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Survey on seasonal incidence of foliar and fruit diseases of chilli in major chilli growing areas of Nadia district, West Bengal

Veera Suresh, Amitava Basu and Vikas Kumar Rawat

Abstract

A survey was conducted during 2014-15 and 2015-16 in ten major chilli growing areas of Nadia district viz., Jaguli, Mondouri, Kalyani C block, BCKV CWC, Basantpur, Laupala, Moregacha, Narayanpur and Uttarajapur. The survey was carried out during pre-kharif, kharif and Rabi seasons. During the survey incidence of total six pathogens viz, *Colletotrichum* sp, *Alternaria* sp, *Choanephora* sp, *Curvularia* sp, *Corynespora* sp and *Lasioidiplodia* sp were recorded. During Kharif season maximum percent disease incidence on leaf and fruit was recorded in *Colletotrichum* sp (27.31%) and (31.87%) least incidence on leaf and fruit was recorded in *Corynespora* leaf spot (10.50%) and *Curvularia* sp (8.41%). In Rabi season maximum leaf and fruit disease severity was recorded by *Alternaria* sp (28.48%) and (22.55%) respectively on bullet variety at BCKV CWC farm. In Pre-Kharif season, maximum leaf and fruit infections were recorded by *Choanephora* sp 28.63 per cent and 14.68 percent on bullet variety Basanthpur, followed by *Colletotrichum* sp (18.64 and 16.60 %) and *Alternaria* sp (7.64 and 13.45%).

Keywords: Colletotrichum, alternaria, fruit rot, disease severity, chilli diseases etc.

Introduction

Chilli (*Capsicum annum* L.) is an important cash crop, grown extensively in different parts of India. It belongs to genus *Capsicum* and family Solanaceae. It is one of the most important vegetable and spice crop. The crop is mainly grown for its pungent fruits which are used as green and ripe to impart pungency to food. It is important constituent of many foods, adding flavor, colour, vitamins, pungency and therefore indispensable to the world food industries. Capsanthin pigment makes colour and capsaicin makes pungency to the chilli fruit. In India chillies are grown in an area of 3.16 lakh hectares with a production 36.3 lakh tonnes with an average productivity of 610 kg/ha (NHB, 2018) [10].

In the modern agricultural strategies top priority is given to increase production through intensive cultivation practices by the introduction of high yielding varieties, increased fertilizer application, reduced plant spacing and increased irrigation. All these intensive practices expose crop to many diseases caused by fungi, bacteria, viruses and nematodes (Deshmukh, 2002) [3]. Among the fungal diseases, Anthracnose, *Alternaria* leaf spot, *Choanephora* blight, *Corynespora* leaf spot, Powdery mildew, *Cercospora* leaf spot, *Phytophthora* root and fruit rot, *Verticillium* wilt, *Rhizoctonia* collar rot, *Fusarium* wilt, Seedling damping off, Early blight, Gray mold, Southern blight, White mold etc. are the most prevalent ones. These diseases affect quality and quantity as well as the export value to a great extent.

The fungal diseases are more severe in India because of its complex nature. To understand the fungal diseases of chilli there is a need for extensive survey on diseases in the farmer field's gives information about the extent of chilli leaf and fruit diseases affecting the crop and quality of the fruits in different locations. A survey was conducted in chilli crop fungi namely *Fusarium solani*, *Alternaria alternata*, *Curvularia lunata*, *Alternaria solani*, *Choanephora cucurbitarum* and *Helminthosporium spiciferum* were encountered either parasitizing leaves or fruits in Uttar Pradesh (Hussain *et al.*, 2010) [5]. Among all the chilli diseases worldwide anthracnose disease is the major constraint to chilli production resulting in high yield losses (Than *et al.*, 2008) [8]. Fruit rot was the most prevalent disease (36.4%) of chilli in Karnataka (Ekbote, 2002) [4].

In the present situation of climate change, there is a need to investigate the disease in depth, as epidemics vary in different regions giving scope for understanding the extent of variability in pathogen population.

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Material and Methods

A survey was conducted during 2014-15 and 2015-16 in ten major chilli growing areas of Nadia district viz., Jaguli, Mondouri, Kalyani C block, BCKV CWC, Basantpur, Laupala, Moregacha, Narayanpur and Uttarajapur. The survey was carried out during pre-kharif, kharif and Rabi seasons to detect the incidence and severity of different leaf and fruit diseases of chilli in the farmers' fields in each village. (One to three fields were surveyed) In field plants were selected in zigzag manner and the severity of different disease of chilli on leaf and fruit were recorded by following 0 to 9 scale. Per cent disease index (PDI) was calculated by using following formula proposed by Wheeler (1969) [9].

