



Survey of Chilli Anthracnose in Burhanpur District of Madhya Pradesh

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Abstract

The highest incidence of anthracnose was noticed in fields of Napanagar block. The least incidence of the disease was recorded in Dapora village of Burhanpur block. Among the blocks, highest disease incidence was recorded in Napanagar followed by Khaknar. The least incidence was noticed in Burhanpur block. The fungus produced initial symptoms of the disease between 5 to 7 days on infected leaves and fruits. The result revealed that green fruits exhibited maximum disease incidence followed by ripe fruits. However, least disease incidence was observed in infected leaves.

Key words : Chilli, *colletotrichum capsici*, anthracnose.

Introduction

India is the largest producer of chilli in the world accounting for over 45% of the total area under cultivation. Andhra Pradesh, Maharashtra, Karnataka, Orissa and Tamil Nadu account about 75% of the total area as well as production (1). In Madhya Pradesh chilli is grown in about 0.54mh area with 0.93mt annual production. It is an important cash crop of Nimar region of Madhya Pradesh. Madhya Pradesh ranks fourth in terms of chili production with the output making upto 9% of the country's production. Chilli is grown on 4,298 ha area with 22,349 ton annual production in Burhanpur district (2).

Among the various fungal diseases of chilli, anthracnose is one of serious disease on chilli to cause the yield loss and to reduce the quality of marketable fruits (3,4). Disease incidence is recorded from 20 to 80% on fruits of *Capsicum annum* in the field conditions and post harvest losses of fruit quality ranges from 21 to 47%. Severely infected crop by anthracnose which may cause yield losses of up to 50% (5).

Anthracnose derived from a Greek word "coal", which is common name for plant diseases characterized by very dark, sunken lesions, containing spores. Anthracnose of chilli was first reported from New Jersey, USA. Anthracnose disease can occur on leaves, stems and both pre and post-harvest fruits (6).

Materials and Methods

Survey of anthracnose disease was done at Burhanpur district from each block five fields were randomly selected. Diseased plant parts were collected in paper envelops and brought to the laboratory for isolation. From each selected field the observation on incidence of the disease was

recorded. Samples were brought in the laboratory then symptoms were recorded in detail. The tissues of affected plants showing the symptom of anthracnose were examined under the microscope for the presence of the causal agent. The samples were dried and store in separate envelopes.

The diseased fruits of chilli showing the anthracnose symptoms were washed thoroughly with tap water and small pieces from infected fruit were cut with the help of sterilized blade. These pieces were surface sterilized with 0.1% mercuric chlorides ($HgCl_2$) solution for one minute followed by three changes in sterilized distilled water to remove trace of $HgCl_2$. The pieces of surface diseased fruits were transferred aseptically to petri plates containing PDA. Inoculated Petri plates were incubated at $25 \pm 2^{\circ}C$ for seven days and examined at frequently intervals to see the growth of the fungus developing from different pieces.

The fungus was further purified by single hyphal tip method. They are grown by inoculating in the centre of a plain agar plate. The fungus will spread out with its hyphal stands in search of nutrients. These hyphal strands could be located under low power of the microscope, and the isolated hyphal tips marked. These tips are carefully transferred to potato dextrose agar slants. The bacteria could also be more easily eliminated by making the agar medium acidic.

The cultures of *Colletotrichum capsici* were purified by sub-culturing the single hyphal tip method and maintained by mass transfer on potato dextrose agar medium at room temperature. After purification these isolates of *Colletotrichum capsici* were identified by observing the colony against light with the naked eyes and later confirmed with the help of microscope.

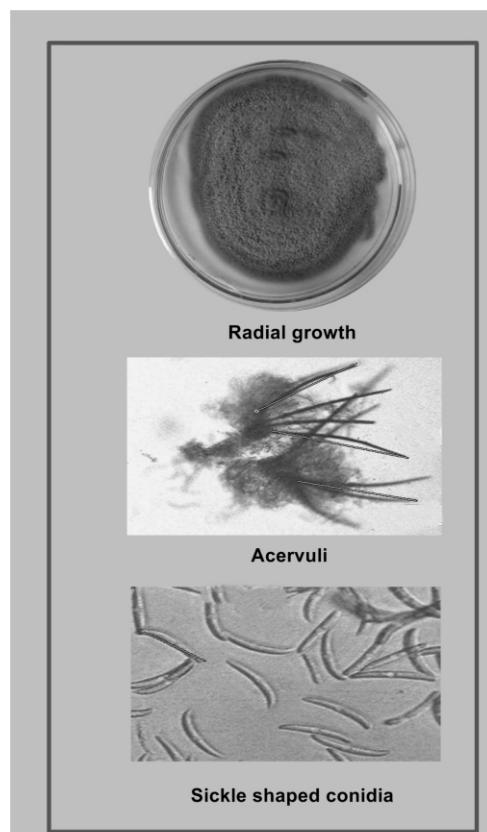
Table-1 : Incidence of Anthracnose in chilli from three blocks of Burhanpur district.

