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Assessment of Disease Incidence and Virulence of *Colletotrichum truncatum* (syn. *C.capsici*) Incited Fruit rot of Chilli (*Capsicum annum* L.)

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ABSTRACT

Chilli, (*Capsicum annum* L.) is considered as an important vegetable and spice crop which is cultivated throughout the world. The pungency present in the chilli is mainly due to the presence of alkaloid knows as capsaicin. The cultivation of chilli is affected by various biotic and abiotic stresses, majorly due to fungal diseases causing significant loss in the production and productivity of chilli crop. The fruit rot of chilli caused by *Colletotrichum truncatum* (syn. *C. capsici*) tends to cause heavy yield loss in almost all chilli growing areas. A roving survey was conducted in the major chilli growing areas of Tamil Nadu to assess the disease incidence of fruit rot of chilli. The disease severity ranges from 9.04% to 39.56%. The highest disease intensity was recorded in the Kovilpatti of Thoothukudi district whereas the lowest disease intensity is recorded in Kolathur of Salem district. Twenty-five isolates were collected from different geographical locations and the variations among them are observed based on the mycelial characters and conidial production. The isolate named C_{10} showed the maximum mycelial growth and showed maximum disease incidence and proved to be virulent among the different isolates record

Key words: *Chilli, Fruit rot, Colletotrichum truncatum, Morphological studies, Virulent.*

Introduction

Chilli (*Capsicum annuum* L.) is a cash crop native to Central & South America, which is grown widely in different parts of India. Chilli belongs to the genus Capsicum and family Solanaceae. It is considered as one of the important vegetables as well as a spice crop grown throughout India. The chilliis mainly grown for its pungency due to the presence of alkaloid Capsaicin. It is considered as an important constituent of many foods which adds aroma and taste and makes indispensable for the world food industries. The red colored fruits have an alkaloid known as capsanthin which has more content of vitamin A whereas, green chillies with a considerable amount of vitamin C (Kumar *et al.,* 2018). Capsanthin pigment present in the chilli makes its versatile red colour. The oleoresin compound can also be extracted from chillies and is widely used in western countries and has its applications in beverages, cosmetics as well as for medicinal purposes. The alkaloids from chilli are used for a wide range of medicinal uses such as tonsillitis, fever, sore throat, diphtheria and also for the treatment of tumors. India ranks first in the producer, consumer and exporter of chillies in the world. In India, Andhra Pradesh ranks first in the production of chilies (37.35%) and Tamil Nadu ranks eighth in the Production (1.15%).

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In India, the chilli crop is grown in an area of 8.52 lakh hectares with a production of 15.78 lakh tonnes. Whereas in Tamil Nadu, 0.24 lakh tonnes of chilli were produced from 0.54 lakh hectares during 2021-22. The Chilli crop is mainly grown in Virudhunagar, Ramanathapuram, Thoothukudi and Tirunelveli districts and also sparsely grown in almost all other districts of Tamil Nadu (TNAU Price Forecast, 2023).

Economic Importance: In severe conditions, pre and post-harvest losses of chilli accounts up to 50 percent (Sahitya *et al.*, 2014). Itaffectsmajorly the aerial parts of the plant andmainly it produces fruit rot to both green as well as ripe fruits which is considered to be having major economic importance in the consumption. However, the disease prevalence is more on the ripen fruits when compared to the unripe green fruits, hence it has the name ripe fruit rot of chilli (Lokhande *et al.*, 2019).

Symptomatology: The major characteristic symptom of this disease is the appearance of multiple sunken angular or circular lesions, the lesions coalesce to form severe fruit rot. The lesions were characterized by the presence of black-colored spots inconcentric rings. These aggregates, which have setae containing conidia, are called as acervuli. The symptoms are also seen on stems and leave which results in the defoliation of leaves. The infection results in necrosis of branches which then proceeds backward and starts drying from the tip (Die backstage) and it may kill the whole plant (Gupta *et al.*, 2017).

