J. Mycopathol. Res. **44**(1) : 143-146 (2006)

Symptomatology, host range and control of a fruit rot disease of *Coccinia indica*

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During April to August in 2003-2004, a widespread severe new fruit rot of *Coccinia indica* Wight and Arn., caused by *Fusarium moniliformae* Sheldon was observed in local markets of Allahabad. Symptoms, pathogenicity and host range of the causal organism was studied. *In-vitro* and *in-vivo*, evaluation of fungicides were done against the pathogen. Bavistin and Ziram-500 performed well in inhibiting the fruit loss from *Fusarium moniliforme*, and were found more effective than others; thus these fungicides have been recommended for the control of the disease. This rot of *C. indica* is hitherto unrecorded.

Key Words : Symptomatology, host range, control, rot disease, *Coccinia indica*, *Fusarium moniliformae*

INTRODUCTION

During a recent survey of rot diseases (April-August in 2003-2004) a new fruit rot of *Coccinia indica* Wight and Arn., was observed in the local markets of Allahabad district (U.P.). The causal organism has been identified as *Fusarium moniliforme* Sheldon. Earlier the *Fusarium* sp. were found causing soft rot of papaya (Lal *et al.*, 1980); banana and bael (Arya *et al.*, 1986). Biswas and Das (2001) reported that *Fusarium moniliformae* Sheld, the causal fungus of Bakanae disease of rice, appeared primarily on 'Boro corp' in West Bengal and reported to cause about 10% loss in yield under field condition.

Other fungi associated with this fruit are *Bipolaris tetramera* (Mc Kinney) Shoemaker; *Macrophomina phaseolina* (Tassi.) Goidanich (Sharma, 2004) and *Oidium erysiphoides, Pythium aphanidermatum, Choanephora infundebulifera* and *Puccinia cephalandrae indicae* (Bilgrami *et al.*, 1979). The persual of pertinent literature reveals that occurrence of this disease is new to science (Jamaluddin *et al.*, 2001). Thus in the present paper its control with ten fungicides has been tried and also its symptomatology and host range have been recorded.

MATERIALS AND METHODS

During survey of various markets, diseased fruits of *Coccinia indica* were colleced in clean polyethylene bags and brought to the laboratory, washed with sterile water and then cleaned with 90% alcohol. Isolations were made on P.D.A. petriplates and single spore culture of *F. moniliforme* prepared by the method designated by Keyworth (1959). The identification was confirmed by I.A.R.I., New Delhi (I.T.C.C. No. 5745). Pathogenicity test was conducted, Reisolations were made from the diseased portions to confirm the Koch's postulates. The minimum inhibitory concentration of the fungicides was determined by Poisoned food technique (Nene and Thapliyal. 1979).

For *in-vivo* studies, both pre and post-inoculation

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treatments (dips) were given to the fruits. They were first dipped in known concentration of chemicals for 10 minutes for pre-inoculation treatments and were allowed to dry for 3-4 h, thereafter inoculated with the fungus. In post-inoculation treatments, fruits were first inoculated with the pathogen and after a lapse of 24 h they were dipped in different concentrations of fungicides for 10 minutes. In the control series in place of chemicals the fruits were dipped in sterelized distilled water. Treated fruits were incubated for 8 days, thereafter, the percentage of fruits protected was determined with the help of formula suggested by Lal *et al.*, (1981).

$$\text{Percentage control} = \frac{\text{Per cent decay in control-per cent decay in treatment}}{\text{Per cent decay in control}} \times 100$$

$$\text{Where per cent decay} = \frac{(W - w)}{W} \times 100$$

where W = weight of the fruits before incubation
w = weight of the fruits after removal of the infected tissue.

RESULTS AND DISCUSSION

Symptomatology

The beginning of rot was observed as a brown coloured spot alongwith slight softening of the tissue of fruit. Within 3 days of infection cottony growth of fungus was recorded over infected spot but later after 8 days of infection extensive white mycelial growth appeared on the whole surface of fruit. The decay progressed rapidly and caused rotting of the fruit along with the emission of foul odoured yellow coloured liquid. Finally after 10 days the fruit became pulpy and deformed, and 100% decay of fruit was observed.

Pathogenicity test

The pathogenicity test was conducted by inoculating the test pathogen on its host. The per cent of infection observed after the incubation period of 8 days was found to be 100%.

Host Range

Cross inoculations were made in order to study the comparative parasitic ability of the fungus (Table 1).