S. No.	Block	Village	PDI (%)
1.	Burhanpur	Rahipura	16.59
2.		Nimbola	24.34
3.		Bahadarpur	19.50
4.		Loni	27.36
5.		Fatepur	13.17
6.		Dapora	11.34
Mean PDI (%)			18.72
7.	Nepanagar	Basad	35.08
8.		Bori Khurd	20.49
9.		Nasirabad	14.78
10.		Borsal Ryt	30.24
11.		Nimna Ryt	23.10
Mean PDI (%)			24.74
12.	Khaknar	Lingwa	27.80
13.		Bedwalya	14.22
14.		Pura	18.07
15.		Gan	21.16
16.		Piplya	15.91
Mean PDI (%)			19.43

Pathogenicity test were conducted during the course which methods described by (7, 8). Healthy, ripe red and green chilli fruits were surface sterilised in 0.1% mercuric chlorides ($HgCl_2$) for 1 min separately and washed twice with sterile-distilled water, then air dried on sterile filter paper. Each fruit was inoculated with 1 μ L of a conidial suspension (1×10^6 conidial/mL), which was injected onto the non-wounded fruit surface using a microsyringe. Control fruits were treated with 1 μ L of distilled water. Each isolate was inoculated to five replicate fruits. The inoculated fruits were kept under high humidity by blotter papers. They were kept at room temperature and observed frequently for development of symptoms. Leaves of chilli selected for inoculation, were placed inside each petri plate. Leaves were sprayed with culture suspension of *C. capsici* with the help of atomizer. Petri plates with inoculated leaves were kept under high humidity by blotter papers. They were kept at room temperature and observed frequently for development of symptoms.

Results and Discussion

Survey : Roving survey was undertaken during Kharif 2017 to assess the severity of anthracnose of chilli around the Burhanpur district. The survey of chilli crop was conducted at the three blocks of Burhanpur viz., Burhanpur, Nepanagar and Khaknar in 16 locations. Percent disease Incidence (PDI) was recorded and presented in table-1 and Fig.-1.

**Plate-1 : Cultural and morphological characteristics of *Colletotrichum capsici*.**

The overall disease incidence was ranged from 11.34 to 35.08 per cent. The highest severity (35.08%) of anthracnose was noticed at Basad village of Nepanagar block. The least (11.34%) incidence was recorded in Dapora village of Burhanpur block. The highest mean disease incidence among the blocks were recorded in Nepanagar (24.74%) followed by Khaknar (19.43%). The least incidence was noticed in Burhanpur block (18.72%) (Table-1 and Fig.-1).

Out of six villages of Burhanpur block, the highest incidence was recorded in Loni (27.36%) followed by Nimbola (24.34%), Bahadarpur (19.50%), Rahipura (16.59%) and Fatepur (13.17%). The lowest incidence was noticed in Dapora village (11.34%).

Five villages of Nepanagar block viz., Basad, Bori Khurd, Nasirabad, Borsal Ryt, and Nimna Ryt were surveyed. Highest per cent disease index (PDI) was observed in Basad (35.08%) followed by Borsal Ryt, Nimna Ryt and Bori Khurd village (30.24, 23.10 and 20.49%, respectively).

In Khaknar block, out of five villages, only one village Lingwa (34.50%) showed disease incidence above 25%. Per cent disease incidence was lower than 20% in Pura (18.07%), Piplya (15.91%) and Bedwalya (14.22%).