The objective of this present study is surveying of major chilli growing areas of Tamil Nadu to know about the present status and severity of chilli fruit rot. This study will help in better understanding of the distribution and prevalence of the pathogen and the influence of climatic or environmental factors on increasing the severity of the fruit rot. In order to assess the ecology, virulence, and evolutionary aspects of *Colletotrichum truncatum* (syn. *C. capsici*), the cultural, morphological and pathogenic variability among different isolates of fruit rot from different locations were observed. The different inoculation methods were tested to evaluate the virulence of the isolates collected.

Materials and Methods

A roving survey has been conducted in major chilli growing districts of Tamil Nadu during April 2023. In each district, two villages were selected at random which is based on the infection and severity of the disease. Then two fields were selected from each of the village. From the selected field, 5 plots were selected under random with an area of 5 m^2 from which one plot has been plotted in the center of the selected field and the remaining plots plotted at random locations which are away from the border rows of the selected field. The chilli plants were identified based on the symptoms of fruit infection which were then collected separately in polythene cover and are labelled properly. These symptoms are stored in refrigerator (4 ^{0}C) for carrying out further studies in laboratory. Disease incidence was assessed by counting the number of infected plants (both leaf infection and fruit rot) out of all total plants in each of the plots (5m^2). Then the corresponding mean disease incidence was calculated from two fields in each of the village. Then, the percent disease incidence was calculated by the formula (Pandi *et al*., 2018)

$$\text{PDI} = \frac{\text{Number of plants affected}}{\text{Total number of plants observed}} \times 100$$

The magnitude of infection on the chilli fruits is also calculated and expressed as percent disease indexas per the grade chart given in the table.

Value	Percentage offruitareainfected
0	0 %
1	1 – 10 %
3	11 – 15 %
5	16 – 25 %
7	26 – 50 %
9	51 % and above

Isolation

The samples of infected plants were collected, brought to the laboratory, and thoroughly cleaned with tap water to get rid of all the debris. Using a sterile scalpel (2×2 mm), a small section of the infected tissue along with a healthy portion of the tissue was exercised. After that, these bits are surface sterilized for 20 seconds in 70% alcohol and one minute in 1% sodium hypochlorite followed by rinsing in sterile distilled water for three times. After that, they are dried on sterile filter paper in the laminar airflow chamber. Following the process of drying, the fragments were aseptically transferred to Petri-plates that were filled with potato dextrose agar medium (PDA), so that the three bits on each

plate are located toward the edges of the plates. Now, for three days, these plates are being incubated at 28 ± 2 °C in a biological oxygen demand (BOD) incubator. The single spore isolation method is used for purification (Dhingra and Sinclair, 2017). The resulting pure cultures are then maintained on PDA slants and kept in a refrigerator at 4 °C for use in future studies. The same procedure is adopted for all the isolates of the pathogen collected from different Chilli growing areas of Tamil Nadu.

Cultural and Morphological characterization

Nine mm discs of the 15-day-old pathogen culture were aseptically inserted into the center of Petri plates holding 20 ml of PDA, and they were incubated for 20 days at 28 ± 2 °C in a BOD incubator. Mycelial growth, color, conidial shape, and the number of septa per setae were among the morphological and mycelial characteristics that were noted for all of the isolates.

Effect of different methods of inoculation for the development of fruit rot

Healthy semi-ripe fruits were selected for carrying different methods of inoculation techniques because they contain less phenolics and less wax contents when compared to green fruits (Mesta *et al.*, 2007). Then these samples were surface sterilized using sodium hypochlorite solution (1%) for 1min and followed by sterile water washing for three times and allowed to dry under aseptic conditions in laminar chamber. Then spore suspensions were made from 15 days old culture of the pathogen isolated and its concentrations was adjusted to 10^6 per ml. Then the surface sterilized fruits were inoculated with different isolates of *Colletotrichum* using different inoculation techniques mentioned below andthen the size of the lesions was then measured. The different inoculation techniques used are pin prick method, followed by placing a disc ofmycelia, injection of spore suspension, spore suspension spray, dipping of fruits in the spore suspension, and placing a mycelial disc on fruits (Suthin Raj *et al.*, 2013). Then the separate controls are maintained for each inoculation method whereas the sterile distilled water was used instead of the spore suspension. The fruits are observed for the development of symptoms for 7-15 days and the size of the lesion produced was recorded and percent disease index (PDI) was also calculated.