Per cent disease index (PDI) = Sum of individual ratings X 100

No. of leaves/fruits assed X maximum disease grade

Results and Discussion

Survey on seasonal incidence of foliar and fruit diseases of chilli. A fixed plot survey was undertaken during 2014-15, 2015-16 in ten major chilli growing areas of Nadia district viz., Jaguli, Mondouri, Kalyani C block, BCKV CWC, Basantpur, Laupala, Moregacha, Narayanpur, Uttarajapur and Haringhata.

In the above mentioned locations were surveyed during Kharif, Rabi and Pre-Kharif seasons. Data pertaining to survey conducted during kharif 2014-15 as presented in Table 1, Fig. 1 and Plate 1 revealed that, During Kharif season, incidence of total six pathogens viz., *Colletotrichum* sp, *Alternaria* sp, *Choanephora* sp, *Curvularia* sp, *Corynespora* sp and *Lasiodiplodia* sp were recorded, the different disease incidence was noticed with a range of 4.50% to 27.31% per cent. In which maximum percent disease incidence on leaf was recorded in *Colletotrichum* sp (27.31%) on Bullet variety at Jaguli instructional farm followed by *Choanephora* sp (23.34 %), *Alternaria* sp (18.44%) and least was recorded in *Corynespora* leaf spot (4.50%) on bullet variety at Uttarajapur village. Among the different locations, disease severity on fruits ranged from 5.51 % to 31.87% was recorded. Highest Per cent fruit disease incidence was on Bullet variety by *Colletotrichum* sp (31.87%) at Jaguli instructional farm followed by *Choanephora* sp (18.42 %), *Alternaria* sp (17.28%) and *Lasiodiplodia* sp (12.50%) and least was found on Bullet variety by *Curvularia* sp (8.41%) in Uttarajapur village in West Bengal.

In 2014-15 Rabi season Table 2 revealed that total four pathogens were recorded viz., *Alternaria* sp, *Colletotrichum* sp and *Corynespora* sp the disease incidence ranged from 4.22 to 28.48 %, In this maximum leaf disease severity was recorded by *Alternaria* sp (28.48%) on bullet variety at BCKV CWC farm followed by, *Colletotrichum* sp (16.56%) and least was recorded by *Corynespora* sp (4.22%) on bullet variety in Uttarajapur in 2015. Among different locations maximum PDI in fruits *Alternaria* sp (22.55%) was recorded followed by *Colletotrichum* sp (15.56%). (Table 2 and Fig. 2) In 2015-16 Pre-Kharif season table 3 revealed maximum leaf and fruit infections were recorded by *Choanephora* sp 28.63 per cent and 14.68 percent on bullet variety Basanthpur, followed by *Colletotrichum* sp (24.75 and 16.60 %) and *Alternaria* sp (13.45% and 7.66%). (Table 3 and Fig. 3) From the above results of survey it is clear that *Colletotrichum* leaf and fruit rot is established as one of the main biotic stresses during kharif season. During Rabi season the main problem of chilli production *Alternaria* disease severity as well as maximum crop losses, as well as during Pre-kharif season *Choanephora* blight is one of the main constraints of chilli production. Hence, from the view point of the damage due to disease severity as well as crop losses, *Choanephora* blight gave maximum threats. The present investigation was in agreement with the Prabhavathy and Reddy (2006)⁶, reported that fruit rot of bell pepper caused by fungi viz., *Colletotrichum capsici*, *Alternaria alternata*, *Curvularia lunata* (*Cochliobolus lunatus*), *Botrydiplodia theobromae*, *Fusarium moniliformae* and *Choanephora cucurbitarum* of the chilli fruits from Andra Pradesh. Similarly Sharma *et al.*, (2011) [7] recorded 12.5-45.0 per cent of Chilli anthracnose/Fruit rot (*C. capsici*) disease incidence in different orchards in Himalachal Pradesh. and Anamika *et al.* (2012) [11] fruit rot incidence was recorded from 20 to 80 per cent in rewa province. And also Chandrakala *et al.*, (2016) [12] reported that the high incidence of *Choanephora cucurbitarum* was recorded in Khammam district of Telangana state from India.

Acknowledgment

We like to express our deepest thanks towards Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia for providing facilities and financial assistance during research work.

