Journal of Tropical Agriculture 34 (1996) : 121-124

EVALUATION OF MANGO FRUITS IN STORAGE FOR RESISTANCE AGAINST ANTHRACNOSE (*COLLETOTRICHUM GLOEOSPORIOIDES* PENZ) AND *DIPLODIA* STEM END ROT (*DIPLODIA NATALENSIS* POLE EVANS)

A. K. Banik, S. A. K. M. Kaiser[1] and R. S. Dbua
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur 741 235, West Bengal, India

Abstract: A total number of 28 cultivars of mango fruits were evaluated against the anthracnose pathogen (*Colletotrichum gloeosporioides* Penz) and *Diplodia* stem end rot pathogen (*Diplodia natalensis* Pole Evans) after harvest using hypodermic needle method of inoculation on the Gangetic plains of West Bengal, India during the months from May to July of 1992 and 1993. A wide range of variation in respect of disease reaction occurred among the test cultivars. The average grade ranged from resistant to highly susceptible. Among the 28 cultivars tested, 13 cultivars, namely Alphonso, Langra Banarasi, Chandankosa, Dashehari, Lakshmanbhog, Lalphuli, Langra, Mohanbhog, Piaraphuli, Saradamonibhog, Sarikhas, Totapuri and Zardalu were resistant while seven cultivars namely, Amrapalli, Biswanath Chatterjee, Bombay Yellow, Fazli, Gulabkhas, Kohitoor and Safdar Pasand were moderately resistant to *C. gloeosporioides.* Among those 28 cultivars only three cultivars namely, Alphonso, Krishnabhog and Totapuri Red Small were resistant while eight cultivars, namely Dashehari, Biswanath Chatterjee, Lakshmanbhog, Lalphuli, Piaraphuli, Saradamonibhog, Totapuri and Zardalu were moderately resistant to *D. natalensis.* The remaining cultivars were moderately susceptible to highly susceptible in reaction against the respective pathogen.

Key words: Anthracnose, *Diplodia* stem end rot, mango cultivars, resistance, screening.

INTRODUCTION

Fungi belonging to some 20 different genera are known to attack mango (*Mangifera indica* L.) causing a variety of post-harvest decay in Indian market (Pathak, 1980). Among them, anthracnose caused by *Colletotrichum gloeosporioides* Penz. and *Diplodia* stem end rot caused by *Diplodia natalensis* Pole Evans are the two major post-harvest diseases of mango which cause appreciable damage to the ripe fruit in storage (Tandon, 1967) and thereby reduce its market value under favourable climatic conditions (Pathak and Srivastava, 1967).

Some workers have reported the relative susceptibility of different cultivars of mango fruit to both *C. gloeosporioides* and *D. natalensis* in storage (Srivastava *et al.*, 1965; Pathak and Srivastava, 1967; Tandon and Singh, 1968; Sohi *et al.*, 1973). But most of those observations were made out of naturally infected fruit samples collected from different parts of the country. Knowledge on the selection of resistant cultivars through artificial inoculation is, however, scanty and hence the study.

MATERIALS AND METHODS

The study was undertaken at the Bidhan Chandra Krishi Viswavidyalaya (BCKV), Kalyani (23.5 N, 89°E) located on the Gangetic plains of West Bengal during the months of May to July of 1992 and 1993. A total number of 28 cultivars of mango fruits were included in the present study. Fruits of different test cultivars were collected from an orchard of the Horticultural Research Station, Mondouri (22.5° N, 88.2° E) of BCKV. The soil of the experimental field was alluvial and the pH varied from 6.0 to 6.8. The age group of mango plants grown under normal agronomic practices varied from 15 to 20 years. From an ecological point of view, the existing weather conditions in the Gangetic plains at Kalyani are conducive for the development of both anthracnose and *Diplodia* stem end rot of mango (Banik, 1995).

Highly virulent strains of both *C. gloeosporioides* and D. *natalensis* were isolated from the affected fruits of a susceptible mango cultivar Himsagar and were used in the experiment. Pathogenicity of the two isolates

[1]Agricultural Research Complex, Bidhan Chandra Krishi Viswavidyalaya, Kalyani 741 235, W. Bengal, India

Table 1. Average disease index, per cent fruit rot and type of disease reaction

C. gloeosporioides Average disease index	*D. natalensis* % *fruit rot*	Reaction
1.0 to 1.5	20	Resistant
1.6 to 2.5	21 to 40	Moderately resistant
2.6 to 3.0	41 to 60	Moderately susceptible
3.1 to 4.5	61 to 80	Susceptible
4.6 to 5.0	81 to 100	Highly susceptible

was retained by filtering through the same susceptible cultivar Himsagar in each crop season. The cultures were maintained on potato dextrose agar medium and subcultured at fortnightly interval.

