Int.J.Curr.Microbiol.App.Sci (2018) *7*(12): 1829-1834

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 12 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.712.213

In vivo Cross Pathogenicity of *Colletotrichum gloeosporioides* causing Anthracnose of Mango with Subtropical Fruits and Weeds Host

Sanjeev Leharwan[1], V.K. Malik[2]*, Rajender Singh[2] and Munish Leharwan[1]

Department of Plant Pathology, CCS Haryana Agricultural University, Hisar-125004, Haryana, India

**Corresponding author*

Keywords

Cross pathogenicity, *Colletotrichum gloeosporioides*, Mango, Fruits and weeds host

Article Info

Accepted:
15 November 2018
Available Online:
10 December 2018

A B S T R A C T

Anthracnose disease of mango causes by *Colletotrichum gloeosporioides* (Penz.) Penz and Sacc. is one of the most devastating pathogen in mango, which behaves differently to varied host crops in their symptom development, severity and adaptability. So, an *in vivo* study was conducted to know reaction of some fruits crop and weeds to *C. gloeosporioides*. Our study found that the pathogen was capable to infect all fruit crops evaluated (citrus, grape, guava, papaya and strawberry) and two weeds (Ulta kanta and Santhi), but failed to infect three weeds (amaranthus, cassia and kanghi butti). Mycelial growth pattern and pigmentation varied from circular to suppressed and white, pinkish to black respectively. This cross inoculation experiments will help us to demonstrated variations in the level of host preference among *C. gloeosporioides* isolates from different fruit crops and weeds host and help in study of survival of fungal pathogen.

Introduction

Mango (*Mangifera indica* L.) is one of the most important and popular fruit crop in tropical and sub-tropical regions (Shad *et al*. 2002), belonging to the family *Anacardiaceae*, which is grown in more than 110 countries of the world. Although mango is considered to be a hardy plant, it is exposed to various pathogens, which infect and disturb the normal physiological functions during growth and development. Anthracnose caused by *C. gloeosporioides*, is recognized as one of the most important pre and post-harvest disease limiting mango fruit production worldwide (Arauz, 2000). In India, this disease was first reported by Stevens and Pierce in 1933 and it is widely distributed in the entire mango growing states of the India causing huge economic loss. In India, fruit losses in the field due to this disease have been estimated to the tune of 2-3 per cent (Prakash, 1998). The pathogen causes black spot, leaf blight, blossom blight, fruit rot and in severe cases die-back (Sangeetha, 2003; Akem, 2006). The pathogen poses a threat to many economically important crops such as mango, almond, avocado, apple, Arabica coffee, guava, dragon fruit, cassava, sorghum and strawberry (Amusa *et al*., 2005 and Masyahit *et al*.,

2009). Cross pathogenicity studies on *C. gloeosporioides* reveals that the isolates obtained from mango are also pathogenic to different fruits crops. Earlier, The fungus *C. gloeosporioides* has been isolated from 23 fruit crops in Sri Lanka (Alahakoon *et al*., 2008). Fungus-host relationships are broad, imprecise and often overlapping (Freeman *et al*., 2000). *Colletotrichum* species can infect many hosts and may adapt to new environments (Photita *et al*., 2004), leading to serious cross infection problems in plant production. The study of pathogenic variability of *Colletotrichum* sp. is therefore important and the understanding of the host range of a particular pathogen may help in efficient disease control and management.

Materials and Methods

Collection, isolation, purification and maintenance of culture

Mango leaves having typical symptoms of anthracnose of mango were collected from the orchard of CCS Haryana Agricultural University, Hisar. Infected portions of leaves were cut into small pieces along with some healthy portion, they were surface sterilized with 0.1% mercuric chloride (HgCl2) solution for 30 seconds and then rinsed 3-4 times in distilled sterilized water so that all the traces of mercuric chloride were removed. The bits were then aseptically placed on potato dextrose agar slants and incubated at 28±1^{0}C for 7 days. The stock culture was maintained on potato dextrose agar medium at 5±1^{0}C and subcultured after every 30 days.

