

***Colletotrichum capsici*, pathogen alter nutritive value of green chilli (*Capsicum annum* L.)**

Dongre Mayur A.

mayurdon82@gmail.com

Post Graduate Department of Botany, S.S.V.P. Sanstha's L. K. Dr. P.R. Ghogrey Science College,
Dhule, Maharashtra, INDIA

Abstract

Capsicum annum L. belongs to family *Solanaceae*. is most widely grown vegetable in the world, and most popular in Asia. the most problematic disease in Asia who causes severe loss in production is caused by *Colletotrichum capsici*, disease known as anthracnose of chilli. Chilli fruit is consumed green as vegetable or red as a spice. Cultivation of chilli is affected by various factors like cultivation practices and handling during transportation and storage. Anthracnose is a disease caused by *Colletotrichum capsici*(syd.) E.J. Butler and Bisby (1931) infect both pre-harvest and post-harvest stage. *Colletotrichum capsici* infect the fruit at maturity and it may lead up to 50% lost in quality and quantity (Cannon *et al.*, 2011). Chilli is nutritionally rich in volatile oil, alkaloids, vitamins, protein, fibre and minerals.

Colletotrichum capsici were demonstrated to be highly resistant pathogen and causes disease to most chilli fruits (Taylor,2007).

In vitro inoculation and pathogenicity were tested and later nutrient content were analysed. Here we find that Water content, Total Carbohydrate, Reducing sugar, Dietary fibres, Lipids, vitamin C, Chlorophyll content was decline while protein, free amino acids and dry matter was found to be slightly elevated when compared with control.

Keywords: Capsicum, Colletotrichum, Vegetables

1. Introduction

Capsicum annum L. is most widely grown vegetable in the world, and most popular in Asia. the most problematic disease in Asia who causes severe loss in production is caused by *Colletotrichum capsici*, disease known as anthracnose of chilli.

Chilli is herbaceous annual dicotyledonous plant belongs to family *Solanaceae*. It found growing all over the world, among these India is also a main cultivar of chilli. In Maharashtra also a large area is seems to cultivate chilli.

Chilli fruit is consumed green as vegetable or red as a spice. Cultivation of chilli is affected by various factors like cultivation practices and handling during transportation and storage. Various biological agent decreases its quality and quantity which includes viruses, bacteria, fungi etc.

Anthracnose is a disease caused by *Colletotrichum capsici* (syd.) E.J. Butler and Bisby (1931) infect both pre-harvest and post-harvest stage. *Colletotrichum capsici* infect the fruit at maturity and it may lead up to 50% lost in quality and quantity (Cannon *et al.*, 2011). Chilli is nutritionally rich in volatile oil, alkaloids, vitamins, protein, fibre and minerals.

Colletotrichum capsici were demonstrated to be highly resistant pathogen and causes disease to most chilli fruits (Taylor,2007).

2. Material and Methods

For pathological study and nutritive study on chilli fruit, samples were collected from field as well as from market from where they are subjected to distributed as vegetable.

2.1 Symptoms of disease: -

The necrotic lesions are form at the site of infection, which later sunken and enlarge (Agrios, 2005). The symptoms developed only on fully ripe fruit, under humid condition, it appears as a sunken lesion with abundant orange conidial mass (Williams *et al.*, 1990). *Colletotrichum* easily adopt wide range of environment and infect many hosts (Sanders and Korsten, 2003).

2.2 identification of pathogen

Colletotrichum capsici was identified on the basis of morphological characters such as size and shape of conidia, existence of setae and culture characters (Smith and black, 1990).