Table 1: Survey on seasonal incidence of chilli fruit and leaf infections in Kharif season 2014-15

Location	Year	Fields	Varieties	Major diseases	Time of onset Disease (DAT)	Time of Max. Severity (DAT)	% Disease severity		Estimated Yield loss
							Leaf	Fruit	
Jaguli	2014	Instructional farm	Bullet	Anthracnose	90	120	27.31	31.87	24.50
		Farmer's field	Beldanga	Anthracnose	86	130	17.11	24.80	21.22
	2015	Instructional farm	Bullet	Anthracnose	86	120	26.90	28.10	25.92
		Farmer's field -1	-do-	Alternaria	40	80	9.80	5.62	4.54
		Farmer's field -2	-do-	Choanephora	45	120	21.30	9.52	18.37
		Farmer's field -1	Beldanga	Anthracnose	100	130	18.62	23.54	17.15
		Farmer's field -2	-do-	Alternaria	110	140	14.67	16.34	15.38
Farmer's field -3	-do-	Choanephora	45	120	23.34	18.42	16.54		
Mondouri	2014	Farm field	Bullet	Anthracnose	85	130	23.10	19.23	18.30
		Farmer's field -1	-do-	Alternaria	40	125	15.68	17.28	13.45
		Farmer's field -2	-do-	Choanephora	80	125	21.00	-	19.65
	2015	Farm field	Bullet	Anthracnose	90	120	21.25	24.62	15.38
		Farmer's field -1	-do-	Alternaria	45	130	12.52	12.73	11.86
		Farmer's field -2	-do-	Choanephora	60	90	23.27	-	18.76
		Farm field -1	Bullet	Alternaria	60	130	10.70	9.90	8.65
		Farm field -2	-do-	Anthracnose	90	120	21.33	24.0	18.70

Kalyani C block	2014	Farmer's field -1	B.eldanga	Alternaria	110	148	11.82	9.90	9.14
		Farmer's field -1	Bullet	Anthraco-nose	90	135	19.52	22.03	20.05
		Farmer's field -2	-do-	Alternaria	95	115	12.24	10.7	8.72
		Farmer's field -3	Beldanga	Choanephora	88	120	25.13	-	22.45
	2015	Farm field -1	Bullet	Anthraco-nose	88	135	17.45	20.07	17.66
		Farm field -2	do-	Alternaria	95	115	15.60	14.22	13.28
		Farmer's field -1	Beldanga	Choanephora	88	120	21.24	-	18.22
		Farmer's field -1	Bullet	Anthraco-nose	110	148	13.42	16.42	15.44
2015	Farmer's field -2	-do-	Choanephora	65	120	18.63	10.52	12.56	
	Farmer's field -3	Beldanga	Alternaria	100	150	16.40	-	11.38	
	2014	Farm field -1	Bullet	Alternaria	95	140	18.44	15.72	19.85
		Farm field -2	-do-	Choanephora	35	75	10.12	-	8.88
BCKV CWC	2014	Farm field -1	Bullet	Alternaria	90	130	15.15	12.52	14.66
		Farm field -2	-do-	Choanephora	40	80	12.40	-	11.32
	2015	Farm field -3	-do-	Anthraco-nose	85	120	12.72	-	11.36
		Farmer's field -1	Bullet	Choanephora	85	120	25.13	14.32	23.62
Basantpur	2014	Farmer's field -2	-do-	Anthraco-nose	85	135	22.13	15.81	19.27
		Farmer's field -1	Bullet	Choanephora	80	120	21.15	18.32	18.60
	2015	Farmer's field -2	-do-	Anthraco-nose	85	135	12.51	-	9.99
		Farmer's field -1	Bullet	Alternaria	95	120	12.53	5.52	11.45
Laupala.	2014	Farmer's field -1	Bullet	Alternaria	90	130	13.74	11.11	12.32
		Farmer's field -2	-do-	Choanephora	40	80	5.48	6.80	4.55
	2015	Farmer's field -1	Beldanga	Anthraco-nose	90	135	11.82	13.34	12.51
		Farmer's field -2	-do-	<i>L.theobromae</i>	90	80	-	9.90	8.84
Moregacha	2014	Farmer's field -1	Beldanga	Anthraco-nose	90	125	14.51	19.64	11.32
		Farmer's field -2	-do-	<i>L.theobromae</i>	90	80	-	12.50	11.27
	2015	Farmer's field -1	Bullet	Curvularia	120	135	-	7.52	6.55
		Farmer's field -2	-do-	Alternaria	95	130	8.56	5.51	6.87
Narayanpur	2014	Farmer's field -1	Bullet	Curvularia	120	135	9.54	8.41	7.35
		Farmer's field -2	-do-	Alternaria	95	130	13.72	7.88	10.48
	2015	Farmer's field -3	-do-	Anthraco-nose	90	120	5.30	-	4.32
		Farmer's field -1	Bullet	Anthraco-nose	85	125	14.24	6.51	12.46
Uttarajapur	2014	Farmer's field -2	-do-	Corynespora	80	135	7.66	-	6.47
		Farmer's field -1	Bullet	Anthraco-nose	85	125	22.43	12.21	14.68
	2015	Farmer's field -2	-do-	Corynespora	80	135	4.50	-	9.22
		Farmer's field -1	Beldanga	Anthraco-nose	90	130	15.24	17.82	16.48
Haringata	2014	Farmer's field -2	-do-	Alternaria	120	115	10.88	12.92	11.36
		Farmer's field -1	Beldanga	Anthraco-nose	90	130	14.55	17.62	15.36
	2015	Farmer's field -2	-do-	Alternaria	120	115	10.86	6.52	8.46
		Farmer's field -1	Bullet	Anthraco-nose	90	130	18.65	19.54	16.35
2015	Farmer's field -2	-do-	Alternaria	120	115	11.42	7.82	6.66	