Pathogenicity test

This experiment establishes the virulence of the various isolates that were collected. The pathogenicity test was used to assess the virulence of each of the 25 isolates that were obtained (Harikesh B Singh, 2016). Five kg of soil was taken from the chilli field and had been sterilized for three days by tyndallization, or intermittent heating, and then put into cement pots measuring (30cm × 45cm). Allthe isolates were cultured on PDA at 28±2 ^{0}C in a BOD incubator. Each isolate's inoculums are multiplied on a medium based on corn sand (1:9) and combined with the soil in the pots at a rate of 20 grams per kilogram of soil. Three replications of the K-2 variety of chilli seedlings were maintained after they were transplanted into the pots at one month of age. Frequently irrigation was carried out to keep the soil moisture content at 25%. Next, the development of symptoms on these plants is monitored, and the mean disease incidence is recorded by calculating the PDI on both fruits and foliage using the previously mentioned formula. Using the pinprick method, healthy chilli fruits were chosen to inoculate the pathogen. The control group consisted of chilli fruits that were injected with sterile distilled water. Fruits are monitored for seven to fifteen days for the development of fruit rot symptoms. The intensity of the fruit rot is calculated as per the grade chart and formula mentioned above and expressed as the percent disease index (Pandi *et al.*, 2018).

Experimental Design and Results

The experiments were conducted following the Completely Randomized Design (CRD) with three replications. Duncan's Multiple Range Test (DMRT) was used to compare the means to determine whether there was any significant difference. Before statistical analysis, the data are transformed as needed using the proper techniques.

Results and Discussion

Survey

In order to determine the prevalence of fruit rot disease, a survey was carried out in April 2023 in Tamil Nadu's main chilli growing regions. The disease was found in all of the Tamil Nadu districts that were surveyed, however in different forms. The highest disease incidence was recorded from Kovilpatti of Thoothukudi district (39.56%). It was

followed by Paramakudi of Ramanathapuram district (35.58%) whereas the lowest disease intensity is recorded in Kolathur village of Salem district (9.04%) (Table 1). Rahul *et al.* (2021) observed that maximum occurrence of chilli anthracnose in Subramaniapuram village, Thoothukudi district of Tamil Nadu. Charumathi *et al.* (2019) also recorded that highest incidence of fruit rot in Kovilpatti region of Thoothukudi district of Tamil Nadu. Similarly, Jaiganesh *et al.* (2019) conducted a survey for fruit rot and reported maximum disease incidence in Kovilpatti region of Thoothukudi district of Southern Tamil Nadu.

Effect of different methods of inoculation for the development of fruit rot

The Pin Prick method was found to be the most effective of the various inoculation techniques, with an average lesion size of 8.56 mm and a PDI of 58.43%. This was followed by the Spore Suspension Injection method, which had an average lesion size of 8.36 mm and a PDI of 55.56%. On the other hand, the Fruit Dip method was found to be the least effective, with an average lesion size of 7.27 mm and a PDI of 53.16% (Table 2). Previous studies involving the inoculation of chilli fruits at varying ages with various inoculation techniques showed that the pin pricking method was the most successful and that semi-ripe to ripe fruits caused severe symptoms (Rajamanickam and Sethuraman, 2014). An earlier experiment of a similar nature used different methods to inoculate the chilli fruits while they were still attached to the plants, and it was found that the pinprick method resulted in the largest lesions on the fruits (Hossain *et al.*, 2010).