Pathogenicity test

To prove Koch's postulate, the pathogenic nature of the fungus (*C. gloeosporioides*) isolated from diseased leaves of mango was artificially inoculated on leaves and fruits of highly susceptible variety Dashehari using pin prick method. The inoculated leaves and fruits were placed in sterilized desiccators containing sterilized distilled water. The symptoms were observed on inoculated leaves and fruits.

Reaction of some fruits crop and weeds to *C. gloeosporioides*

The experiment was conducted in field conditions to study the cross infection potential of mango anthracnose. Five different fruit crops viz. *Psidium guajava* (guava), *Vitis vinifera* (grape), *Citrus nobilis* X *Citrus deliciosa* (kinnow mandrin), *Carica papaya* (papaya), *Fragaria ananassa* (strawberry) and five weeds viz. *Abutilon bidentatum* (kanghi butti), *Achyranthus aspera* (ultakanta), *Amaranthus viridis* (jungle cholai), *Casia tora*, *Trianthema portulacastrum* (santhi) were used to see the reaction of host to *C. gloeosporioides*. Surface sterilized fruits of all fruit crops and the leaves of weeds were inoculated (pinprick method) with spore suspension (3×10^4 conidia /ml) of *C. gloeosporioides* prepared from 8 days old culture. Fruits with sterile distilled water served as the control. After inoculation the leaves and fruits were covered with polythene bags for 12 hrs in order to maintain relative humidity. Observations were taken after 7 days and the infection on the hosts was recorded.

Results and Discussion

Isolation and identification

The associated pathogen was isolated from infected leaves and pure culture of the fungus was obtained on potato dextrose agar media. The cultural characters of the test fungus were studied and the fungus produces circular white to pale brown colour growth on culture medium (Plate 1).

Pathogenicity test

In study of pathogenicity test the symptoms observed on inoculated leaves and fruits were similar to those observed in natural infection. Re-isolations made from artificially inoculated leaves and fruits consistently yielded the culture which was identical to one used for inoculation of leaves and fruits. Thus, pathogenicity was successfully proven by the use of artificial inoculation techniques (Plate 2).

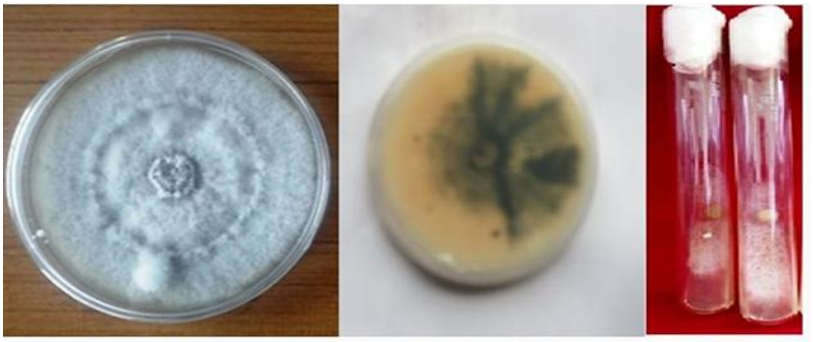
Reaction of some fruit crops and weeds to *C. gloeosporioides* inoculation

In this study, five fruit crops (citrus, grape, guava, papaya and strawberry) and five weeds (amaranthus, cassia, kanghi butti, ulta kanta and santhi) were inoculated with spore suspension (3x 10^4 spore per ml) of *C. gloeosporioides* using pin prick method in the field conditions for fruit crops and in screen house conditions for weeds. The relative humidity was maintained by covering inoculated parts with polythene bags. It is evident from the Table 1 that fungus was found to infect all fruit crops and two weeds (ulta kanta and santhi). Fungus did not infect three weeds namely amaranthus, cassia and kanghi butti. In case of fruit crops infection was noticed on fruits only except on grape where infection was found on leaves and fruits. The infection was limited to leaves only in case weed plants (Plate 3).