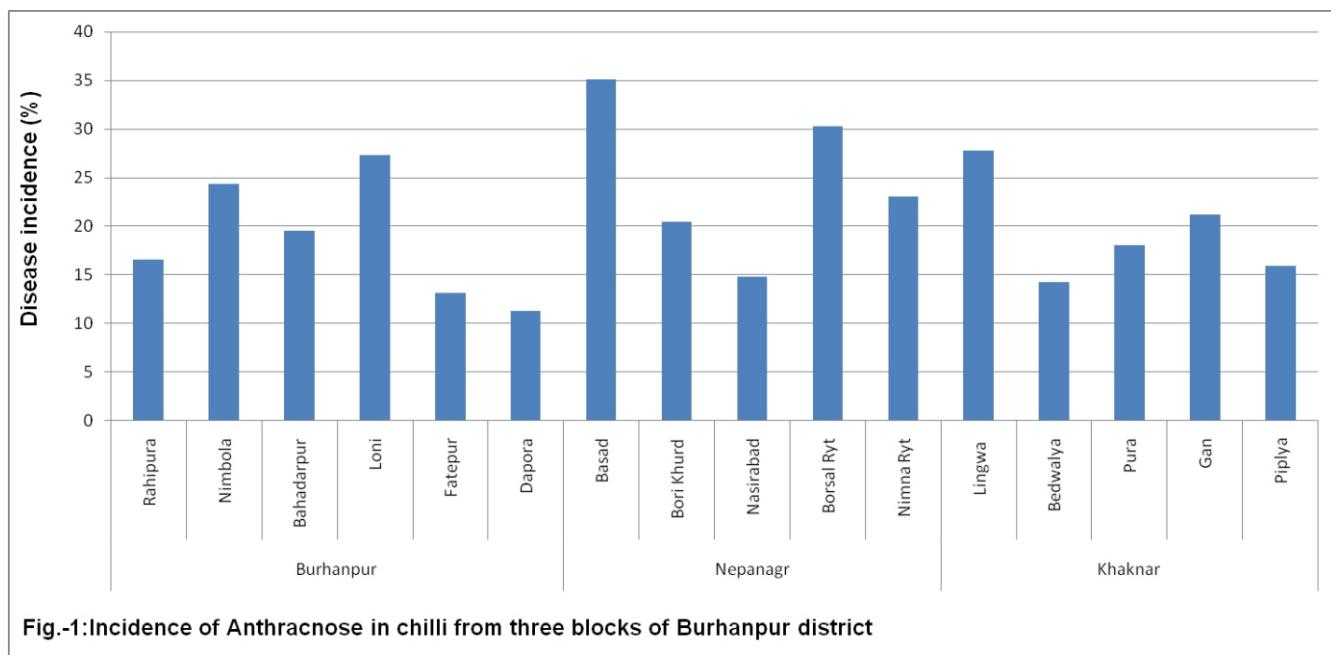
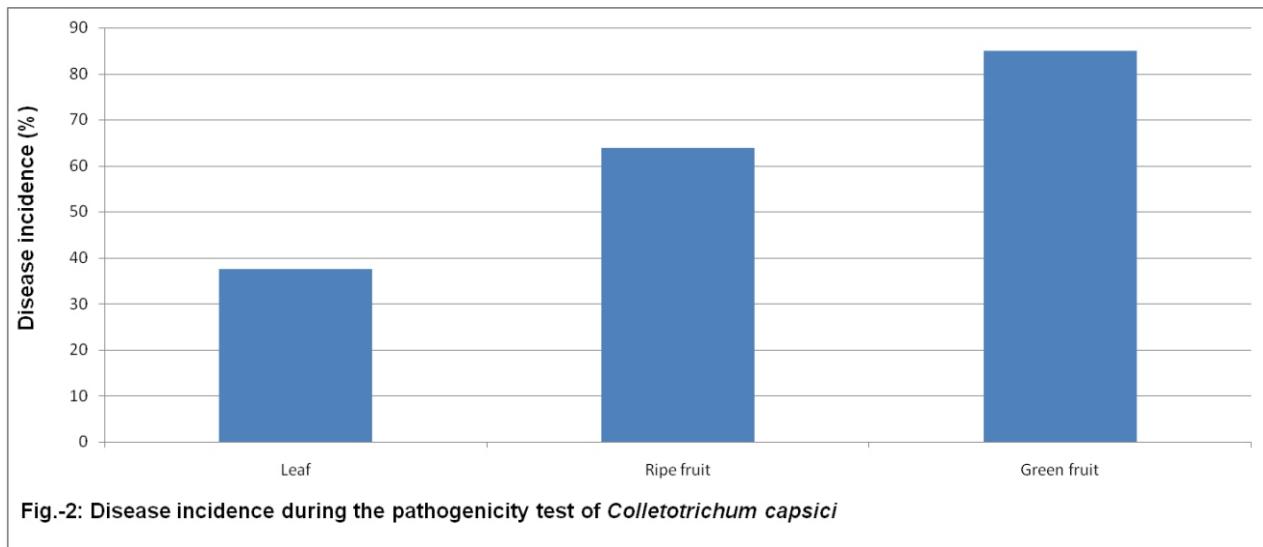