In the experimental procedure, mature fruits of the test cultivars were harvested before ripening during the third week of May to the third week of June as the case arose and those were taken to the laboratory, washed in running tap water followed by washing in distilled water and then air dried. Air dried fruits after surface sterilization were inoculated in separate sets with the individual pathogen following the hypodermic method of inoculation described by Banik (1995). Each of the test cultivars contained 10 fruits in five replications. Inoculated fruits were placed on aluminium racks and were incubated at fluctuating temperature between 24° to 37° C under 12 hours of continuous light and darkness. Symptoms appeared on those fruits in about seven and five days after Inoculation with *C. gloeosporioides* and *D. natalensis* respectively. Disease incidence was recorded on individual fruit basis with the help of a disease rating scale of 1 to 5 in respect of *C. gloeosporioides* while in respect of *D. natalensis* it was recorded on percentage basis (% fruit rot) as described by Banik (1995). After calculating the average disease index per fruit, or per cent fruit rot as the case arose, the type of disease reaction in a test cultivar was determined as shown in Table 1.

The cultivars which showed resistant to moderately resistant reaction were included for further testing in the next year and the remaining cultivars were excluded.

RESULTS AND DISCUSSION

Results on the reaction of different cultivars against *C. gloeosporioides* and *D. natalensis* are presented in Table 2 and Table 3 respectively. A wide range of variation in respect of disease reaction occurred among the test cultivars. The average grade ranged from resistant to highly susceptible. Among the 28 cultivars tested, 13 cultivars, namely Alphonso, Langra Banarasi, Chandankosa, Dashehari, Lakshmanbhog, Lalphuli, Langra, Mohanbhog, Piaraphuli, Saradamonibhog, Sarikhas, Totapuri and Zardalu were resistant while seven cultivars, (Amrapalli, Biswanath Chatterjee, Bombay Yellow, Fazli, Gulabkhas, Kohitoor and Safdar Pasand) were moderately resistant to *C. gloeosporioides*. Among the 28 test cultivars, only three cultivars, namely Alphonso, Krishnabhog and Totapuri Red Small were resistant while eight cultivars (Biswanath Chatterjee, Dashehari, Lakshmanbhog, Lalphuli, Piaraphuli, Saradamonibhog, Totapuri and Zardalu) were moderately resistant to *D. natalensis*. The remaining cultivars were moderately susceptible to highly susceptible in reaction against the respective pathogens.

A great degree of variability in respect of reaction against C. *gloeosporioides* and *D. natalensis* was also recorded among the different cultivars of mango fruit by some workers. Srivastava *et al.* (1965) from market survey observed that varietal losses due to *C. gloeosporioides* were 15% in Dashehari, 13% in Himsagar, 8% in Bombay and 6% in Alphonso while Tandon and Singh (1968) from orchard survey reported no loss due to *C. gloeosporioides* in varieties Langra and Dashehari. Sohi *et al.* (1973), however, reported that varietal losses due to *C. gloeosporioides* in Bangalore markets were 30% in Alphonso. In respect of *D. natalensis*, Chakravarti and Srivastava (1964) estimated 10% varietal infection in Langra while Srivastava *et al.* (1965) observed that varietal losses were 6.5 to 20% in Dashehari, 7.5 to 12% in Bombay and 9% in Totapuri. Pathak and Srivastava (1967) from

Table 2. Reaction of different cultivars of mango fruit against anthracnose pathogen *C. gloeosporioides*

Cultivar	Average dis. index	Reaction
Alphonso, Langra, Banarasi, Chandankosa, Dashehari, Lakshmanbhog, Lalphuli, Langra, Mohanbhog, Piaraphuli, Saradamonibhog, Sarikhas, Totapuri, Zardalu	1.0 to 1.5	Resistant
Amrapalli, Biswanath Chatterjee, Bombay Yellow, Fazli, Gulabkhas, Kohitoor, Safdar Pasand	1,8 to 2.5	Moderately resistant
Khasulkhas, Mallika, Totapuri Red Small, Zehanara	2.1 to 3.5	Moderately susceptible
Krishnabhog, Meghlanthan	3.8 to 4.5	Susceptible
Bombay Green, Himsagar	4.6 to 5.0	Highly susceptible