Table I: Collection site, culture and morphological characters of *Colletotrichum capsici* on Green Chilli

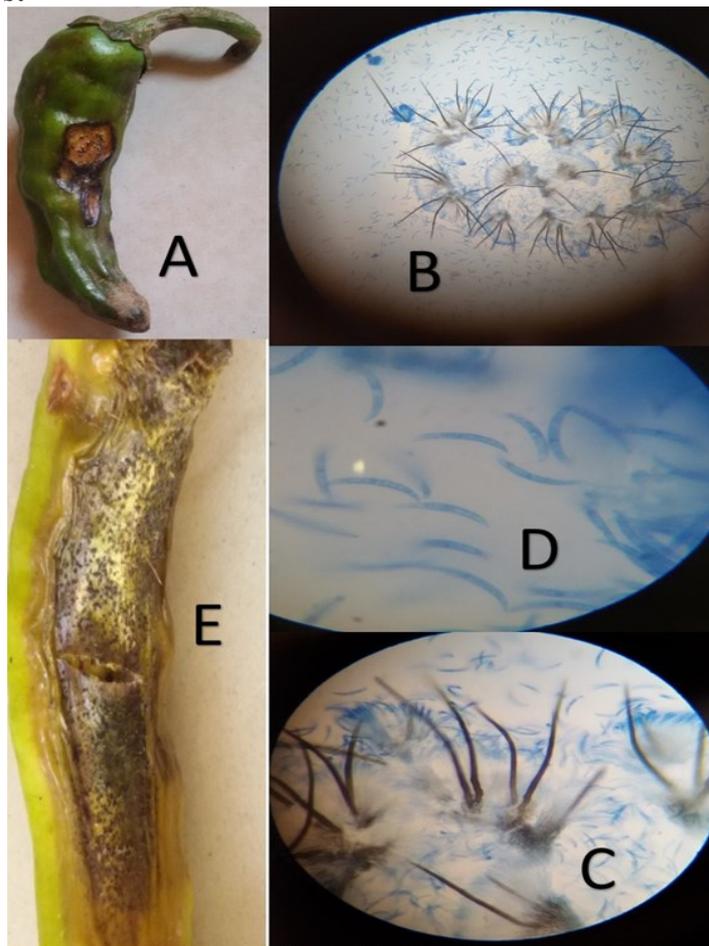
Sr. no.	Place of Collection	Geographical Data	Culture appearance on PDA plate		Conidia length X diameter μm
			Color of colony	Appearance	
1.	Khandesh -Dhule, Dongargaon	21°04'56.8"N 74°50'33.5"E	Grey	Irregular margin, fluffy mycelium	13.60 X 2.15
2.	Khandesh - Chalisgaon	20°27'50.5"N 74°59'55.2"E	Dark Grey	Irregular margin, fluffy mycelium	14.25 X 3.30
3.	Ulhasnagar, Thane	19°13'30.3"N 73°09'42.2"E	Grey	Irregular margin, fluffy mycelium	12.50 X 2.45
4.	Kolhapur	16°44'00.5"N 74°14'42.1"E	Grey	Irregular margin, fluffy mycelium	15.98 X 2.80
5.	Vidharbha – Tirora	21°24'19.8"N 79°56'00.9"E	Grey	Irregular margin, fluffy mycelium	14.45 X 2.55
6.	Vidharbha –Nagpur, Itwari	21°09'09.5"N 79°06'43.0"E	Greyish	Irregular margin, fluffy mycelium	16.00 X 3.20
7.	Marathwada, Nanded , Naigaon	18°50'46.6"N 77°31'42.9"E	Grey	Irregular margin, fluffy mycelium	15.30 X 2.10
8.	Marathwada, Parbhani	19°15'10.5"N 76°47'38.4"E	Greyish	Irregular margin, fluffy mycelium	15.50 X 2.15
9.	Nashik. Ozar	20°06'19.1"N 73°56'29.6"E	Grey	Irregular margin, fluffy mycelium	15.75 X 3.00
10.	Konkan, Lonere	18°10'18.1"N 73°20'15.5"E	Greyish	Irregular margin, fluffy mycelium	14.20 X 2.54

2.3 Morphology of pathogen:

Culture characters:

The isolated pathogen was first placed on the PDA medium and kept it for 7 days under dark condition. The colony was started growth as jelly like growth after 2 days of inoculation. Later it forms cottony and puffy structure with uneven margin. The colour of colony was usually grey in colour.