Pathogenicity test

Pathogenicity test was carried out on K-2 variety of chilli with the 25 fungal isolates under pot culture conditions. All the collected isolates were found to be virulent and produced fruit rot symptoms of varying magnitude. Among the different isolates

Table 1. Survey for the incidence of chilli fruit rot in major chilli growing districts of Tamil Nadu

S. No.	Districts	Locality	Variety	Crop Stage	Disease Incidence(%)
1	Salem	Kolathur	CO 1	Fruiting	9.04^{u}(17.49)
2	Salem	Omalur	CO 1	Vegetative	21.92^{h}(27.91)
3	Cuddalore	Sivapuri	CO 1	Fruiting	9.86^{t}(13.30)
4	Cuddalore	Kurinjipadi	CO 1	Fruiting	13.19^{qr}(21.46)
5	Cuddalore	Palur	PLR 1	Fruiting	15.02^{no}(22.80)
6	Theni	Cumbum	CO 1	Vegetative	30.69^{d}(33.64)
7	Theni	Chinnamannur	K 1	Fruiting	18.86^{j}(25.73)
8	Virudhunagar	Sattur	K 2	Fruiting	20.82^{i}(27.14)
9	Virudhunagar	Rajapalayam	MDU 1	Fruiting	22.53^{gh}(28.33)
10	Thoothukudi	Kovilpatti	K 2	Fruiting	39.56^{a}(38.97)
11	Trichy	Marungapuri	CO 1	Fruiting	11.14^{s}(19.49)
12	Trichy	Kulithalai	CO 1	Fruiting	10.03^{tu}(18.46)
13	Coimbatore	Annur	CO 1	Vegetative	33.82^{c}(35.55)
14	Coimbatore	Sulur	CO 1	Fruiting	17.02^{lm}(24.36)
15	Namakkal	Pottanam	CO 1	Fruiting	14.93^{op}(22.73)
16	Tiruvannamalai	Inamkariyandhal	CO 2	Fruiting	12.69^{r}(20.86)
17	Tiruvannamalai	Thandrampet	CO 1	Vegetative	14.07^{g}(22.03)
18	Madurai	Melur	MDU 1	Fruiting	23.29^{fg}(28.84)
19	Madurai	Vadipatti	K 2	Fruiting	15.66^{n}(23.31)
20	Ramanathapuram	Paramakudi	Sattur Samba	Fruiting	35.58^{b}(36.62)
21	Ramanathapuram	Mudukulathur	K 1	Fruiting	18.02^{k}(25.11)
22	Tirunelveli	Radhapuram	CO 1	Fruiting	24.33^{f}(29.55)
23	Tirunelveli	Nanguneri	MDU 1	Fruiting	17.33^{kl}(24.59)
24	Sivagangai	Sivagangai	MDU 1	Fruiting	27.82^{e}(31.83)
25	Tenkasi	Alangulam	PKM 1	Fruiting	16.53^{m}(23.98)

Mean of three replicationsValues in the column followed by common letters do not differ significantly at 5% level by Duncan's multiple range test (DMRT)

tested C_{10} from Kovilpatti resulted in the highest incidence of fruit rot which is 84.33%. The culture Sequence was identified as *Colletotrichum truncatum* deposited in NCBI GenBank with accession no (OR642780). This was followed by C_{20} (81.67%) from Paramakudi. The lowest incidence of percent disease index was reported from C_{12} (31.07%) from Manachanallur which was followed by C_3 (30.18%) from Sivapuri. Highest leaf infection was produced in C_{10} from Kovilpatti with incidence of 76.07%. This was followed by C_{20} (75.33%) from Paramakudi. The lowest incidence of percent disease index was reported from C_{12} (30.89%) from Manachanallur which was followed by C_3 (34.16%) from Sivapuri (Table 3). Because the isolates were from different places, had different biotypes, and experienced different environmental conditions, there was a noticeable difference in their virulence. A pathogen's virulence varies depending on the environment, which can be caused by variations in humidity, temperature, and rainfall (Charumathi and Suthin Raj, 2019).