Table 3. Reaction of different cultivars of mango fruit against *Diplodia* stem end rot pathogen D. *natalensis*

Cultivar	Fruit rot, %	Reaction
Alphonso, Krishnabhog, Totapuri Red Small	13.5 to 18.3	Resistant
Biswanath Chatterjee, Dashehari, Lakshmanbhog. Lalphuli, Piaraphuli, Saradamonibhog, Totapuri, Zardalu	22.3 to 37.5	Moderately resistant
Amrapalli, Fazli, Langra Banarasi	47.8 to 54.7	Moderately susceptible
Chandankosa, Gulabkhas, Langra, Mohanbhog, Sarikhas	61.3 to 76.2	Susceptible
Bombay Green, Bombay Yellow, Himsagar, Khasulkhas, Kohitoor, Mallika, Meghlanthan, Safdar Pasand, Zehanara	81.3 to 100	Highly susceptible

market survey in Delhi, however, reported that varietal losses due to *D. natalensis* were 6.2% in Langra and 4.2% in Totapuri.

From the observations made by different workers stated above, it appears that the cultivar Alphonso was resistant to moderately susceptible while the cultivars Bombay, Dashehari, Himsagar, Langra and Totapuri were resistant to *D. natalensis.* In the present study also the cultivars Alphonso, Dashehari, Bombay Yellow and Langra were resistant to C. *gloeosporioides* while Dashehari and Totapuri were resistant to *D. natalensis.* But the cultivars Alphonso and Himsagar reported to be moderately susceptible and resistant respectively against *C. gloeosporioides* were found resistant and highly susceptible respectively against this pathogen in the present study. It is also interesting to note that the cultivars Bombay and Langra reported resistant against *D. natalensis* were found susceptible to highly susceptible in the present case. This variation in respect of disease reaction might be attributed to the change of environment of races of the pathogens involved in the screening process. Moreover, those workers made their observations over natural infection and not through artificial inoculation in any case as it was done in the present study. Reports on the selection of mango cultivars through artificial inoculation on this aspect is however lacking.

From the results of the present study it also appears that resistance against *C. gloeosporioides* and *D. natalensis* is common to nine cultures (Alphonso, Biswanath Chatterjee, Dashehari, Lakshmanbhog, Lalphuli, Piaraphuli, Saradamonibhog, Totapuri and Zardalu). This resistance as observed in the present study may be further exploited for the development of multiple resistance against other

important post-harvest diseases of mango, namely black rot (*Aspergillus niger*), *Sclerotium* rot (*S. rolfsii*)and bacterial rot (*Pseudomonas mangiferae indicae*) prevalent in the diverse agro-ecosystem of India taking into account some physicochemical characters of fruits also.

ACKNOWLEDGEMENT

This forms a part of the Ph.D thesis of the senior author submitted to the Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal. The authors are thankful to the Department of Agriculture, Government of West Bengal for the financial help.

REFERENCES

Banik, A. K. 1995. Studies on pre and post-harvest treatments on shelf life of mango with special reference to major diseases. Ph.D thesis. BCKV, West Bengal, p. 55-62

Chakravarti, D. K. and Srivastava, D. N. 1964. Stem end rot of orange and mango fruit incited by *Diplodia natalensis* Pole Evans. *Curr. Sci.* 33 : 285

Pathak, V. N. 1980. *Diseases of Fruit Crops.* Oxford & IBH Pub. Co.. New Delhi

Pathak, V. N. and Srivastava, D. N. 1967. Mango losses due to *Diplodia* stem end rot. *Trop. Agric.* 123 : 75-77

Sohi, H. S., Sokhi, S. S. and Tiwari, R. P. 1973. Studies on the storage rot of mango caused by *Colletotrichum gloeosporioides* Penz. and its control. *Phytopath.* 12 : 114-116

Srivastava, M. P., Tandon, R. N., Bhargava, S. N. and Ghosh, A. K. 1965. Studies on fungal diseases of some tropical fruits : III. Some post-harvest diseases of mango. *Proc. Nat. Acad. Sci. India* 35B : 69-75

Tandon, I. N. and Singh, B. B. 1968. Control of mango anthracnose by fungicide. *Indian Phytopath.* 21 : 212-216

Tandon, R. N. 1967. Post-harvest diseases of tropical and subtropical fruits. Technical Report, PL 480 Scheme (FG-IN-133), University of Allahabad, Allahabad