Fig.-1:Incidence of Anthracnose in chilli from three blocks of Burhanpur district

Fig.-2: Disease incidence during the pathogenicity test of *Colletotrichum capsici*

Isolation and Identification of associated fungi :

Infected fruit tissues of chilli collected from Burhanpur district were used for the isolation of the fungus. The pathogenic fungus was isolated on potato dextrose agar medium and purified by single spore isolation method. After inoculation and incubation as described in the material and methods, the white to light brown mycelia growth emerged from diseased leaf tissues on PDA medium in Petri plates. The fungus got isolated by single spore technique and transferring them to fresh slants containing potato dextrose agar medium. Pure culture of the fungus was obtained by several such transfers and kept viable by sub-culturing at the interval of 30 days. The pure culture thus obtained was maintained in the refrigerator at 4°C for further studies.

Microscopic examination of fungus revealed that the mycelium was septate with aseptate unbranched conidiophores. Conidia were sickle shaped, single celled, hyline, smooth walled with a central oil globule. The fungus started growing within 24 hours of inoculation. Hyphae were hyaline, septate, filled with several oil globules, producing initially cottony white, raised growth which later on turned grey to olive brown. The fungus produced submerged black dot like structures of pinhead size near the periphery of Petri-plates in circular ring fashion. Later on these acervuli ruptured and exuded orange pigmentation of spore mass in circular ring fashion (Plate-1). The fungus was identified as *Colletotrichum capsici* (Butler and Bisby) on the basis of morphological characters when compared with standard literature.

Pathogenicity : The pathogenicity of the isolates of *Colletotrichum capsici* causing anthracnose of chilli was proved by Koch's postulate under *in vitro* condition. Healthy chilli fruits and leaves collected from the fields were washed with tap water and then surface sterilized with 70% ethyl alcohol. *C. capsici* was cultured on PDA for 10 days. 5 mm agar plug of 10 days old pure culture of pathogen was placed on pierced area on chili leaves and fruits. Leaves and fruits were inoculated with sterilized water served as control. Inoculated fruits were kept in moistened Petri plates to maintain humidity and incubated at $28 \pm 2^{\circ}\text{C}$ and observed daily for the disease symptoms. Pathogen was re isolated from the infected fruits and compared with the original culture (Plate-2).

The fungus produced initial symptoms of the disease between 5 to 7 days on infected leaves and fruits. The data presented in table-3 revealed that green fruits exhibited 85 per cent disease incidence followed by ripe fruits (63.80 % disease incidence). However, least disease incidence (37.60 %) was observed in infected leaves (Fig.-2).