Table.1 Reaction of some fruit crops and weeds to *C. gloeosporioides*

S No.	Common name	Scientific Name	Reaction [Infection (+) or No infection (-)]
1	Citrus *(kinnow)*	*C. nobilis* × *C. deliciosa*	+
2	Guava	*Psidium guajava*	+
3	Grape	*Vitis vinifera*	+
4	Papaya	*Carica papaya*	+
5	Strawberry	*Fragaria ananassa*	+
6	Amaranthus	*Amaranthus viridis*	-
7	Casia	*Cassia tora*	-
8	Kanghi Butti	*Abutilon bidentatu*	-
9	Ulta Kanta	*Achyranthus aspera*	+
10	Santhi	*Trianthema portulacastrum*	+

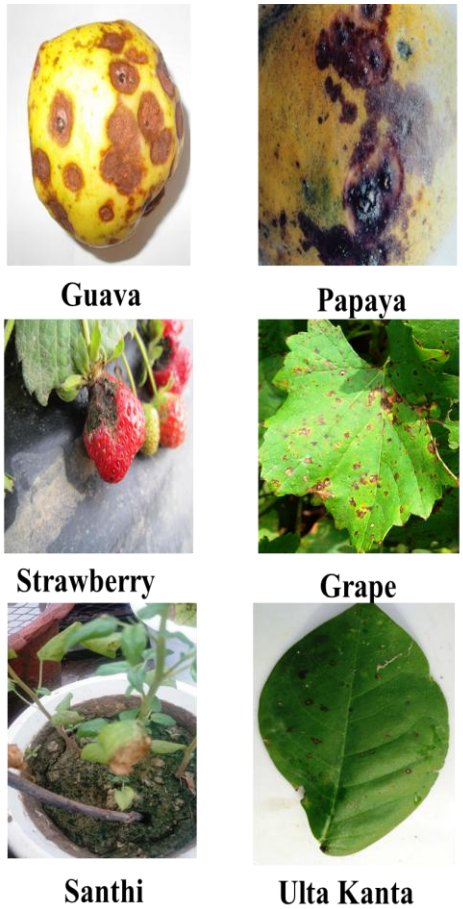
Plate.1 Pure culture of *C. gloeospioides*



A. In Petri plate B. Rear side of Petri plate C. In Test-tubes

Plate.2 Pathogenicity of *C. gloeospioides*

Plate.3 *Fruit* crops and weeds showing symptoms of anthracnose following inoculation with *C. gloeosporioides*



C. gloeosporioides, the causal agent of anthracnose of mango (*Mangifera indica* L.) is a devastating pre and post-harvest fungal disease which has wide occurrence and causes substantial yield losses. In India, the pathogen has been reported to infect wide range of cultivated crops, including the mango crop (Sharma and Kulshrestha, 2015). Host range studies determine the susceptibility of different hosts to the particular pathogen and thus provide information needed for understanding its perpetuation from one season to another. In the present study, out of 10 hosts only seven namely citrus, grape, guava, papaya, strawberry, ulta kanta and santhi showed the symptoms of the disease. There is lot of information worldwide regarding *C. gloeosporioides* causes mango anthracnose is pathogenic to more than 470 different host plant at various development stages of plants (Prusky and Plumbley, 1992 and Ploetz and Prakash, 1997. The cross pathogenicity of *C. gloeosporioides* on different fruit crops was supported by the finding of (Sharma and verma, 2007) that the isolates obtained from mango, citrus, guava had capability to infect the host of each other. This study established the possibility of cross infection between host organisms in the case of *C. gloeosporioides* with respect to examined varieties of hosts. This could result in the development of model orchards of mango mixed cropping systems, with the motto of an integrated, safe and convenient means of reducing post-harvest losses in fruit crops.

References

Akem, C.N. (2006). Mango anthracnose disease: present and future research priorities. *Plant Pathology Journal*, 5(3):266-273.