Cultural and Morphological characterization

The mycelia of most of the isolates that were collected possessed a light brown color. Very few were greyish in color, though some were creamy white. Thirteen isolates showed a fluffy growth pattern, whereas the remaining twelve isolates showed cottony mycelial growth (Table 4). C_{10} possessed the largest colony diameter measured, measuring 87.90 mm. C_7, which had a diameter of 85.60 mm, came next. C_3 had the smallest colony diameter measured, measuring 61.20 mm. While some isolates produced spindle and cylindrical conidia, the majority of isolates produced falcate conidia. Each isolate produced acervuli which varied from dark brown in color. Number of septa ranged in between 2-6. *Colletotrichum truncatum* (syn. *C. capsici*) was the pathogen responsible for chilli anthracnose in most of the areas, while *C. gloeosporioides*, *C. acutatum*, and

Table 2. Effect of different methods of inoculation for the development of fruit rot

Isolate	Pin Prick Method		Spore Suspension Spray		Spore Suspension Injection		Fruit Dip		Mycelial Discs	
	Lesion Size (mm)	PDI (%)	Lesion Size (mm)	PDI (%)	Lesion Size (mm)	PDI (%)	Lesion Size (mm)	PDI (%)	Lesion Size (mm)	PDI (%)
C_1	6.92	43.33	5.82	42.86	6.43	43.19	4.96	40.52	5.12	41.70
C_2	10.03	67.81	9.62	65.67	9.73	62.18	8.68	63.19	9.02	64.10
C_3	5.21	33.16	5.12	30.05	4.96	32.16	4.78	29.70	4.84	29.86
C_4	6.10	38.86	5.64	37.16	5.90	38.54	5.09	36.12	5.20	37.01
C_5	7.63	46.62	7.14	45.12	7.21	45.98	6.28	43.12	6.90	42.60
C_6	11.23	78.86	11.18	72.67	11.10	74.83	9.80	70.05	10.62	71.15
C_7	9.73	61.37	9.16	60.36	9.35	61.12	8.42	58.50	8.60	52.50
C_8	9.89	65.23	8.53	63.71	8.68	64.79	7.68	58.20	7.90	57.00
C_9	10.16	68.83	9.80	62.86	10.03	64.18	8.62	60.50	8.90	61.62
C_{10}	12.23	82.22	11.86	79.39	12.14	81.42	10.97	76.50	11.64	72.50
C_{11}	5.38	34.42	4.63	31.86	5.12	30.05	4.16	32.86	4.32	31.20
C_{12}	5.05	31.17	4.92	28.64	4.77	29.05	4.04	26.20	4.63	28.34
C_{13}	11.97	80.23	11.27	77.23	11.63	79.07	10.28	75.84	10.96	76.02
C_{14}	8.78	54.43	8.18	52.89	8.26	53.15	7.24	50.05	9.93	51.90
C_{15}	6.53	39. 82	6.08	37.64	6.23	38.82	5.84	36.05	6.01	37.12
C_{16}	5.82	37.14	5.32	36.34	5.59	37.05	4.96	32.50	5.10	33.89
C_{17}	6.46	39.14	6.12	35.02	6.28	36.14	5.72	33.12	5.84	33.69
C_{18}	10.21	70.13	9.98	68.84	10.03	69.17	9.09	65.20	9.63	63.96
C_{19}	7.92	71.87	7.12	69.17	7.34	68. 86	6.34	65.20	6.90	66.00
C_{20}	12. 16	81.87	11.68	78.62	11.97	80.82	9.08	77.89	10.96	77.64
C_{21}	9.42	58.28	8.98	55.76	9.08	57.42	7.80	53.10	8.21	54.96
C_{22}	10.63	72.23	10.21	70.83	10.32	71.42	9.01	68.96	9.62	67.50
C_{23}	8.96	55.16	8.68	54.19	8.21	55.08	7.62	51.10	7.90	53.91
C_{24}	10.97	76.692	10.35	73.67	10.68	74.87	9.20	76.12	9.68	71.89
C_{25}	8.43	53.29	7.83	51.07	8.18	52.91	6.26	48.50	6.43	49.80
Avg	8.56	58.43	8.20	55.26	8.36	55.56	7.27	53.16	7.79	53.11

