disease samples were collected from Warangal, Karimnagar, Khammam and Ranga Reddy districts of Telangana. Standard blotter method was used to know the per cent infection of mycoflora associated with chilli seed. Highest (59.60%) mean per cent infection of mycoflora was observed in Warangal district while the lowest (46.10%) mean per cent incidence was observed in Karimnagar district. The most commonly found mycoflora were *Colletotrichum capsici*, *C. gloeosporioides*, *Cercospora* spp., *Fusarium* spp., *Alternaria* spp., *Penicillium* spp. and *Aspergillus* spp. Among the different fungi associated with chilli fruit rot, *C. capsici* found with highest per cent infection (58.83%) whereas, *Cercospora* spp. found with least per cent infection (2.62%).

Introduction

Chilli (*Capsium annuum* L.) is the most important spice crop in the world. Indian chilli is considered to be world famous for two important commercial qualities such as colour (due to pigment Capsanthin) and pungency levels (due to Capsaicin).

In India, yield is very low as compared to other developed countries of the world and

this low production is attributed to several biotic and abiotic factors.

Among the biotic factors, fruit rot disease is the most important factor which results in crop losses 10 % to 80 % in different parts of (Poonpolgul and Kumphai, 2007). Different species of *Colletotrichum*, namely *C. capsici*, *C. gloeosporioides* and *C. acutatum*, *Alternaria alternata* and *Fusarium oxysporum* are known to cause fruit rot in chilli. All these

pathogens are seed borne in nature either internally or externally and play a significant role by reducing seed germination and seedling vigour resulted in poor yield (Basak, 1994).

Keeping in view, the present investigations was made out to study chilli seed mycoflora associated with chilli seeds from infected fruits collected from different areas of Telangana.

Materials and Methods

Chilli fruit rot samples were collected from different fields in various mandals of Andhra Pradesh. All the fruit rot samples obtained from a mandal were mixed and a representative sample for each mandal was used for studying the mycoflora associated with the seeds of fruit rot infected fruits. A total of 200 seeds from each mandal were observed. Standard blotter method was followed.

Three pieces of blotting paper of 90 mm were moistened with distilled water and placed in 90 mm sterilized petri plates after draining excess water seeds were placed at equal distance in petriplates. The plates were incubated at $25 \pm 2^\circ\text{C}$ under alternate cycles of light and darkness. After 8 days of incubation, the seeds were examined under stereo binocular microscope and temporary mounts under compound microscope for the associated fungi (Khare, 1996).

Results and Discussion

Studies on the seed mycoflora associated with seeds of fruit rot infected fruits from different mandals of Telangana (Table 1 and 2) revealed that, the overall percentage of seed infection is 49.68 %. Among the four districts, highest seed infection was observed in Warangal district (59.60 %), followed by

Khammam (50.10 %), Karimnagar (46.10 %), while the lowest (42.90 %) seed infection was observed in Ranga Reddy district. Among the mycoflora observed, *C. capsici* was the most predominant fungus which occurred as solitary fungus in 42.93 per cent of total infected seeds. *C. capsici* was also observed as mixed infection with other pathogens like *Fusarium* spp. (1.71 %), *Alternaria* spp. (5.79 %), *Penicillium* spp. (2.92 %) and *Aspergillus* spp. (5.92 %). Both solitary and mixed infections put together *C. capsici* was observed in 58.83 % of the total infected seeds. Overall infection of *C. gloeosporioides* was observed only in 2.72 % of infected seeds while *Cercospora* spp. was observed in 2.62 % of infected seeds. Other mycoflora associated with infected seeds either alone or as mixed infection with other fungi were *Alternaria* spp. (22.65 %), *Aspergillus* spp. (21.59 %), *Penicillium* spp. (11.02 %), *Fusarium* spp. (8.86 %).

Seed mycoflora studies of samples obtained from different mandals of Warangal district revealed that, among the various fungi, *C. capsici* was the most predominant fungus in 56.72 per cent of infected seeds which includes 42.45 % of solitary infection and mixed infection with other fungi like *Aspergillus* spp. (6.88 %), *Alternaria* spp. (4.03 %), *Fusarium* spp. (1.68 %) and *Penicillium* spp. (1.68 %). *C. gloeosporioides* was observed in 2.68 % as only solitary fungus. Solitary infection of *Cercospora* spp. was observed in 2.85 % of infected seeds.

Other mycoflora associated with infected seeds either as solitary infection or as mixed infection with other fungi were *Aspergillus* spp. (23.32 %), *Alternaria* spp. (20.13 %), *Penicillium* spp. (11.92 %) and *Fusarium* spp. (8.05 %).

In the seed samples obtained from various mandals of Karimnagar district, *C. capsici* was observed in 61.17 % of infected seeds

(both solitary and mixed infections put together).

None of the infected seeds produced *C. gloeosporioides* while *Cercospora* spp. was observed in 3.03 % of infected seeds. Other fungi observed were *Alternaria* spp. (23.86 %), *Aspergillus* spp. (21.26 %), *Penicillium* spp. (16.49 %) and *Fusarium* spp. (9.55 %).