Table 2: Survey on seasonal incidence of chilli fruit and leaf infections in Rabi season 2014-15

Location	Year	Fields	Varieties	Major diseases	Time of onset Disease (DAT)	Time of Max. Severity (DAT)	% Disease severity		Estimated Yield loss
							Leaf	Fruit	
Jaguli	2014	Instructional farm	Bullet	Anthraco-nose	85	130	13.92	10.30	10.26
		Farmer field	-do-	Corynespora	80	120	11.52	-	9.99
		Farmer field-1	Beldanga	Alternaria	40	88	7.80	5.55	6.56
	2015	Farmer field-1	Bullet	Alternaria	90	130	12.34	10.54	11.24
		Farmer field-2	-do-	Anthraco-nose	85	130	8.84	9.66	7.86
Mondouri	2015	Farmer field	Beldanga	Alternaria	40	90	6.80	5.12	4.56
		Farm field	Beldanga	Alternaria	40	90	8.24	6.61	7.65
Kalyani C block	2014	Farm field	Bullet	Alternaria	90	135	17.89	11.22	13.55
		Farmer field-1	Bullet	Alternaria	100	135	10.72	9.11	8.86
		Farmer field-2	Beldanga	Anthraco-nose	90	130	11.32	4.54	10.26
	2015	Farmer field-1	Bullet	Alternaria	100	140	16.91	10.50	14.38
		Farmer field-2	Beldanga	Anthraco-nose	90	130	12.45	8.65	11.36
BCKV CWC	2014	Farm field-1	Bullet	Alternaria	90	135	21.32	12.53	16.42
		Farm field-2	do-	Alternaria	40	90	12.25	7.52	11.58
	2015	Farm field-1	Bullet	Alternaria	90	148	28.48	22.55	23.86
		Farm field-2	-do-	Anthraco-nose	40	80	7.23	4.88	5.72
Basantpur	2014	Farmer field	Bullet	Alternaria	100	135	25.82	15.50	17.53
	2015	Farmer field	Bullet	Alternaria	90	140	24.07	18.64	16.66
Laupala	2014	Farmer's field -1	Bullet	Anthraco-nose	40	100	4.76	-	3.28
		Farmer's field -2	Bullet	Anthraco-nose	40	90	11.32	4.80	9.85
Moregacha	2014	Farmer's field -1	Bullet	Alternaria	95	135	21.63	15.89	15.62
		Farmer's field -2	Beldanga	Corynespora	45	90	5.74	5.80	4.48
		Farmer's field -3	-do-	Alternaria	85	130	19.68	10.78	18.72

Narayanpur	2015	Farmer's field -1	Bullet	Alternaria	90	120	17.41	15.65	16.28
		Farmer's field -2	Beldanga	Anthracnose	40	85	16.56	8.88	15.82
		Farmer's field -3	Beldanga	Corynespora	40	85	12.53	5.44	10.18
	2014	Farmer's field -1	Bullet	Alternaria	90	130	18.35	15.54	14.53
		Farmer's field -2	-do-	Anthracnose	105	135	15.65	10.35	12.28
	2015	Farmer's field -1	Bullet	Alternaria	90	130	19.64	18.62	17.86
Farmer's field -2		Bullet	Anthracnose	105	140	15.85	15.56	15.22	
Uttarajapur	2014	Farmer's field -1	Bullet	Alternaria	40	90	4.44	3.54	2.88
		Farmer's field -2	Beldanga	Alternaria	90	125	14.56	12.23	10.34
	2015	Farmer's field -1	Bullet	Anthracnose	110	135	5.44	2.25	4.16
		Farmer's field -2	Beldanga	Anthracnose	105	140	9.67	11.53	10.22
		Farmer's field -3	Bullet	Corynespora	40	80	4.22		3.88
Haringata	2014	Farmer's field -1	Bullet	Alternaria	95	125	15.11	16.73	14.32
	2015	Farmer's field -2	Bullet	Alternaria	100	140	26.82	15.34	21.08