Table 3. Virulence of different isolates (Pathogenicity test)

Isolate	Locality	Fruit Rot Incidence (PDI) (%)	Percent Leaves infected (%)
C_1	Salem	52.85^{m}(47.50)	54.36^{m}(47.50)
C_2	Salem	68.26^{ij}(52.42)	62.82^{ij}(52.42)
C_3	Cuddalore	30.18^{rs}(35.75)	34.16^{rs}(35.75)
C_4	Cuddalore	44.82^{r}(37.17)	36.52^{r}(37.17)
C_5	Cuddalore	54.00^{no}(44.50)	49.14^{no}(44.50)
C_6	Theni	77.12^{cd}(58.59)	72.82^{d}(58.59)
C_7	Theni	63.82^{hi}(53.84)	65.16^{hi}(53.843)
C_8	Virudhunagar	65.45^{ef}(55.70)	68.23^{ef}(55.70)
C_9	Virudhunagar	71.58^{c}(59.59)	74.33^{cd}(59.59)
C_{10}	Thoothukudi	84.33^{ab}(60.72)	76.07^{b}(60.72)
C_{11}	Trichy	36.54st(34.76)	32.53st(34.769)
C_{12}	Trichy	31.07^{t} (33.76)	30.89^{t}(33.76)
C_{13}	Coimbatore	79.38^{bc}(59.88)	74.74^{c}(59.89)
C_{14}	Coimbatore	58.74^{jk}(51.25)	60.82^{jk}(51.25)
C_{15}	Namakkal	49.16^{n}(45.79)	51.38^{n}(45.79)
C_{16}	Tiruvannamalai	39.82^{q}(41.10)	43.22^{q}(41.10)
C_{17}	Tiruvannamalai	46.38^{op}(43.89)	48.07^{op}(43.89)
C_{18}	Madurai	73.38^{de}(57.29)	70.74^{de}(57.29)
C_{19}	Madurai	54.82^{lm}(49.10)	57.14^{lm}(49.11)
C_{20}	Ramanathapuram	81.67^{b}(60.22)	75.33^{bc}(60.22)
C_{21}	Ramanathapuram	61.03^{i}(53.15)	64.04^{i}(53.15)
C_{22}	Tirunelveli	75.62^{a}(62.75)	78.92^{a}(62.75)
C_{23}	Tirunelveli	60.96^{gh}(54.11)	65.62^{gh}(54.11)
C_{24}	Sivagangai	75.13^{fg}(55.15)	67.33^{fg}(55.14)
C_{25}	Tenkasi	56.27^{kl}(50.61)	59.74^{kl}(50.62)

Mean of three replications
Values in the column followed by common letters do not differ significantly at 5% level by Duncan's multiple range test (DMRT)

Table 4. Cultural and Morphological Characterizations of *Colletotrichum* spp.

