

Screening of papaya cultivars against anthracnose disease caused by *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc.

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Abstract

Seventeen papaya (*Carica papaya* L.) cultivars were screened against *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc. causing anthracnose disease of papaya under laboratory conditions to identify sources of resistance for the disease. Papaya fruits of different cultivars were brought into the laboratory and ten fruits from each cultivar were inoculated with a spore suspension of *C. gloeosporioides* and incubated for disease development. Disease severity and the percent disease index (PDI) were calculated. The reactions of different cultivars were classified into resistant, moderately resistant, susceptible and highly susceptible based on PDI. Shillong, Pusa Dwarf, Solo and Washington varieties were found to have susceptible reactions, while all the other varieties tested were highly susceptible. Data revealed that there was no variety showing a resistant or moderately resistant response.

Key words: anthracnose, *Colletotrichum gloeosporioides*, papaya, varietal screening

Introduction

Papaya (*Carica papaya* L.) is one of the most popular fruit plants grown widely under tropical and sub-tropical climates. It is the most important fruit plant in home gardens, and green papaya is also used as a vegetable¹. It is one of the few fruit plants which yields throughout the year, gives quick returns and adapts itself to various soil and climatic conditions.

Papaya fruit has a very thin skin and therefore rough handling leads to heavy losses due to a number of rots caused by fungi and bacteria. Commercial papaya production has been hampered worldwide due to the high susceptibility of the crop to various diseases. Of the important diseases, anthracnose caused by *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc. is the most serious disease that affects the ripened fruit. The disease is prevalent wherever papaya is grown² and becomes more prominent during marketing and at consumer level.

Differences in resistance among cultivars against *Colletotrichum gloeosporioides* have been reported for several other crops including rubber, eggplant, cashew, water yam, banana, avocado, and mango³. However, there was no evidence of the fruits of papaya having temporary resistance against anthracnose disease at any developmental stage. According to Duran *et al*⁴, at all stages examined, papaya fruits were susceptible to anthracnose disease. It was suggested that a combination of native papaya genotypes may show resistance to the disease, or not show symptoms. Although no known cultivars of papaya offer complete resistance to anthracnose, the Hawaiian cultivar 'Sunrise Solo' has found some resistance to infection by *C. gloeosporioides*, more than 'Kapoho Solo'⁵.

In view of the above, the current study was undertaken to screen different cultivars of papaya to *C. gloeosporioides* for anthracnose disease resistance.

Materials and methods

All field and laboratory experiments were conducted at the Indian Institute of Horticultural Research (IIHR), Hessaraghatta, Bangalore from June 2002 to February

2004. Papaya fruits of different cultivars were harvested at the ripening stage and were brought to the laboratory for screening against anthracnose disease. Papaya fruits of the following cultivars were screened in the experiment.

Papaya varieties used for screening against anthracnose disease:

- | | |
|-----------------------------|---------------------------|
| 1. Pink Fleshed Sweet (PFS) | 10. CO-4 |
| 2. Pusa Nanha (PN) | 11. CO-5 |
| 3. Tainung-1 (TN-1) | 12. Coorg Honey Dew (CHD) |
| 4. Tainung-2 (TN-2) | 13. Solo |
| 5. Shillong | 14. Surya |
| 6. Pusa Dwarf (PD) | 15. Thailand |
| 7. AC 119 | 16. Washington |
| 8. CO-1 | 17. Mauritius |
| 9. CO-2 | |

Ten days old monoconidial cultures of *Colletotrichum gloeosporioides* grown on potato dextrose agar (PDA) were scraped with a sterilized scalpel and transferred into a conical flask containing 50 ml of sterilized distilled water under aseptic conditions. A uniform, homogenized spore suspension was obtained by agitating on a rotary shaker for 15 minutes. The spore concentration was adjusted to 10⁶ spores/ml after counting the number of spores in a haemocytometer with the aid of a 10x binocular microscope.

Ten fruits from each cultivar were used to screen for resistance against anthracnose disease in this experiment. Fruits were washed with tap water and dipped in a spore suspension of *C. gloeosporioides* for ten minutes. Fruits were kept in a humid chamber for 48 hours and then transferred into plastic crates and kept at a room temperature of 28±1 °C.

