
Diseases of Major Fruit Crops in the red and lateritic zones of West Bengal

S. A. K. M. KAISER AND B. SAHA

Department of Plant Pathology, Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur 741252, West Bengal

Diseases of major fruit crops in the red and lateritic zones of West Bengal need to be explored. Investigation carried out for the period from 1996 to 2001, however, revealed that mango is mainly affected by anthracnose (*Colletotrichum gloeosporioides*) and *Diplodia* stem end rot (*Diplodia natalensis*) followed by leaf blight (*Macrophoma mangifera*) and powdery mildew (*Oidium mangiferae*). The major problem of guava was wilt (*Fusarium solani* f. sp. *psidii*) and some post harvest fruit rots incited by species of *Colletotrichum*, *Rhizopus*, *Aspergillus* and *Fusarium*. On citrus, canker (*Xanthomonas citri*) was endemic and greening (mycoplasmal disease) was a problem on mosambi. Seedling blight incited by species of both (*Pythium spinosum*) and *Fusarium* was a serious problem in cashew followed by die-back (*Pythium spinosum*) and anthracnose (*Colletotrichum gloeosporioides*), while litchi suffered mainly from postharvest fruit rots due to *Fusarium semitectum*, *Aspergillus niger* and *Aspergillus flavus*. *Rhizopus* rot on young fruits of Jackfruit was widely prevalent.

Different kinds of fruit rot incited by species of *Penicillium* on amla, *Aspergillus* on amra and bael, *Colletotrichum* on banana, ber, custard apple, jamun and papaya were also recorded from different markets. Chemical control was achieved particularly against post-harvest fruit rots of mango and litchi, citrus canker, and dieback and seedling blight of cashew. Varietal resistance was recorded against postharvest fruit rots of mango and litchi, seedling blight of guava and dieback of citrus.

Key Words : Disease, fruit crops, post harvest rot, pathogen, red and lateritic zones

INTRODUCTION

The agroclimatic zone consisting of red and lateritic soil in West Bengal lying in the western parts of the state (21°45' to 24°35' N and 85°45' to 88°25' E) and spreading over different districts including entire Purulia and major parts of Bankura, Midnapore (West) and Birbhum and some parts of Burdwan and Midnapore (East). The major fruit crops grown in these zones are mango, guava, citrus (sweet orange, limes and lemons), jack fruit, cashew, ber and litchi. In addition to these custard apple, bael, amla, amra, jamun, banana and papaya are also grown in scattered pockets. In spite of greater scope the cultivation of cashew in this zone is confined to the Jhargram subdivision of Midnapore and some

pockets of Purulia and Bankura. Although these fruit crops are affected by various diseases every year but the systematic study on this aspect was not undertaken so far. Investigations carried out for the last 5 years from 1996 to 2001 on the prevalence of various diseases of the respective fruit crops and their management are briefly described.

MATERIALS AND METHODS

Mango (*Mangifera indica*. L.)

Leaf blight

The disease caused by *Macrophoma mangifera*, Hingorani & Sharma was recorded from the dis-

districts of Midnapore (West) and Birbhum. Symptoms appear mainly on the leaves and rarely on the stem. Yellowish, pin-head like spots appear on the leaves, the surrounding tissues turn dark brown with slightly raised and broad dark purplish margin, and finally they become ashy coloured due to appearance of pycnidia. Spots are rounded in the beginning, later become oval or irregular. Infection starts with the onset of the monsoon. On stem, elliptical lesions sometimes appear. On fruit, water soaked, circular lesions may develop, which later result in the postharvest fruit rot in storage.

The disease may be checked by spraying tree with Dithane M45 @ 2000 ppm twice at 15 days interval.

Powdery mildew

Oidium mangiferae Berthet causing the disease was recorded from the orchards of Midnapore (West) and Burdwan. Infection was first noticed on the leaves during the end of January. Subsequently the disease was found to spread on the tender twigs, inflorescence and young fruits with the rise of atmospheric temperature and humidity during February to April, sometimes resulting into defoliation and fruit shedding.

