

Original Research Article

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## Seed Mycoflora of Chilli Fruit Rot Infected Fruits Collected from Major Chilli Growing Areas of Andhra Pradesh, India

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### ABSTRACT

#### Keywords

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Chilli fruit rot disease samples were collected from Guntur, Krishna, Prakasam, Kurnool and Chittoor districts of Andhra Pradesh. Standard blotter method was used to know the Per cent infection of mycoflora associated with chilli seed. Highest (54.20%) mean per cent infection of mycoflora was observed in Guntur district while the lowest (39.70%) mean per cent incidence was observed in Chittoor 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 (64.53%) on seeds.

### Introduction

Chilli (*Capsicum annum* L.) is one the most important spice crop in the world and India. It is cultivated world wide in both tropical and subtropical regions. Chillies are low in sodium, cholesterol free, rich in vitamins A and C, and are a good source of potassium, folic acid and vitamin E. Fresh green chilli contain more vitamin C than citrus fruits and fresh red chilli has more vitamin A than carrots (Than *et al.*, 2008). Pepper is also

suitable for the diets of the obese and is useful in the control of cancer of the stomach and colon (Pamplona-Roger, 2007).

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 world (Poonpolgul and Kumphai, 2007). Seeds are the passive carriers of some important seed borne diseases caused by microorganisms which usually result in considerable yield losses. Fungi, bacteria, viruses and nematodes can be carried with, on or in seeds. The use of healthy seeds is important for crop establishment, yield and productivity.

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.

### 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  $25 \pm 2$  °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) and were identified based on their morphology.

### Results and Discussion

Studies on the seed mycoflora associated with seeds of fruit rot infected fruits from different mandals of Andhra Pradesh (Table 1 & 2) revealed that, the overall percentage of infected seeds is 47.94 %. Among the five districts, the percentage of infected seeds varied from 39.70 % in Chittoor district to 54.20 % in Guntur district. Percentage of seed infection in Kurnool, Prakasam and Krishna and districts were 51.80, 48.80 and 45.20 per cent respectively. Among the mycoflora observed on seeds, *Colletotrichum capsici* was the predominant fungus which occurred as solitary fungus in 42.59 per cent of infected seeds. Mixed infection of *C. capsici* with other pathogens like *Fusarium* spp. (4.80 %), *Alternaria* spp. (7.88 %), *Penicillium* spp. (2.54 %) and *Aspergillus* spp. (6.72 %) was observed.

Both solitary and mixed infection of *C. capsici* together account for 64.53 per cent of the total infected seeds. Overall infection of *C. gloeosporioides* is only 2.42 per cent while *Cercospora* spp. was observed in only 1.09 per cent of infected seeds. Other mycoflora associated with infected seeds either alone or as mixed infection with other fungi were *Aspergillus* spp. (24.12 %), *Alternaria* spp. (23.15 %), *Fusarium* spp. (10.22 %), *Penicillium* spp. (9.55 %).

Seed mycoflora studies of samples obtained from different mandals of Guntur district revealed that, among the various fungi, *C. capsici* was the most predominant fungus observed in 71.41 % of infected seeds

including solitary infection in 35.61 % of seeds and mixed infection with other fungi like *Aspergillus* spp. (11.07 %), *Alternaria* spp. (10.89 %), *Fusarium* spp. (9.41 %), *Penicillium* spp. (4.43 %). None of the seeds were observed with *C. gloeosporioides*. Infection of seeds with *Cercospora* spp. was observed in 2.03 % of infected seeds.

Other mycoflora associated with infected seeds both either as solitary infection or as mixed infection with other fungi were *Aspergillus* spp. (25.09 %), *Alternaria* spp. (24.73 %), *Fusarium* spp. (16.05 %), *Penicillium* spp. (7.38 %).

In the samples obtained from various mandals of Krishna district, *C. capsici* was observed in 63.07 % of infected seeds (both solitary (40.27) plus mixed infections put together). *C. gloeosporioides* was observed in 4.43 % of infected seeds. Other fungi observed (both solitary and mixed infections together) *Alternaria* spp. (23.23 %), *Aspergillus* spp. (22.56 %), *Fusarium* spp. (12.83 %) and *Penicillium* spp. (7.74 %).