Mycelium characters:



The mycelium is greyish in colour, forms smooth circular margin, the conidia of *Colletotrichum capsici* 13 to 16 μm in length and 2-3 μm in diameter (Yun *et al.*, 2009). Setae are long and ranges from 70 μm to 110 μm in length, width of setae same to that of conidial width.

Image:- Image: Green chilli showing infection of *Colletotrichum capsici* (A), Acervulli of pathogen showing setae and conidia (B and C), Conidia (D) and Diseased developed after testing for pathogenicity (E).

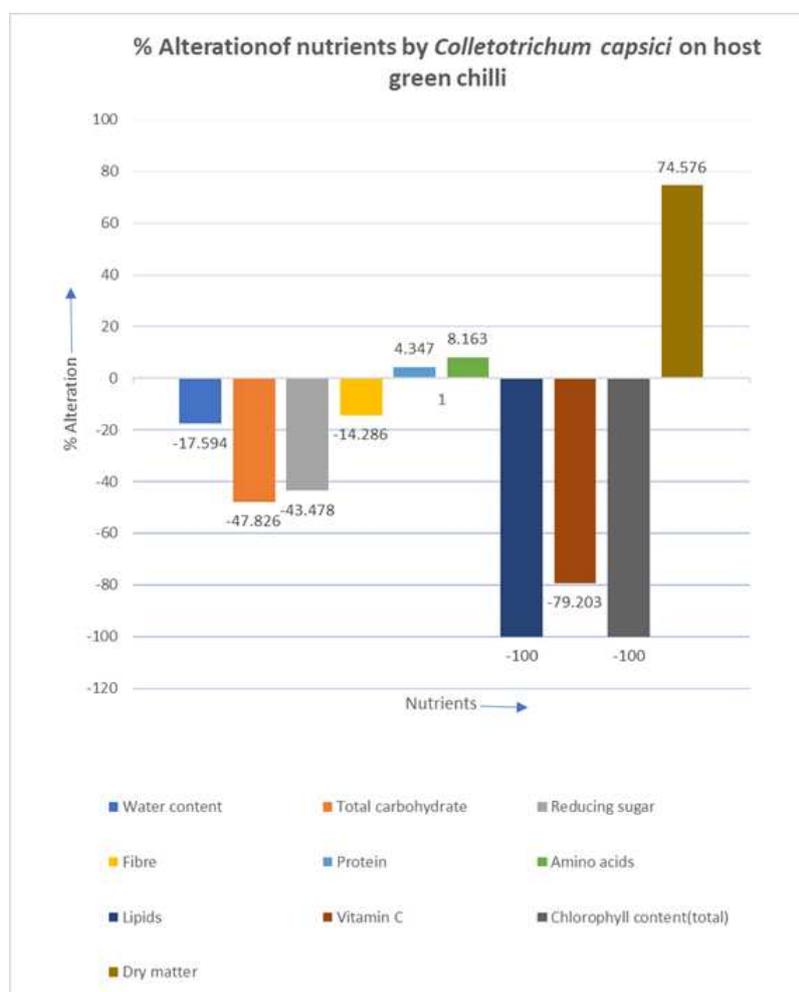
2.4 Pathogenicity test: -

The culture was inoculated on the mature chilli fruit in garden condition and the symptoms confirm its pathogenic nature. The diseased symptoms i.e. anthracnose was observed after four days of inoculation at 28 ± 1 °C.