Table 1 : Host range of *Fusarium moniliforme*

Name of the fruits/vegetables	*Fusarium moniliforme*
Capsium annum Linn. (shimla mirch)	–
Carica papaya Linn. (papaya)	+
Citrullus vulgaris Schared. (tinda)	+
Citrus sinensis (Linn.) Osbeck (orange)	+
Citrus limon (lemon)	+
Cucurbita maxima (bottle gourd)	+
**Daucus carota* (carrot)	+
Lycopersicon esculentum Mill. (tomato)	+
Mangifera indica Linn. (mango)	+
Musa paradisiaca Linn. (banana)	+
Phaseolus vulgaris (seem)	+
Pisum sativum Linn. (pea)	+
Psidium guajava Linn. (guava)	+
**Solanum tuberosum (potato)	–
Solanum melongena Linn. (brinjal)	–
Vitis vinifera Linn. (grapes)	+
****Zingiber officinale* (ginger)	+

+ Indicates susceptible to infection.
– Indicates not susceptible to infection.
* root ** tuber ***rhizome

Evaluation of fungicides

Different ten fungicides were employed in this study to evaluate their fungitoxicity against the pathogenic fungus. Both *in-vitro* and *in-vivo* studies were done.

(i) *In-vitro studies of fungicides*

Poisoned food technique was employed and presence or absence of growth of pathogen was recorded after the 7 days of incubation (Table 2). The minimum inhibitory concentration required to control the pathogen was determined.

(ii) *In-vivo studies of fungicides*

Some fungicides were selected through *in-vitro* studies and used in further investigation of *in-vivo* studies (Table 3).

It can be clearly depicted from the data in Table 3 and Fig. 1 that post inoculation treatment with Difolatan and Bavistin were more effective then pre-inoculation treatment showing 22% and 48% disease control respectively at 1250 ppm. Dithane M-45 could show 32% reduction of disease at 500 ppm. Ziram-500 and Anustin at concentration of 1000 ppm were able to control 46% and 27% of disease through pre-inoculation treatment.

Table 2 : Effect of different concentrtions of fungicides on the growth of *Fusarium moniliforme*.

Fungicides	Concentration in ppm	*Fusarium moniliforme*
Captan	100	+
	250	+
	500	+
	750	+
	1000	+
Blitox	100	+
	250	+
	500	+
	750	+
	1000	+
Difolatan 80W	100	+
	250	+
	500	+
	750	+
	1000	–
Bavistin	100	–
	250	–
	500	–
	750	–
	1000	–
Tecto-40	100	+
	250	+
	500	+
	750	+
	1000	–
Indofil	100	+
	250	+
	500	+
	750	+
	1000	+
Dithane M-45	100	–
	250	–
	500	–
	750	–
	1000	–
Ziram-500	100	+
	250	+
	500	–
	750	–
	1000	–
Anustin	100	+
	250	–
	500	–
	750	–
	1000	–
Dithane Z-78	100	+
	250	+
	500	+
	750	+
	1000	+

\+ Shows the presence of the fungal growth
– Shows the absence of the fungal growth

Table 3 : Effect of different fungicides in checking (expressed as per cent control) the disease under investigation.

Fungicides	Concentration in ppm	*F. moniliforme*	
		Pre*	Post*
Difolatan	750	10.0	6.0
	1000	18.0	12.0
	1250	24.0	22.0
Bavistin	750	24.0	18.0
	1000	48.0	41.0
	1250	59.0	48.0
Dithane M-45	250	16.0	11.0
	500	24.0	32.0
	750	27.0	25.0
Ziram–500	500	19.0	17.0
	750	23.0	26.0
	1000	46.0	41.0
Anustin	500	4.0	6.0
	750	14.0	12.0
	1000	227.0	25.0

* Pre = Pre-inoculation treatment
** Post = Post-inoculation treatment

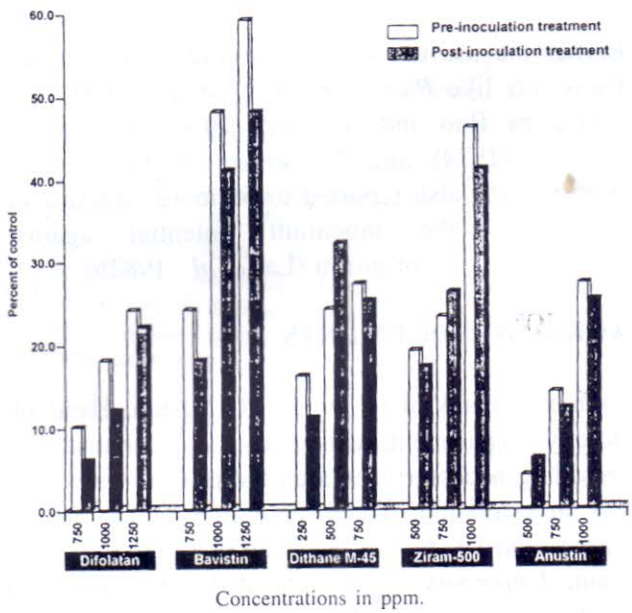

Fig. 1 : Showing efficacy of different fungicides in checking (expressed as per cent control) the disease under investigation.