Systemic fungicides Topsin M-70 and Bavistin used as orchard spray @ 2000 ppm twice at 15 days interval were effective in controlling the disease.

Anthracnose

The disease caused by *Colletotrichum gloeosporioides* penz. occurs every year in the orchards. Symptoms appear on young leaves, stem, inflorescence and fruits. Leaves show oval or irregular, grayish brown spots which may coalesce. Affected leaf tissues dry and shred. Leaves on infected petioles drop and fall. On young stem, gray brown spots were sometimes noticed. In humid weather, minute, black dots appeared on the floral organs resulting in partial or complete deblossoming. Post-harvest rot on ripening fruits due to the same fungus showing typical anthracnose symptom was found to be widely prevalent in the markets of different districts. Fruit rot in storage was found to increase at temperatures between 28°

to 34.27°C associated with 70 to 87.2% RH (Banik *et al.*, 1998).

Pre-harvest application of systemic fungicides Bavistin and Topsin M-70 were most effective in reducing the fruit rot incidence in storage (Banik *et al.*, 1998). Preharvest application of Calcium chloride and Calcium nitrate sprayed thrice @ 5000 to 1000 ppm of Ca at weekly interval significantly reduced the fruit rot incidence in storage. Post harvest application by vacuum infiltration @ 5000 ppm also gave similar result (Kaiser *et al.*, 2001.). Varietal resistance in storage was recorded in Amrapalli, Bombay yellow, Langra, Sariklias, Lalphuli and Totapuri (Banik *et al.*, 1996).

Diplodia stem end rot

This important postharvest rot incited by *Diplodia natalensis* Pole Evans was recorded from different markets of Birbhum, Burdwan and Midnapore (West). Characteristic symptom at the initial stage is the darkening of the epicarp around the pedicel and within few hours it enlarges to form a circular black patch which under humid atmosphere extends rapidly and turns the whole fruit completely black within 2 to 3 days resulting typical soft rot symptom. The rot was found to increase at temperature between 32° to 36.2° C and high RH range (84.32 to 100%) (Banik *et al.*, 1988).

Preharvest application of same fungicides and calcium compounds were found to be equally effective in reducing the fruit rot incidence as in the case of *C. gloeosporioides* (Banik *et al.*, 1988). Varietal resistance against this fruit rot in storage was recorded in Alphonso, Totapuri red small, Lalphuli and Piaraphuli (Banik *et al.*, 1996).

Guava (Psidium guajava L.)

Wilt

Fusarium solani Mart. & Sacc. f. sp. *psidii* Sengupta was recorded to incite the disease. Characteristic symptoms were the yellowing and browning of leaves at the tip of the twigs, the leaves died and, the twig bark showed splitting. The drying of leaves and terminal branches was followed by complete wilting of the tree within 2 to 3 weeks.

Field observations showed wilting of trees upto 15 to 16 year old. Field trials conducted at the Regional Research Station, Jhargram showed that the cultivars Banarasi, Allahabad Safeda and Seedless were tolerant to this disease.

Market diseases

Different kinds of fruit rot, namely anthracnose (*Colletotrichum gloeosporioides* Penz.), soft rot (*Rhizopus nigricans* Ehrenberg), *Aspergillus* rot (*Aspergillus niger* Singh & Tandon) and *Fusarium* rot (*Fusarium solani* Mart.) App. & Wolleweber were recorded from different markets of Birbhum (Sekhampore, Suri and Bolpur), Burdwan (Ranigunj and Asansol) and Midnapore (Kharagpur, Jhargram and Khemasuli). Pathogenicity of the pathogens isolated from the diseased fruits were established on the healthy fruits by cross inoculation and the pathogens were finally identified.

About 10 to 15.5% of the fruit were found to be affected in the respective cases. Characteristic

symptoms of anthracnose included appearance of sunken circular lesions, dark brown to black in colour while in case of *Rhizopus* rot the lesions were usually water soaked and circular. *Aspergillus* and *Penicillium* rots were characterised by the softening of the fruit surface on which the distinct fungal structures appeared.