Table II: Nutrient content in Healthy and Diseased vegetables and % alteration of content by *Colletotrichum capsici*

Sr. No.	Nutrient	Healthy Grams or mg / 100 Grams	Diseased Grams or mg / 100 Grams	% alteration in nutrient
1.	Water content	88.1 Grams	72.6 Grams	-17.594
2.	Total carbohydrate	9.2 Grams	4.8 Grams	-47.826
3.	Reducing Sugar	4.6 Grams	2.5 Grams	-43.478
4.	Fibres	2.1 Grams	1.8 Grams	-14.286
5.	Protein	2.3 Grams	2.4 Grams	4.347
6.	Lipid content	0.98 Grams	1.06Grams	8.163
7.	Free amino acid content	0.3 Grams	00 Grams	-100
8.	Vitamin C content	226mg	47mg	-79.203
9.	Chlorophyll content	230mg	00mg	-100
10.	Dry matter	11.8 Grams	20.6 Grams	74.576

2.5 Nutrient alteration study:



Total Carbohydrate was estimated by Hedge, J E and Hofreiter, B T (1962) Antrone method. absorbance with 630nm using systronics 2202 double beam UV- Visible spectrophotometer. Crude fibre is mainly consisting of cellulose and lignin and some minerals. Acid and alkali treatment the cellulose and lignin were degraded. The initial and final weight after ignition at 600 °C give the crude fibre content in the sample. Reducing sugar were estimated using arsinomolybdate reagent by following the method of Nelson-Somogyi. Lawry method was followed for estimating protein. Oil from were extracted through Soxhlet apparatus using Petroleum ether as solvent, following the protocol given by Bligh, E.G., and Dyer, W.J., (1959) and Sadasivam S. and Manickam, (2005). Ninhydrin method was applied for estimation of free amino acids. Dry matter content and water content were analysed by using procedure given by Ruck (1969). Vitamin C content estimated by using 2,6- dichlorophenol-endophenol dye solution, procedure given by Sadasivam and Manickam.

Graph: Nutrient content in Healthy and Diseased vegetables and % alteration of content by *Colletotrichum capsici* on green chilli.

3. Conclusion

Colletotrichum capsici and its pathogenicity was proved by artificial inoculation of pure culture of pathogen. This pathogen cause severe loss to quality and quantity of green chilli.

This pathogen is most abundant among the field and market of Maharashtra. Nutrients like Protein, free Amino acids and dry matter are seems to be elevated while other content are reduced which includes Vitamin C, Carbohydrate (Reducing and Non reducing), lipid, water etc.

4. Acknowledgements:

Author is thanking to farmers and shopkeepers who permit for visiting and collecting samples and also thankful to principal of S.S.V.P. S's L.K. Dr. P.R. Ghogrey Science College, Dhule for providing laboratory.

References: -

- Agrios, G.N. 2005. Plant Pathology, 5th edition, Academic Press San Diego. Pp. 922.
- Butler, E.J. and Bisby G.R. 1931. The Fungi of India. The Imperial Council of Agriculture Research, India. pp262. Available online on <https://ia601600.us.archive.org/29/items/FungiIndia/FungiIndia.pdf>
- Cannon, P. F., Damm, U., Johnston, P. R., Weir, B.S., 2011. Morphology, Molecular phylogeny and pathogenicity of *Colletotrichum panacicola* causing anthracnose of Korean ginseng. Plant Pathol. J., 27:1-7
- Fangling, Liu., Guiting, Tang., Xiaojuan, Zheng., Ying, Li., Xiongang, Sun., Xiaobo, Qi., You, Zhou., Jing, Xu., Huabao, Chen., Xioli, Chang., Sirong, Zhang. and Guoshu, Gong. 2016. Molecular and phenotypic characterization of *Colletotrichum* species associated with anthracnose disease in peppers from Sichuan Province, China. Scientific reports. Available online on www.nature.com/articles/srep32761.pdf .
- Hedge, J.E. and Hofreiter, B.T. (1962). Determination of reducing sugar and carbohydrates: Anthrone colorimetric method, Methods in Carbohydrate chemistry, 17 (Eds. Whistler R.L. and B.Miller, J.N., Academic press, New York. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1265672/pdf/biochemj00980-0166.pdf>