Table 3: Survey on seasonal incidence of chilli fruit and leaf infections in Pre-Kharif season 2015-16

Location	Year	Fields	Varieties	Major diseases	Time of onset Disease (DAT)	Time of Max. Severity (DAT)	% Disease severity		Estimated Yield loss
							Leaf	Fruit	
Jaguli	2015	Instructional farm	Bullet	Choanephora	40	110	15.32	10.54	13.65
		Farmer's field-1	-do-	Anthracnose	86	120	10.75	7.88	6.42
		Farmer's field-2	Beldanga	Choanephora	60	130	21.57	8.64	19.38
	2016	Farmer's field-3	-do-	Anthracnose	90	120	10.22	5.62	6.42
		Instructional farm	Bullet	Choanephora	40	125	16.45	-	14.85
		Farmer's field-1	-do-	Anthracnose	90	130	12.57	6.56	11.26
Mondouri	2015	Farmer's field-2	Beldanga	Choanephora	40	120	18.74	12.82	14.38
		Farmer's field-3	-do-	Anthracnose	85	130	13.57	10.56	12.16
		Farm field-1	Bullet	Alternaria	110	125	9.99	-	7.55
	2016	Farmer's field-1	-do-	Anthracnose	100	120	18.46	12.60	14.88
		Farmer's field-2	-do-	Choanephora	60	90	6.75	11.90	10.72
		Farm field-1	Bullet	Alternaria	120	130	10.56	-	13.86
Kalyani C block	2015	Farmer's field-1	-do-	Anthracnose	110	130	17.56	8.10	15.53
		Farmer's field-2	-do-	Alternaria	40	85	2.67	13.45	10.70
		Farm field-1	Bullet	Alternaria	115	120	9.99	-	7.88
	2016	Farm field-2	-do-	Choanephora	60	120	21.72	4.30	14.76
		Farm field-3	Beldanga	Anthracnose	100	125	11.14	-	10.82
		Farm field-4	-do-	Choanephora	60	100	12.69	8.27	9.74
BCKV CWC	2015	Farm field-1	Bullet	Alternaria	120	128	8.66	5.65	6.34
		Farm field-2	-do-	Choanephora	60	120	26.46	6.87	17.88
		Farm field-3	Beldanga	Anthracnose	110	130	17.63	8.25	13.82
	2016	Farm field-4	-do-	Choanephora	50	120	14.57	6.65	12.11
		Farmer's field-1	Bullet	Alternaria	110	130	7.75	4.64	5.92
		Farmer's field-2	-do-	Curvularia	120	125	-	3.80	2.15
Basantpur	2015	Farmer's field-1	Bullet	Alternaria	120	140	9.66	4.66	3.88
		Farmer's field-2	-do-	Curvularia	120	138	-	3.44	2.56
		Farmer's field-1	Bullet	Alternaria	110	120	7.64	4.24	5.82
	2016	Farmer's field-2	-do-	Anthracnose	90	135	16.86	10.52	13.38
		Farmer's field-3	-do-	Choanephora	60	90	24.69	14.68	17.56
		Farmer's field-1	Bullet	Alternaria	110	130	8.25	4.86	5.81
Laupala	2015	Farmer's field-1	Bullet	Anthracnose	85	130	14.73	13.27	10.82
	2016	Farmer's field-2	-do-	Choanephora	35	120	17.53	11.88	13.34
Moregacha	2015	Farmer's field-1	Bullet	Anthracnose	90	130	24.75	16.60	17.28
		Farmer's field-1	Bullet	Anthracnose	100	120	22.43	-	10.54
		Farmer's field-1	Bullet	Anthracnose	90	130	18.64	11.65	12.56
	2016	Farmer's field-1	Beldanga	Choanephora	85	125	8.84	-	7.22
		Farmer's field-2	-do-	Anthracnose	85	120	6.57	8.35	7.86
		Farmer's field-3	-do-	Choanephora	86	110	28.63		21.55
Narayanpur	2015	Farmer's field-1	Bullet	Anthracnose	110	136	17.65	12.45	15.48
		Farmer's field-2	-do-	Choanephora	45	110	11.46	8.34	8.13
	2016	Farmer's field-1	Beldanga	Anthracnose	105	130	7.56	5.62	6.54
		Farmer's field-2	-do-	Choanephora	86	120	13.67	5.45	9.28
Uttarajapur	2015	Farmer's field-1	Bullet	Choanephora	86	110	24.57		18.56
		Farmer's field-2	-do-	Alternaria	110	140	10.72	8.13	7.86
	2016	Farmer's field-1	Bullet	Choanephora	90	120	5.68	-	6.58
		Farmer's field-2	-do-	Alternaria	120	130	13.45	7.66	12.42