Citrus (*Citrus spp.*)

canker

The disease caused by *Xanthomonas citri* (Hasse) Dowson is endemic and it appears in all the citrus growing area of this zone. All the aerial parts including leaves, twigs, petioles, branches, fruit stalks, fruits and also thrones are affected. Characteristic symptom was the formation of yellowish lesions which gradually enlarged and became raised, rough and brownish. Lesions on fruits were crater like in appearance which became rough and corky. Canker affected trees became thin on top by leaf fall.

Table 1 : Post harvest diseases of some fruits recorded from different markets

Different fruits	Types of rot	Casual pathogens	Characteristic symptoms	Percentage of infected fruits	Markets surveyed
Amla (<i>Emblca officinalis</i> Gaertn)	Brown rot	<i>Penicillium</i> sp.	Brown patches and water soaked areas appear	15 to 20	Bolpur, Suri and Jhargram
Amra (<i>Spondias mangifera</i> Wild)	Black rot	<i>Aspergillus</i> sp.	Water soaked lesion appear which later enlarges and dark brown fungal structures appear	8 to 11	Sekhampur, Parui and Jhargram
Bael (<i>Aegle marmelos</i> Corr.)	Black rot	<i>Aspergillus awamori</i> Nakazawa	White outer skin of the shell becomes soft and rotten inner pulp produces black sooty growth of the fungus.	5 to 7	Bolpur, Sekhampur and Jhargram
Ber (<i>Zizyphus mauritiana</i> Lamk)	Anthracnose	<i>Colletotrichum gloeosporioides</i> Penz	Small, slightly depressed light brown, water soaked lesions appear, which later enlarge and coalesce to form larger spots, Under humid conditions acervul develop on the spots.	6 to 9	Shekhampur, Jhargram and Parui
Banana (<i>Musa</i> spp.)	Anthracnose	<i>Colletotrichum musal</i>	Different types of symptom are produced which include anthracnose black spot, blackend and crown rot.	3 to 4	Suri and Jhargram
Custard apple (<i>Annona</i> spp)	Black rot	<i>Glomerella cingulata</i>	Infected fruit shriveled with blackish brown appearance	7 to 9	Suri, Bolpur and Jhargram
Jamun (<i>Syzygium cumini</i> Skeels)	Anthracnose	<i>Colletotrichum gloeosporioides</i> Penz.	Same as in case of Anthracnose of ber	9 to 12	Suri, Bolpur and Jhargram
Papay (<i>Carica papaya</i> L.)	Soft rot	<i>Rhizopus</i> sp.	Water soaked irregular lesions on the ripe fruit appear, which gradually enlarge and get covered with white and dark brown fungal growth.	8 to 10	Suri, Bolpur and Jhargram
	Anthracnose	<i>Colletotrichum gloeosporioides</i>	Water soaked, circular, sunken lesions appear on ripe fruit. Later the lesions coalesce with mycelial growth.	10 to 12	Suri, Bolpur and Jhargram

Application of Streptomycin sulphate @ 1000 ppm 2 to 3 times at weekly interval was found effective. Varietal resistance was observed in Mosambi (*Citrus sinensis* L.) Osbeck.

Greening

It is a serious mycoplasmal disease recorded in Mosambi at Jhargram. Mature leaves showed yellowing of midribs and lateral veins, interveinal areas also showed diffuse yellowing and in advanced stage the whole leaf turned yellow. Such leaves may drop off during summer months. Selection of resistant clones is needed to combat against this disease.

Market diseases

Soft rot due to *Aspergillus niger* van Teigh was recorded from different markets of Birbhum (Suri and Bolpur) and Midnapore (Jhargram and Kharagpur) on different lemon (*Citrus aurantifolia* Christm Swingle) varieties. About 8 to 10% of the fruits were found to be affected. The rot started as a small, circular water-soaked spot that enlarged and turned brown. Within 2 to 3 days white mycelium and latter black conidial heads appeared. Affected fruits may be destroyed within a week depending upon the high temperature (above 30°C) and RH (above 80%)

Cashew (*Anacardium occidentale* L.)