Disease severity of fruits six days after the inoculation of the pathogen was recorded using a 0-5 scale as described below. In addition, the number of days taken to develop the first symptom was also recorded.

<u>Scale</u>	<u>Description of symptoms</u>
0	Fruits free from infection
1	Spots covering less than 5% fruit surface
2	Spots covering over 5-10% area
3	Spots covering over 10-25% area
4	Spots covering over 25-50% area
5	Spots covering more than 50% area

The per cent disease index (PDI) was calculated using the following formulae.

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total number of observations}} \times \frac{100}{\text{Maximum rating observed}}$$

The cultivars were then classified into different reactions based on PDI as described below.

<u>Reaction</u>	<u>Per cent disease index (PDI)</u>
Resistant	0-10
Moderately resistant	10.1-25
Susceptible	25.1-50
Highly susceptible	50.1 and above

Results and discussion

Seventeen cultivars were screened against anthracnose disease of papaya under laboratory conditions to identify sources of disease resistance. The reaction of different cultivars to the diseases was classified into resistant, moderately resistant, susceptible and highly susceptible categories as presented in Table 1.

There was little variation observed among tested varieties when screened against anthracnose disease. All the varieties screened developed initial symptoms in 3 days except CO-5 which showed symptoms 4 days after inoculation. Data revealed that, there was no variety found in the category of resistant or moderately resistant response with regard to the PDI. The reaction of different cultivars against anthracnose disease was found only in the categories of susceptible and highly susceptible. Shillong, Pusa Dwarf, Solo and Washington cultivars were found to have a susceptible reaction while all the other cultivars tested were highly susceptible (Table 1). Among highly susceptible cultivars, AC 119 and Shantha had higher PDI (79 and 70) while CO-2, Mauritius, Thailand and Tainung-2 had lower PDI. Cultivar Solo had the lowest PDI (42) among all the cultivars tested. Shillong and Washington cultivars had the highest PDI among susceptible cultivars.

Table 1: Reaction of different papaya germplasm against anthracnose disease

Variety/germplasm	Number of days taken for first symptom to appear	PDI	Reaction*
Pusa Fleshed Sweet (PFS)	03	60	HS
Tainung-2 (TN-2)	03	52	HS
Shillong	03	49	S
Pusa Dwarf	03	45	S
AC 119	03	79	HS
CO-5	04	68	HS
Shantha	03	70	HS
Coorg Honey Dew (CHD)	03	64	HS
Tainung-1 (TN-1)	03	58	HS
Solo	03	42	S
Surya	03	64	HS
Thailand	03	53	HS
Washington	03	49	S
CO-1	03	67	HS
CO-2	03	51	HS
CO4	03	60	HS
Mauritius	03	53	HS

* S = susceptible HS = highly susceptible

Conducting a similar experiment, Nakasone and Aragaki⁵ reported that no known cultivars of papaya offered complete resistance to anthracnose but the Hawaiian cultivar 'Sunrise Solo' had some resistance to infection by *C. gloeosporioides*, more than 'Kapoho Solo'. The current study also indicates that none of the tested varieties had resistance reaction with this pathogen.

An intensive search will be necessary to identify cultivars with resistance, but this will be a long-term process. Selections must also take place of the environment where the crop is to be grown because varieties imported from elsewhere are often agronomically

unsuitable. Since many papaya growing countries have very little material from which to select, the first priority will be to establish germplasm collections for initial evaluation.

Conclusions

No sources of resistance were identified during screening of germplasms against anthracnose disease of papaya. All the cultivars tested showed either a susceptible or highly susceptible disease reaction to *C. gloeosporioides*. Shillong, Pusa Dwarf, Solo and Washington cultivars were found to be susceptible (S) while all the other cultivars tested were highly susceptible (HS) to the disease.

Acknowledgements

The first author is thankful to the Sri Lanka Council for Agricultural Research Policy (CARP), Colombo, Sri Lanka, for the grant of a postgraduate scholarship and financial assistance during the course of studies.

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