		Farmer's field-2	-do-	Anthracnose	100	130	13.40	8.67	12.46
		Farmer's field-3	Beldanga	Choanephora	88	120	12.34	-	10.64
Haringata	2015	Farmer's field-1	Bullet	Anthracnose	95	120	24.52	7.15	21.15
	2016	Farmer's field-1	Bullet	Anthracnose	105	128	17.88	5.88	15.82

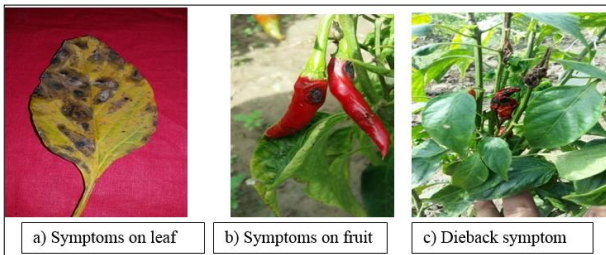


Plate 1: Symptoms caused by *Colletotrichum capsici* on chilli



Plate 2: *Alternaria* leaf spot symptoms

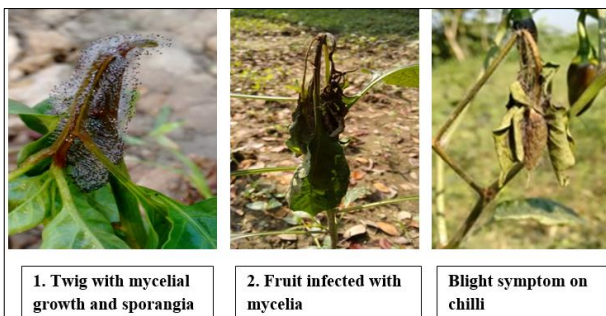
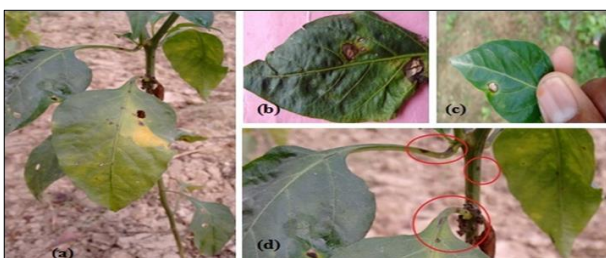


Plate 3: *Choanephora* Blight symptoms on chilli



a, b, c and d - Leaves and Stem symptoms on chilli plant

Plate 4: *Corynespora* leaf spot symptoms



Plate 5: Chilli fruit rot infections



Plate 6: Microphotograph showing morphological characters of *Colletotrichum capsici*