Similar seed infection pattern was observed in Kurnool district with predominant *C. capsici* infection in 64.47 per cent (both solitary (46.14) plus mixed infections put together).

Other fungi observed (both solitary and mixed infections together) *Aspergillus* spp. (25.29 %), *Alternaria* spp. (25.28 %), *Penicillium* spp. (12.17 %) and *Fusarium* spp. (4.44 %). Association of *C. gloeosporioides* and *Cercospora* spp. was very minor, observed in only 1.35 per cent and 0.97 per cent of the infected seeds respectively.

Study of seed mycoflora of samples from Prakasam district also revealed the predominant occurrence of *C. capsici* in 61.27 per cent of total infected seeds. Other predominant fungi observed were the species

of *Aspergillus* (24.59 %), *Alternaria* (19.04 %), *Penicillium* (12.09 %), *Fusarium* (10.45 %). Little infection of *C. gloeosporioides* (1.44 %) and *Cercospora* spp. (1.23 %) was observed. In Chittoor district also, *C. capsici* was the most predominant fungus observed in 60.95 per cent of infected seed samples. *C. gloeosporioides* was observed in 6.04 per cent while *Cercospora* spp. infection was very minimum in only 0.25 per cent of the infected seeds. Other fungi observed were the species of *Aspergillus* spp. (22.42 %), *Alternaria* spp. (23.18 %), *Penicillium* spp. (8.06 %) and *Fusarium* spp. (6.56 %).

In overall, among the different fungi observed with chilli seed, *Colletotrichum capsici* was found with highest per cent infection (64.53 %) followed *Aspergillus* spp. (24.12 %) and *Alternaria* spp. (23.15 %). The least per cent infection was observed with *Cercospora* spp. (1.09 %) followed by *C. gloeosporioides* (2.42 %), *Penicillium* spp. (9.55 %) and *Fusarium* spp. (10.22 %).

The fungi associated with chilli seed have been reported earlier by many researchers. (Rout and Rath, 1972; Dhawale and Kodmelwar, 1978; Pandey and Uma, 1976 and Asalmol *et al.*, 2001). The results of the present study are in line with the findings of Chigoziri and Ekefan (2013), who recorded *C. capsici* (54.75 %), *A. niger* (44.00 %) and *A. flavus* (29.75 %) were the most frequently isolated fungi with chilli fruit rot. In a similar way, Jogi *et al.*, (2010) and Sowly and Kodua (2012) also reported *A. niger*, *A. flavus*, *Colletotrichum* spp., *Fusarium* spp., *Alternaria* spp., and *Penicillium* spp. as the most common and predominant fungi associated with chilli seed.

In the present study, it was concluded that, *Colletotrichum capsici* was the predominant fungi associated with chilli fruit rot in Andhra Pradesh.