Similar seed infection pattern was observed in Khammam district with predominant presence of *C. capsici* in 62.67 % of infected seeds followed by 22.55 % of *Alternaria* spp., 21.96 % of *Aspergillus* spp., 8.58 % of *Penicillium* spp. and 5.99 % of *Fusarium* spp. Association of *C. gloeosporioides* and *Cercospora* spp. was observed in 3.99 % and 1.60 % of infected seeds respectively.

Study of seed mycoflora of samples from Ranga Reddy district also revealed the predominant presence of *C. capsici* in 54.78 % of total infected seeds. Other predominant fungi observed were the species of *Alternaria* (24.94 %), *Aspergillus* (19.11 %), *Fusarium* (12.59 %) and *Penicillium* (6.76 %). Association of *C. gloeosporioides* and *Cercospora* spp. was observed in 4.20 % and 3.03 % of infected seeds respectively.

Seed mycoflora pattern in four districts of Telangana revealed that the association of *C. gloeosporioides* with infected seeds was reported from Warangal, Khammam and Ranga Reddy districts but not in Karimnagar district.

Mango cultivation is predominant in the districts of Warangal, Khammam and Ranga Reddy and relatively less in Karimnagar district. The occurrence of other organisms like *Aspergillus* spp., *Fusarium* spp., *Penicillium* spp., and *Alternaria* spp. may be due to their saprophytic abilities and the multitude of numbers of species associated in

each genus, as in this study identification up to species level was not done for these organisms.

Different earlier workers had also reported the different mycoflora associated with anthracnose infected chilli fruits. Sariah and Zainun (1988) also reported that *C. capsici* was the most frequently isolated fungus from chilli seeds along with other fungi like *Fusarium* spp., *Aspergillus* spp., *C. gloeosporioides*.

Similar predominance of *C. capsici* in chilli fruit rot pathogens was reported by Madhavan *et al.*, (2010) from Tamilnadu who reported that 69.00 % of isolates were *C. capsici* and 19.00 % were *C. gloeosporioides*.

Ramdiyal and Rampersad (2015) also reported that 72.00 % of all isolates were *Colletotrichum truncatum* (=Syn *C. capsici*) and 28.00 % were *C. gloeosporioides* from Trinidad.

Chigoziri and Ekfan (2013) also conducted a similar study on seed borne fungal species in Benue state of South Nigeria and reported that *C. capsici*, *A. niger* and *A. flavus* were the most frequently isolated fungi with 54.75 %, 44.00 % and 29.75 % occurrence respectively.

C. capsici and *A. niger* interaction had the highest occurrence followed by *A. flavus* and *A. niger* interaction.

In a similar way, Machenahalli (2014) also reported the *C. capsici* as most predominant fungus observed in 72.85 % of samples followed by *C. gloeosporioides* (9.26 %) and *C. acutatum* (4.76 %), *Alternaria alternata* (5.20 %) and *Fusarium sporotrichioides* (3.45 %) and *F. oxysporum* (4.30 %).

Table.1 Seed mycoflora of chilli fruit rot infected fruits collected from different mandals of Telangana

S. No	Mandal	District	Total Seeds	Infected Seeds	Different seed mycoflora observed															
					Cc	Cg	Cer.	Fus.	Alt.	Pen.	Asp.	Cc + Fus.	Cc + Alt.	Cc + Pen.	Cc + Asp.	Fus + Alt.	Alt. + Pen.	Pen. + Asp.	Fus. + Asp.	Alt. + Asp.
1	Mangapeta	Warangal	200	120	45	2	2	5	14	8	14	4	3		8	5		5		5
2	Govindraopeta	Warangal	200	115	49		3	5	8	5	9	3	9	3	8		5		3	5
3	Wardhannapeta	Warangal	200	112	53	2	5		9	6	9		6	2	7	2		5		6
4	Zaffernagar	Warangal	200	121	49	6	5	9	3	8	11	3	6		9		5		4	3
5	Eturunagaram	Warangal	200	128	57	6	2	5	11	7	11			5	9		7			8
	Total district	Warangal	1000	596	253	16	17	24	45	34	54	10	24	10	41	7	17	10	7	27
	% in seed mycoflora			59.60	42.45	2.68	2.85	4.03	7.55	5.71	9.06	1.68	4.03	1.68	6.88	1.17	2.85	1.68	1.17	4.53
6	Mutharam	Karimnagar	200	105	39		2		6	5	9	5	8	7	7	4	3	5		5
7	Mahadevpur	Karimnagar	200	80	32		2		3	5	7	2	8	5	7		3		3	3
8	Kataram	Karimnagar	200	85	39		3	3	6	4	7	3	2	5	5	1		4		3
9	Manthani	Karimnagar	200	105	44		4	5	9	6	5		7	6	5	7		4		3
10	Malhar	Karimnagar	200	86	33		3		9		8	4		9		7	5			8
	Total district	Karimnagar	1000	461	187	0	14	8	33	20	36	14	25	32	24	19	11	13	3	22
	% in seed mycoflora			46.10	40.56	0.00	3.03	1.74	7.16	4.34	7.81	3.04	5.42	6.94	5.21	4.12	2.39	2.82	0.65	4.77
11	Khammam	Khammam	200	103	55	9		2	5	6	9		4		5		3			5
12	Tallada	Khammam	200	99	38	4	1		6	7	9	2	7	7	6	2		4		6
13	Konijerla	Khammam	200	90	40	3	3		8	1	8		6		8	5		3		5
14	Thirumalayapalem	Khammam	200	103	49	3	4	3	7	3	9		6		7	5				7
15	Bhadrachalam	Khammam	200	106	55	1		4	6		6		11	3	5	7		6		2
	Total district	Khammam	1000	501	237	20	8	9	32	17	41	2	34	10	31	19	3	13	0	25
	% in seed mycoflora			50.10	47.31	3.99	1.60	1.80	6.39	3.39	8.18	0.40	6.79	2.00	6.19	3.79	0.60	2.59	0.00	4.99