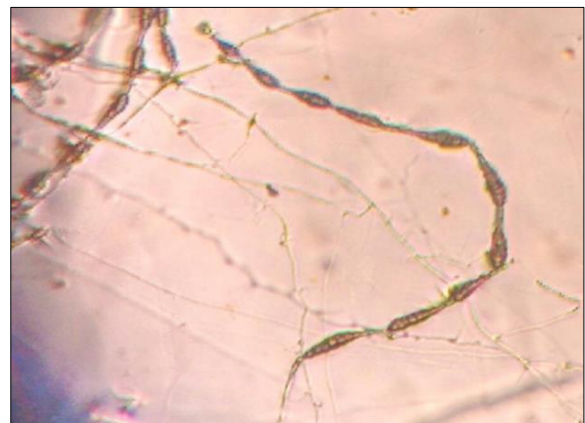


Plate 7: Conidia of *Alternaria alternata*

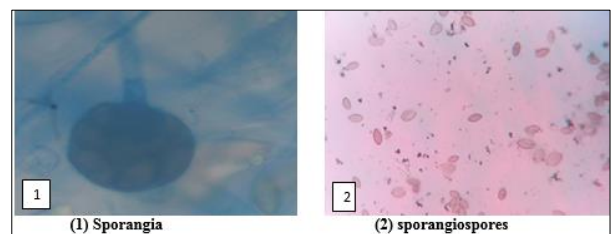


Plate 8: Microscopic photographs of *Choanephora cucurbitarum*

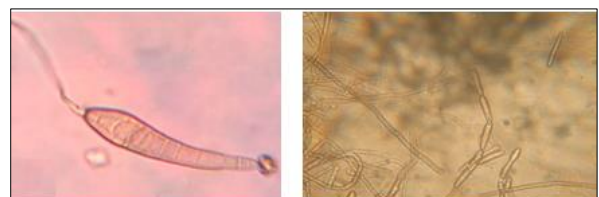


Plate 9: Microscopic photographs of *Corynespora cassicola*



Plate 10: Conidia of *Lasiodiplodia theobromae* and *Curvularia lunata*

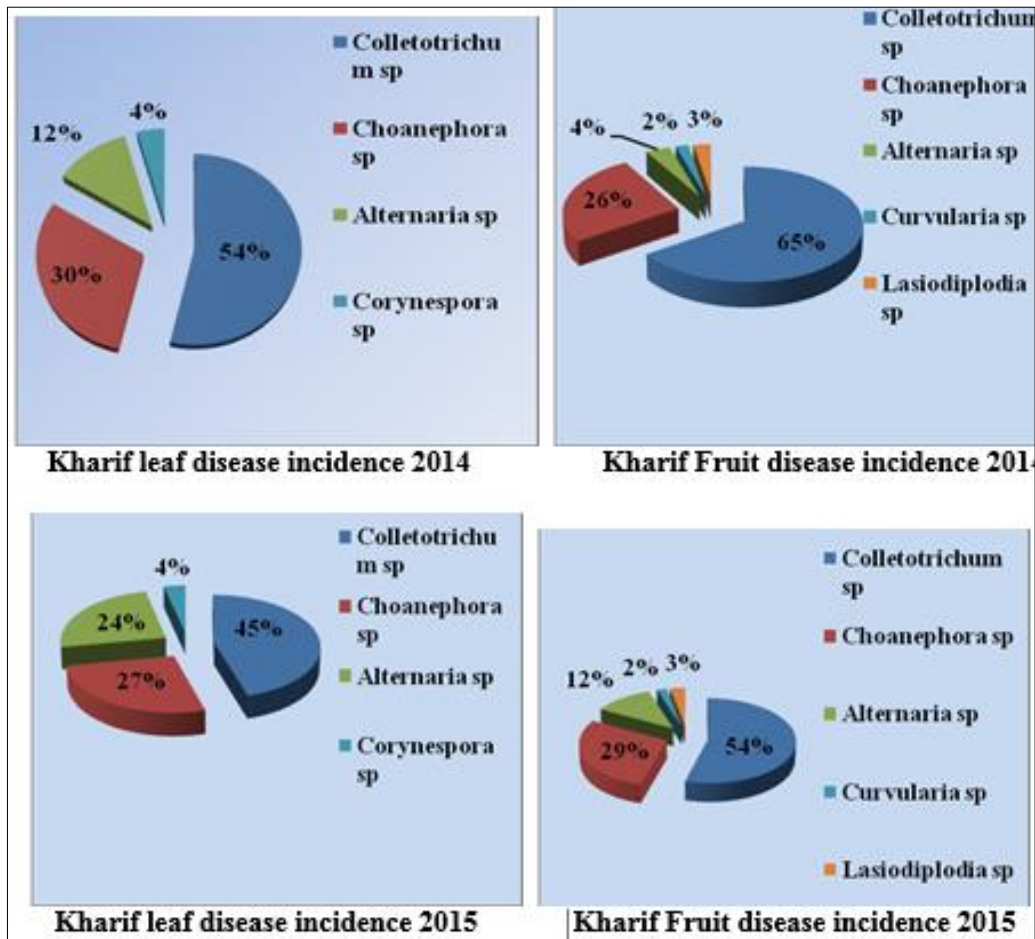


Fig 1: Seasonal incidence of chilli fruit and leaf infections in Kharif season 2014-2015