**Table.1** Seed mycoflora of chilli fruit rot infected fruits collected from different districts of Andhra Pradesh

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	Prathipadu	Guntur	200	105	35		1	5	3		8	12	13	5	11	4	3		2	3
2	Sattenapalli	Guntur	200	110	45		2	3	4		8	10	9	7	12	3	2	2		3
3	Bollapalli	Guntur	200	115	38		3	3	5	2	11	12	9	8	15	3			1	5
4	Dachepalli	Guntur	200	101	33			1	8	2	5	9	13	3	13	5		1		8
5	Macherla	Guntur	200	111	42		5	3	5	1	8	8	15	1	9		3		3	8
	Total district	Guntur	1000	542	193	0	11	15	25	5	40	51	59	24	60	15	8	3	6	27
	% in seed mycoflora			54.20	35.61	0.00	2.03	2.76	4.61	0.92	7.38	9.41	10.89	4.43	11.07	2.77	1.48	0.55	1.11	4.98
6	Penuganchiprolu	Krishna	200	95	39		3	1	5	3	8	5	10	8	5	1		3		4
7	Vissannapet	Krishna	200	99	44			5	6	2	9	8	7		7	1	3	1	1	5
8	Gampalagudem	Krishna	200	91	35	9		3	2	3	5	8	9		5	3		3		6
9	Tiruvuru	Krishna	200	81	27	5		5	9	3	6	5	7		7		1			6
10	Chatrai	Krishna	200	86	37	6		4	6		6	3	6		3	3		5	2	5
	Total district	Krishna	1000	452	182	20	3	18	28	11	34	29	39	8	27	8	4	12	3	26
	% in seed mycoflora			45.20	40.27	4.43	0.66	3.98	6.19	2.43	7.52	6.42	8.63	1.77	5.98	1.77	0.89	2.65	0.66	5.75
11	Nandyal	Kurnool	200	115	53			5	8	4	8	5	12	1	5		1	5		8
12	Pamulapadu	Kurnool	200	103	43	1	3		8	2	9		13	5	6	3		5		5
13	Gadivemula	Kurnool	200	96	38	2	2		5	3	8		8	4	6		5	7		8
14	Guduru	Kurnool	200	101	48	1			6	4	9		7	4	5		3	5		9
15	Gonegandla	Kurnool	200	103	57	3			3		9	3	4	2	5	5	3		2	7
	Total district	Kurnool	1000	518	239	7	5	5	30	13	43	8	44	16	27	8	12	22	2	37
	% in seed mycoflora			51.80	46.14	1.35	0.97	0.97	5.79	2.51	8.30	1.54	8.49	3.09	5.21	1.54	2.32	4.25	0.39	7.14

16	Dornala	Prakasam	200	91	41	1	2	2	5		7	2	8	5	9	3		3		3
17	Arthavedu	Prakasam	200	95	39			2	8	8	9	4	7	2	5	3	3			5
18	Podili	Prakasam	200	101	53		2	3	8	9	11	3		3			3	2		4
19	Donakonda	Prakasam	200	96	42	3			3	3	11	7	4		6		3		5	9
20	Tripuranthakam	Prakasam	200	105	45	3	2		5	8	6	6		2	6	3		5	8	6
	Total district	Prakasam	1000	488	220	7	6	7	29	28	44	22	19	12	26	9	9	10	13	27
	% in seed mycoflora			48.80	45.08	1.44	1.23	1.44	5.94	5.74	9.02	4.51	3.89	2.46	5.33	1.84	1.84	2.05	2.66	5.53
21	Vadamalpeta	Chittoor	200	80	39	4	1		5		4	2	7		3	3			5	7
22	Ramachandrapuram	Chittoor	200	89	42	7		2	5	4	5		8		2		4	3	1	6
23	Gangadara nellore	Chittoor	200	83	38	6		2	4	7	6		6		3		3		3	5
24	Somala	Chittoor	200	70	32	3		2	6	3	6	2	3		6			2		5
25	Punganuru	Chittoor	200	75	36	4		2	5	3	5	1	4	1	7		2		1	4
	Total district	Chittoor	1000	397	187	24	1	8	25	17	26	5	28	1	21	3	9	5	10	27
	% in seed mycoflora			39.70	47.10	6.04	0.25	2.02	6.30	4.28	6.55	1.26	7.05	0.25	5.29	0.76	2.27	1.26	2.52	6.80
	Total in state	A P	5000	2397	1021	58	26	53	137	74	187	115	189	61	161	43	42	52	34	144
	% in seed mycoflora			47.94	42.59	2.42	1.09	2.21	5.72	3.09	7.80	4.80	7.88	2.54	6.72	1.79	1.75	2.17	1.42	6.01