Pathogenicity test reveals the fungus was capable of infecting the host and satisfied the Koch's postulates. Table 1 revealed that pathogen is capable of infecting large number of fruits and vegetable be-

longing to different families. It was clear that the *F. moniliformae* could infect the fruits of *Carica papaya, Citurllus vulgaris, Citrus sinensis, Citrus limon, Cucurbita maxima, Lycopersicon esculentum, Mangifera indica, Musa paradisiaca, Phaseolus vulgaris, Pisum sativum, Psidium guajava, Vitis vinefera,* root of *Daucus carota* and rhizome of *Zingiber officinale* while tuber of *Solanum tuberosum* and fruits of *Capsicum annum* and *Solanum melongena* were found resistant to this fungus. The data in Table 2 clearly depicted that among all the ten fungicides some were found to be effective while others were unable to check the growth of the pathogen. Results summerized in Table 3 indicated that Bavistin showed excellent performance at 100 and 1250 ppm concentration. Efficacy of Ziram was satisfactory at 500 and 750 ppm but superior results were obtained at 1000 ppm. Thus the use of Ziram-500 and Bavistin is suggested.

Earlier the use of Bavistin in controlling various fruits rots like *Phomopsis* fruit rot has been suggested by Rao and Agarwal (1976), Khare and Dhingra (1974) and Lal *et al.* (1981; 1982a). Bavistin was also reported to be more effective in minimizing the inoculum potential against *Thielaviopsis* rot of guava (Lal *et al.*, 1982b).

ACKNOWLEDGEMENTS

Author is thankful to Dr. D. R. Mishra, Head of Botany Department, University of Allahabad for providing necessary research facilities to carry out this investigation. Thanks are due to Dr. G. L. Tewari and Dr. B. Lal Ex-Head of Botany Department, University of Allahabad for his valuable guidance throughout this work.

REFERENCE

Arya, A., Lal B., Agarwal, R. and Srivastava, 1986. Some new fruit rot diseases-II : Symptomatology and host range. *Indian J. Mycol. Pl. Pathol* **16**(3) : 165-169.

Bilgrami, K. S., Jamaluddin and Rizwi, M. A. 1979. Fungi of India (Part-I). Today and Tomorrow's printers and publishers, New Delhi.

Biswas, S. and Das, S. 2001. Incidence of bakanae disease of rice in West Bengal and spread of the causal fungus within the host. *Proceeding of the National Symposium on Tropical Mycology in the 21st century*, Department of Botany, Calcutta University, 8-10 February, 2001. (Abstract) pp 18-19.

Jamaluddin, Goswami, M. G. and Ojha, B. M. 2001. *Fungi of India.* Scientific publisher, Jodhpur.

Keyworth, W. G. 1959. A modified La Rue cutter for selecting single spore and hyphal trip. *Trans. Bot. Mycol. Soc.* **42** : 53-54.

Khare, M. N. and Dhingra, O. D. 1974. *In vitro* and *in vivo* testing of fungicides against *Phomopsis carica papayae* causing fruit rot of papaya (*Carica papaya* L.) *Jour. N.K.V.V. Research Journal.* **8** : 254.

Lal, B. and Arya, A. 1980. Three new fusarial rots of Papaya, *Nat Acad. Sci. Letters,* **3**(3) pp 73.

Lal, B., Arya, A. and Rai, R. N. 1981. A new soft rot of 'Ber' caused by *Phomopsis natsume* and its control. *Ind. Phytopath.* **34** : 361-363.

Lal, B., Arya, A., Rai, R. N. and Tewari, D. K. 1982a. A new soft rot of "Aonta" caused by *Phomopsis phyllanthi* Punith and its chemical control. *Nat Acad. Sci. Letters,* **5**(6) : 183-185.

Lal, B., Rai, R. N., Arya, A. and Tewari, D. K. 1982b. Chemical control of *Thielaviopsis* rot of guava. *Indian J. Hort.* **39**(3 & 4) : 293-294.

Nene, Y. L. and Thapliyal, P. N. 1979). *Fungicides in Plant Disease control.* Oxf and IBH Publication Co. New Delhi.

Rao, D. P. C. and Agarwal, S. C. 1976. Efficacy of fungicides against *Phomopsis* fruit rot of guava. *Indian Phytopath.* **29** : 345.

Sharma, V. 2004. *Physiological and pathological studies of certain fungi causing fruit rot diseases.* D. Phil. Thesis, University of Allahabad, Allahabad.

(Accepted for publication December 12 2005)