Alahakoon, P.W. and Brown, A.E. (2008). Host range of *Colletotrichum gloeosporioides* on tropical fruit crops in Sri Lanka. *International Journal of Pest Management*, 40: 23-26.

Amusa, N.A., Ashaye, O.A., Oladapo, M.O. and Oni, M.O. (2005). Guava fruit anthracnose and the effects on its nutritional and market values in Ibadan, Nigeria. *World Journal of Agricultural Sciences*, 1: 169-172.

Arauz, L.P. (2000). Mango anthracnose: Economic impact and current options for integrated management. *Plant Disease*, 84: 600-611.

Freeman, S., Shabi, E. and Katan, T. (2000). Characteriszation of *Colletotrichum acutatum* causing anthracnose of anemone (*Anmone coronaria* L.). *Applied and Environmental Microbiology*, 66(12):5267–5272.

Masyahit, M., Sijam, K., Awang, Y. and Satar, M.G.M. (2009). The First report of the occurrence of anthracnose disease caused by *Colletotrichum gloeosporioides* (Penz.) Penz. &Sacc. On Dragon Fruit (*Hylocereus* spp.) in Peninsular Malaysia. *American Journal of Applied Sciences*, 6: 902-912.

Photita, W., Lumyong, S., Lumyong, P., McKenzie, E.H.C. and Hyde, K.D. (2004). Are some endophytes of *Musa acuminata* latent pathogens. *Fungal Diversity*, 16:131–140.

Ploetz, C.R.L. and Prakash, O. (1997). Foliar, floral and soil borne diseases. In: The Mango. R.E. Litz (Eds.), CAB International, Wallingford, UK. *Fruit Diseases*. pp. 281- 325.

Prakash, O. (1998). Diseases of mango. In: O. Prakash (Eds.), *Mango Cultivation*. Lucknow: International Book Distributing Co., pp. 301-338.

Prusky, D. and Plumbley, R.A. (1992). Quiescent infections of Colletotrichum in tropical and subtropical fruits. Pp 289-307. In Colletotrichum: Biology, Pathology and Control [edited by Bailey, J.A.; Jeger, M.J.] CAB

International, Wallingford, UK.

Sangeetha, C.G. (2003). Studies on anthracnose of mango caused by *Colletotrichum gloeosporioides* (Penz.) Penz and Sacc. Ph.D. Thesis, University of Agricultural Sciences, Bangalore, India

Shad, M.A., Ansari, T.M., Pervez, H., Rubab Mahmood, T. (2002). Changes in sugar, amino acid and mineral content of leaves of two mango varieties affected by quick decline disease. *Journal of Biological Science*, 2:694-696.

Sharma, A. and Verma, K.S. (2007). *In vitro* cross pathogenicity and management of *Colletotrichum gloeosporioides* causing anthracnose of mango. *Annals of Plant Protection Sciences,* 15(1):186-188.

Sharma, M. and Kulshrestha, S. (2015). *Colletotrichum gloeosporioides*: An anthracnose causing pathogen of fruits and vegetables. *Biosciences Biotechnology Research Asia,* 12(2), 1233-1246.

Stevens, F.L. and Peirce, A.S. (1933). Fungi from Bombay. *Indian Journal of Agricultural Sciences*, 3: 912-916.

Whitelaw-Weckert, M.A., Curtin, S.J., Huang, R., Steel, C.C., Blanchard, C.L. and Roffey, P.E. (2007). Hylogenetic relationships and pathogenicity of *Colletotrichum acutatum* isolates from grape in subtropical Australia. *Plant Pathology*, 56(3):448-463.

How to cite this article:

Sanjeev Leharwan, V.K. Malik, Rajender Singh and Munish Leharwan. 2018. *In vivo* Cross Pathogenicity of *Colletotrichum gloeosporioides* causing Anthracnose of Mango with Subtropical Fruits and Weeds Host. *Int.J.Curr.Microbiol.App.Sci.* 7(12): 1829-1834.
doi: https://doi.org/10.20546/ijcmas.2018.712.213