16	Ibrahimpattam	Rangareddy	200	87	35	2	1	8	8	2	6	8	5			5		3		4
17	Chevella	Rangareddy	200	83	32	5	3	6	9		7		5		8	3	2		1	2
18	Shankarpally	Rangareddy	200	92	38	6	4	6	8	2	7		9			6		3		3
19	Shamshabad	Rangareddy	200	83	39		1		6	5	9		6	6		3			3	5
20	Maheswaram	Rangareddy	200	84	32	5	4	5	7	3	9		7		5			3		4
	Total district	Rangareddy	1000	429	176	18	13	25	38	12	38	8	32	6	13	17	2	9	4	18
	% in seed mycoflora			42.90	41.03	4.20	3.03	5.83	8.86	2.80	8.86	1.86	7.46	1.40	3.03	3.96	0.47	2.10	0.93	4.20
	Total in Telangana state		4000	1987	853	54	52	66	148	83	169	34	115	58	109	62	33	45	14	92
	% in seed mycoflora			49.68	42.93	2.72	2.62	3.32	7.45	4.18	8.51	1.71	5.79	2.92	5.49	3.12	1.66	2.26	0.70	4.63

Table.2 Percentage seed mycoflora (solitary + mixed infection) of chilli fruit rot infected fruits collected from different districts of Telangana

S. No	Organism	% infection
1	<i>Colletotrichum capsici</i>	42.93
	<i>C. capsici</i> + <i>Fusarium</i> spp.	1.71
	<i>C. capsici</i> + <i>Alternaria</i> spp.	5.79
	<i>C. capsici</i> + <i>Penicillium</i> spp.	2.92
	<i>C. capsici</i> + <i>Aspergillus</i> spp.	5.49
	Total <i>C. capsici</i>	58.83
2	<i>Colletotrichum gloeosporioides</i>	2.72
3	<i>Cercospora</i> spp.	2.62
4	<i>Fusarium</i> spp.	3.32
	<i>Fusarium</i> spp. + <i>C. capsici</i>	1.71
	<i>Fusarium</i> spp. + <i>Alternaria</i> spp.	3.12
	<i>Fusarium</i> spp. + <i>Aspergillus</i> spp.	0.70
	Total <i>Fusarium</i> spp.	8.86
5	<i>Alternaria</i> spp.	7.45
	<i>Alternaria</i> spp. + <i>C. capsici</i>	5.79
	<i>Alternaria</i> spp. + <i>Fusarium</i> spp. .	3.12
	<i>Alternaria</i> spp. + <i>Penicillium</i> spp.	1.66
	<i>Alternaria</i> spp. + <i>Aspergillus</i> spp.	4.63
	Total <i>Alternaria</i> spp.	22.65
6	<i>Penicillium</i> spp.	4.18
	<i>Penicillium</i> spp. + <i>C. capsici</i>	2.92
	<i>Penicillium</i> spp. + <i>Alternaria</i> spp.	1.66
	<i>Penicillium</i> spp. + <i>Aspergillus</i> spp.	2.26
	Total <i>Penicillium</i> spp.	11.02
7	<i>Aspergillus</i> spp.	8.51
	<i>Aspergillus</i> spp. + <i>C. capsici</i>	5.49
	<i>Aspergillus</i> spp. + <i>Fusarium</i> spp.	0.70
	<i>Aspergillus</i> spp. + <i>Alternaria</i> spp.	4.63
	<i>Aspergillus</i> spp. + <i>Penicillium</i> spp.	2.26
	Total <i>Aspergillus</i> spp.	21.59

Various other workers like Mesta *et al.*, (2007); Ramachandran *et al.*, (2007); Hemannavar *et al.*, (2009) had also reported that *C. capsici* was the most predominant fungi in fruit rot samples followed by other species like *C. gloeosporioides*, *A. alternata*, *F. oxysporum* and *F. sporotrichioides*, *Cercospora* spp., *Penicillium* spp., *Aspergillus* spp. etc. The present study concluded that, *Colletotrichum capsici* was the predominant fungus associated with chilli fruit rot in Telangana, India.

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