Isolate	Colony Character		Colony Diameter (mm)	Conidial Morphology	Acervuli colour	Noof septa	*Colletotrichum* species
	Mycelia Color	Mycelial Growth					
C_1	Creamywhite	Cottony	63.20	Falcate	Dark Brown	2–4	*Colletotrichum scovillei*
C_2	Lightbrown	Fluffy	74.16	Falcate	Dark Brown	4–6	*Colletotrichum scovillei*
C_3	Lightbrown	Fluffy	61.20	Falcate	Dark Brown	3–5	*Colletotrichum truncatum*
C_4	Creamywhite	Cottony	67.29	Falcateand cylindrical	Dark Brown	2–4	*Colletotrichum acutatum*
C_5	Creamy white	Fluffy	71.93	Falcate	Dark Brown	3–5	*Colletotrichum truncatum*
C_6	Darkgrey	Cottony	79.20	Falcate and spindle	Dark Brown	2–5	*Colletotrichum scovillei*
C_7	Whitishgrey	Fluffy	78.36	Falcate	Dark Brown	2–4	*Colletotrichum acutatum*
C_8	Lightbrown	Cottony	72.60	Falcate and spindle	Dark Brown	2–5	*Colletotrichm truncatum*
C_9	Creamy white	Cottony	68.81	Falcate	Dark Brown	4–6	*Colletotrichum scovillei*
C_{10}	Lightbrown	Cottony	87.90	Falcate	Dark Brown	2–5	*Colletotrichum truncatum*
C_{11}	Lightbrown	Fluffy	81.40	Falcate and spindle	Dark Brown	4–5	*Colletotrichum scovillei*
C_{12}	Creamy white	Cottony	71.43	Falcate	Dark Brown	4–6	*Colletotrichum truncatum*
C_{13}	Dullgrey	Cottony	78.90	Falcate	Dark Brown	3–5	*Colletotrichum truncatum*
C_{14}	Lightbrown	Cottony	78.95	Falcate	Dark Brown	2 -4	*Colletotrichum truncatum*
C_{15}	Dullgrey	Fluffy	62.96	Falcate and spindle	Dark Brown	3–6	*Colletotrichum truncatum*
C_{16}	Lightbrown	Fluffy	71.92	Falcate	Dark Brown	2–5	*Colletotrichums covillei*
C_{17}	Creamywhite	Cottony	74.80	Falcate	Dark Brown	4–5	*Colletotrichum acutatum*
C_{18}	Grey	Fluffy	79.43	Falcateand cylindrical	Dark Brown	4–6	*Colletotrichum gloeosporioides*
C_{19}	Creamywhite	Cottony	76.80	Falcate	Dark Brown	4–6	*Colletotrichum acutatum*
C_{20}	Dullgrey	Fluffy	85.60	Falcate and spindle	Dark Brown	4–6	*Colletotrichum truncatum*
C_{21}	Lightbrown	Fluffy	76.38	Falcate	Dark Brown	2–5	*Colletotrichumscovillei*
C_{22}	Lightbrown	Fluffy	76.20	Falcate	Dark Brown	2–3	*Colletotrichum fragariae*
C_{23}	Lightbrown	Fluffy	68.32	Falcate	Dark Brown	3–5	*Colletotrichum truncatum*
C_{24}	Blackish	Cottony	73.62	Falcate	Dark Brown	4–5	*Colletotrichum gloeosporioides*
C_{25}	Grey	Fluffy	75.21	Falcateand cylindrical	Dark Brown	3–5	*Colletotrichum truncatum*

C. scovilei were the culprits in the other areas. The various isolates varied greatly in terms of their morphological and cultural traits. The experiment's findings regarding cultural variability are consistent with those of other previous researchers. Ragul *et al.* (2019) revealed that all isolates of *C. capsici* produced fluffy mycelial growth. Veerappa *et al.* (2018) reported that among 60 isolates of *Colletotrichum* spp and among them *Colletotrichum capsici* isolates produced whitish-grey colony with irregular margin and flat texture. Grahovav *et al.,* (2012) reported that the variation in the cultures of *Colletotrichum* may be due to the variation in environment and bio types of the pathogen.

Conclusion

There were notable differences in the incidence of chilli fruit rot between different regions of Tamil Nadu. The incidence of the disease was higher in regions where monoculture of chilli was practiced. It might be the result of the pathogen inoculum gradually building up in greater quantities. Therefore, in order to reduce the severity of the disease, crop rotation with non-host crops is always preferable. The pathogenicity test showed that, out of the 25 isolates examined, all of the isolates produced disease to varied degrees. The isolate from Kovilpatti, known as C10, showed the highest incidence of fruit rot and highest percentage of leaf infection; these variations may have been caused by the local environment.The pin pricking technique, which was followed by spore suspension injection, tends to result in larger lesions among the various inoculation techniques tested. It clearly states that the method which wounds the skin of fruit resulted into larger lesions as it will be easy for the pathogen to enter and establish as discussed earlier. The presence of distinct pathogen strains and biotypes may be the cause of the variation in morphological and cultural characteristics. According to this study, the virulence of the isolates varies depending on the location and crop variety.

Conflict of Interest: None

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