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

S. No	Organism	% infection
1	<i>Colletotrichum capsici</i>	42.59
	<i>C. capsici</i> + <i>Fusarium</i> spp.	4.80
	<i>C. capsici</i> + <i>Alternaria</i> spp.	7.88
	<i>C. capsici</i> + <i>Penicillium</i> spp.	2.54
	<i>C. capsici</i> + <i>Aspergillus</i> spp.	6.72
	Total <i>C. capsici</i>	64.53
2	<i>Colletotrichum gloeosporioides</i>	2.42
3	<i>Cercospora</i> spp.	1.09
4	<i>Fusarium</i> spp.	2.21
	<i>Fusarium</i> spp.+ <i>C. capsici</i>	4.80
	<i>Fusarium</i> spp. + <i>Alternaria</i> spp.	1.79
	<i>Fusarium</i> spp. + <i>Aspergillus</i> spp.	1.42
	Total <i>Fusarium</i> spp.	10.22
5	<i>Alternaria</i> spp.	5.72
	<i>Alternaria</i> spp. + <i>C. capsici</i>	7.88
	<i>Alternaria</i> spp. + <i>Fusarium</i> spp. .	1.79
	<i>Alternaria</i> spp. + <i>Penicillium</i> spp.	1.75
	<i>Alternaria</i> spp.+ <i>Aspergillus</i> spp.	6.01
	Total <i>Alternaria</i> spp.	23.15
6	<i>Penicillium</i> spp.	3.09
	<i>Penicillium</i> spp.+ <i>C. capsici</i>	2.54
	<i>Penicillium</i> spp.+ <i>Alternaria</i> spp.	1.75
	<i>Penicillium</i> spp.+ <i>Aspergillus</i> spp.	2.17
	Total <i>Penicillium</i> spp.	9.55
7	<i>Aspergillus</i> spp.	7.80
	<i>Aspergillus</i> spp.+ <i>C. capsici</i>	6.72
	<i>Aspergillus</i> spp. + <i>Fusarium</i> spp.	1.42
	<i>Aspergillus</i> spp. + <i>Alternaria</i> spp.	6.01
	<i>Aspergillus</i> spp.+ <i>Penicillium</i> spp.	2.17
	Total <i>Aspergillus</i> spp.	24.12

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## References

- Asalmol, M. N., Kale, V. P and Ingle, S. T. 2001. Seed borne fungi of chilli and effect on seed germination. *Seed Research*. 29(1): 76-79.
- Basak, A. B. 1994. Mycoflora associated with chilil seed collected in Bogra district. *Chitagong Univ. Studies Science*. 18(1) : 121-123.
- Chigoziri, E and Ekefan, E. J. 2013. Seed borne fungi of Chilli Pepper (*Capsicum frutescens*) from pepper producing areas of Benue State, Nigeria. *Agric. Biol. J North America*. 4(4): 370-374.
- Dhawale, S. D. and Kodmelwar, R. V. 1978. Studies on Mycoflora of chilli seeds. *Seed Research*. 1: 23.



- Jogi, M. G., Padule, D. N and Kamdi, S. R. 2010. Detection of seed mycoflora of chilli and its impact on seed germination and seedling vigour. *Inter. J Plant Sci.* 5(2): 502-504.
- Khare, M. N. 1996. Methods to test seeds for associated fungi. *Indian Phytopathology.* 49: 319-328.
- Pamplona-Roger G. D. 2007. Healthy Foods, *Editorial Safeliz*, Spain. pp.375.
- Pandey and Uma. 1976. Fungi associated with seeds of chillies grown in Kumaon Hills. *Indian Phytopathology.* 29: 472-473.
- Poonpolgul, S and Kumphai, S. 2007. Chilli Pepper Anthracnose in Thailand. Country Report. In: Oh, D. G., Kim, K. T., editors. Abstracts of the First International Symposium on Chilli Anthracnose. Republic of Korea: National Horticultural Research Institute, Rural Development of Administration. 23.
- Rout, B. K and Rath, G. C. 1972. Note on the seed borne diseases of chilli (*Capsicum annuum* L.). *Indian Phytopathology.* 25(4) : 597-598.
- Sowly, E. N. K and Kodua, J. 2012. Detection of seed-borne infection of tomato (*Solanum lycopersicum* L.) Seeds by agar plate and blotter methods. *Ghana J Hort.* 10:69-70.
- Than, P. P., Prihastuti, H., Phoulivong, S., Taylor, P. W and Hyde, K. D. 2008. Chilli anthracnose disease caused by *Colletotrichum* species. *Journal of Zhejiang University Science B.* 9(10): 764-788.

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