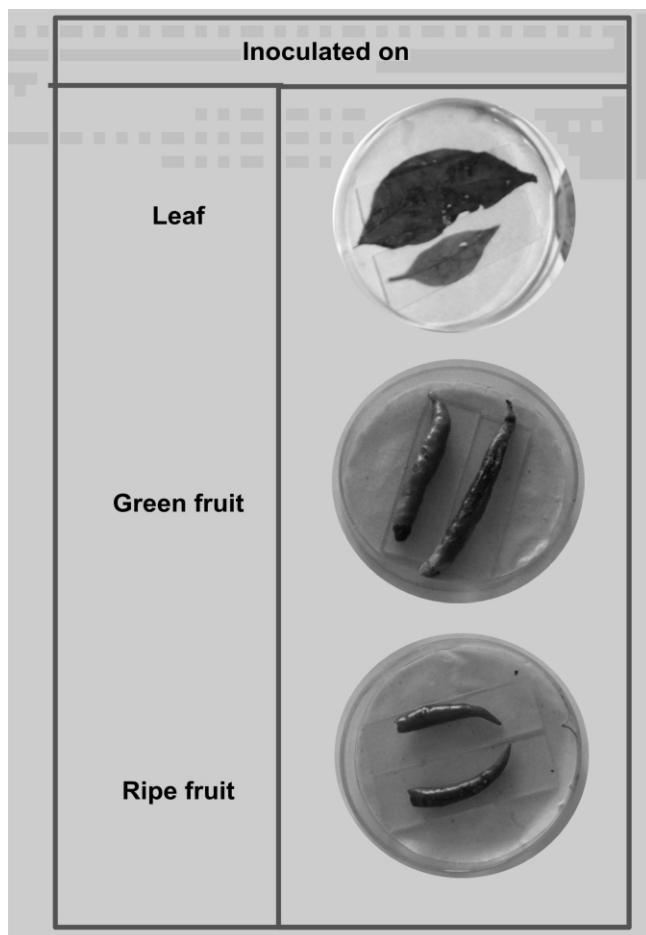


Plate-2 : The pathogenicity test of *Colletotrichum capsici*.

Table-2 : Disease incidence during the pathogenicity test of *Colletotrichum capsici*.

Inoculated on	Disease incidence (%)*)
Leaf	37.60 (37.71)**
Ripe fruit	63.80 (53.03)
Green fruit	85.00 (67.33)
SEm \pm	2.92
C. D. at 5%	6.35

* Mean of three replications

**Data in parenthesis are vper cent arc sin transformed values

In the present study on survey of anthracnose of chilli in Burhanpur district, the overall disease severity was ranged from 11.34 to 35.08 per cent. The highest severity of anthracnose was noticed in fields of Basad village of Nepanagar block. The least incidence of the disease was recorded in Dapora village of Burhanpur block. With respect to the block means, highest mean disease incidence was recorded in Nepanagar followed by Khaknar. The least incidence was noticed in Burhanpur block. (9) conducted a roving survey to know the severity of *Colletotrichum capsici* in Belagavi, Dharwad, Gadag and Haveri districts during kharif/rabi 2013-14.

Isolation, identification and purification of pathogen, the pathogen was isolated from diseased fruits of chilli successfully during the isolation procedure standers precautions were followed and pathogen was purified by single spore isolation method and then was maintained on PDA slants.

Pathogenicity test of isolated pathogen of Anthracnose disease occurred on leaves, stems, and both pre- and post-harvest fruits. The disease attacked seedling first causing the necrotic erumpent, brittle black circular spots on the cotyledons and primary leaves. The pathogen was recorded as necrotic brown, black spots on leaves surrounded by dark margin. Typical fruit symptoms are circular or angular sunken lesions, with concentric rings of acervuli that are often wet and produce pink to orange conidial masses. Under severe disease pressure, lesions may coalesce. Conidial masses may also occur scatteredly or in concentric rings on the lesions. Similar types of symptoms due to anthracnose pathogen in chilli have been reported by (10).

The fungus produced initial symptoms of the disease between 5 to 7 days on infected leaves and fruits. The result revealed that green fruits exhibited maximum disease incidence followed by ripe fruits. However, least disease incidence was observed in infected leaves. Earlier, (11) were tested the four methods of inoculation under *in vitro* condition to assess the effectiveness of infection.

Conclusions

A roving survey was undertaken during kharif 2017 to assess the incidence of chilli anthracnose at the three blocks of Burhanpur in 16 locations. The overall disease severity was ranged from 11.34 to 35.08 per cent. The highest incidence of anthracnose was noticed in Napanagar block followed by Khaknar and the least incidence was noticed in Burhanpur block. Anthracnose disease can occur on leaves, stems, and both pre- and post-harvest fruits. The disease attacked seedling first causing the necrotic erumpent, brittle black circular spots on the cotyledons and primary leaves. The pathogen was recorded as necrotic brown, black spots on leaves surrounded by dark margin. Typical fruit symptoms are circular or angular sunken lesions, with concentric rings of acervuli that are often wet and produce pink to orange conidial masses. Under severe disease pressure, lesions may coalesce. Conidial masses may also occur scatteredly or in concentric rings on the lesions. The fungus produced initial symptoms of the disease between 5 to 7 days on infected leaves and fruits. The result revealed that green fruits exhibited maximum disease incidence followed by ripe fruits. However, least disease incidence was observed in infected leaves.

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