Die-back

It was recorded as a fatal disease showing symptoms of defoliation and drying of twigs during summer. Such trees may die within 3 to 4 years. Fibrous roots turned dark brown and finally died. *Pythium spinosum* Sawada is responsible for this disease. Infection occurs during the rainy season and symptoms appear in dry weather.

Cutting of infected twigs followed by application of 10% Bordeaux mixture to the cut portions and spraying with 10% Bordeaux mixture may reduce the disease intensity. Varietal resistance was recorded in BLA-39-4 and Jhargram 1.

Anthracnose

It is caused by *Colletotrichum gloeosporioides* Penz. affecting leaves, twigs, nuts and fruits. Dark brown shining lesions appear on leaves and may extend on twigs which finally dry out. At the advance stage the whole tree is killed within 4 to 5 years. The flowers turn black and drop. The nuts and fruits show rotting and shrinking.

Cutting away the affected portion and spraying the trees with lime sulphur may check the disease.

Seedling blight

It is a serious problem for raising seedlings in the nursery due to high mortality upto 65 to 70%. The disease was recorded to be particularly severe in case of seedlings raised out of stock-scion combination. Characteristic symptoms are the blackening of roots and stem above the ground level. Species of both *Phytophthora* and *Fusarium* were involved in the process of such pathogenesis.

Sun drying of soil in the nursery during the summer months as well as soil drenching with either Captaf @ 1000 ppm or Bavistin @ 2000 ppm were found to be most effective for reducing such mortality.

Jack fruit (*Artocarpus heterophyllus* Lam.)

Rhizopus rot

Rhizopus artocarpi Racib. causing the disease on the male inflorescence and young fruits was recorded from different places of Midnapore and Birbhum. The rot is characterised by the presence of mycelium near the stalk end. Within short time whole fruit is affected and eventually drops off. Spraying the affected trees at the initial stage of infection with Dithane M 45 @ 1000 ppm twice at weekly interval may reduce the incidence.

Litchi (*Litchi chinensis* Sonn.)

Periodical survey of orchards in Burdwan, Birbhum and Midnapore districts revealed the prevalence of

preharvest rot on green mature fruits showing typical anthracnose symptoms incited by *Colletotrichum gloeosporioides* Penz. in a very mild form. From plant pathological point of view its importance was of less significance.

Postharvest rots

Three fungal pathogens, namely *Fusarium semitectum* Berk & Rav., *Aspergillus niger* ex Fr. and *Aspergillus flavus* Link were found to be associated with the fruit rot symptoms, either individually or in combination recorded from different markets of Birbhum (Bolpur and Suri), Burdwan (Raniganj and Assansol) and Midnapore (Jhargram and Kharagpur). Incidence of *F. semitectum* was, however, higher than *A. niger* and *A. flavus*. Pinkish discoloration and formation of white mycelium were observed on rotted portion in case of *F. semitectum*, while dark brown lesions were observed in case of *A. niger*. Infected portion of the fruits, however, became yellowish green with powdery appearance in case of *A. flavus*. Rotting due to these pathogens in combination was, however, found to increase at temperatures between 35^o to 35.2^o C and high RH range (90.9 to 100%) (Saha and Kaiser, 2001).

Pre-harvest applications of fungicides Bavistin, Benlate and Topsin M-70 @ 2000 ppm considerably reduced the fruit rot incidence in storage. Varietal resistance against *F. semitectum* in storage was recorded in Deshi, Rose scented, Bedana, Piazi and Early large red (Saha and Kaiser, 2001).

Market diseases of some other fruit crops

A preliminary investigation on the post-harvest rots in respect of some other fruits was earlier done through market survey in different districts of this zone. But the causal pathogens in most of the cases were not identified (Anonymous). The present in-

vestigation was, therefore, undertaken, the result of which are presented in Table 1. Careful handling of fruits to avoid postharvest injury, elimination of infected fruits and market sanitation may be useful in checking those rots.

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