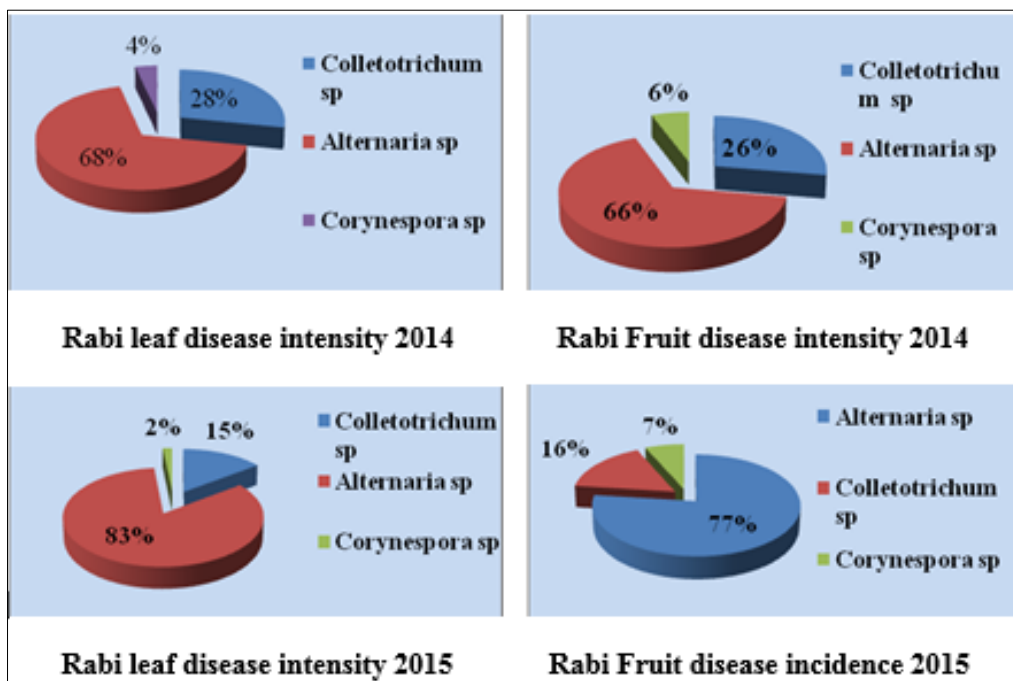


Fig 2: Seasonal incidence of chilli fruit and leaf infections in Rabi season 2014-2015

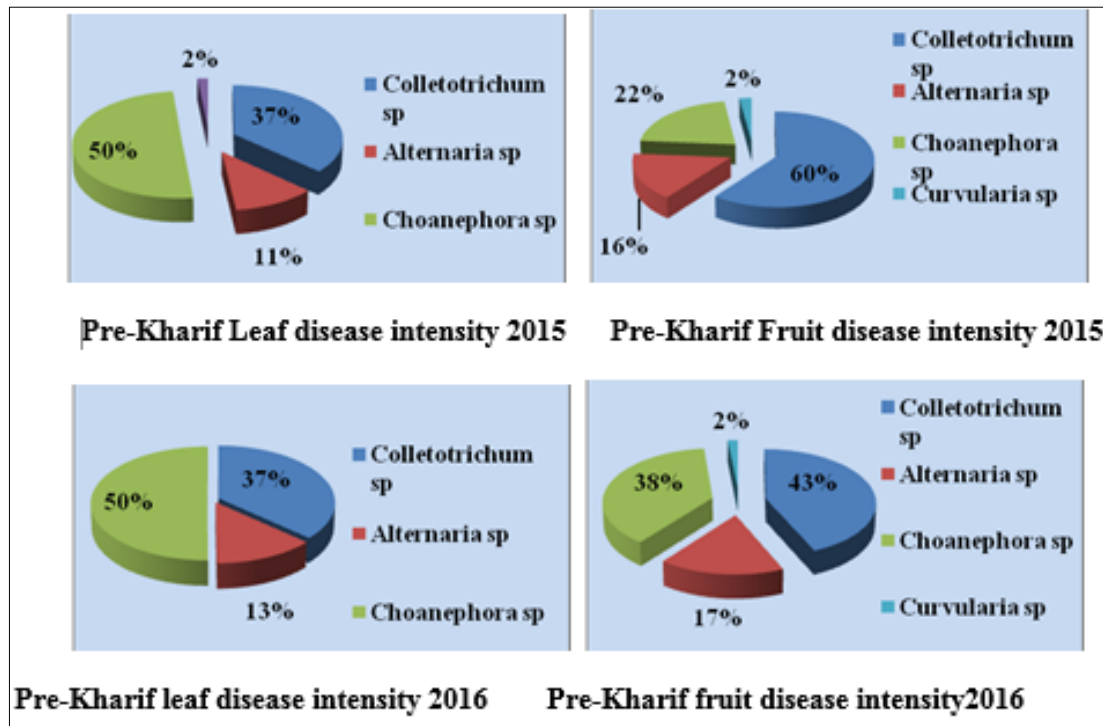


Fig 3: Seasonal incidence of chilli fruit and leaf infections in Pre-Kharif season 2015-2016

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