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POST-HARVEST DISEASES OF RAMBUTAN *[NEPHELIUM LAPPACEUM]* IN THE WESTERN PROVINCE

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Abstract: Anthracnose, stem-end rot and brown spot were identified as the common post-harvest diseases of rambutans in the Western Province of Sri Lanka. The causative organisms of these diseases were isolated and identified as *Colletotrichum gloeosporioides* (Penz.) Sacc., *Botryodiplodia theobromae* Pat. and *Gliocephalotrichum microchlamydosporum* J. A. Mey, B. J. Wiley & E. G. Simmons, respectively. The pathogenicity of these three fungi was proved by adopting Koch's postulates.

Key words: Anthracnose disease, brown spot disease, post-harvest diseases, rambutan, stem-end rot.

INTRODUCTION

Rambutan (*Nephelium lappaceum* Linn.) is a native fruit tree of South East Asia. In Sri Lanka rambutan production is confined to the Central and Western Provinces with major producing areas being located in the Gampaha district. Polyphenol oxidase enzymatic browning associated with mechanical injury,[1] desiccation[2-4] and post-harvest diseases are reported as being the most significant causes of loss of rambutans. Among the post-harvest diseases of rambutan, anthracnose, stem-end rot and brown spot are identified as the most common in the Philippines[5] and Thailand[6,7] causing heavy financial losses. This is the first report of these diseases from rambutan in Sri Lanka.

METHODS AND MATERIALS

Fruits: Diseased fruits of three export cultivars (the Malwana special selection 1, Malaysian yellow and Malaysian red) were collected from commercial production areas in Dompe, Malwana and Pasyala in the Western Province of Sri Lanka.

The healthy fruits were harvested from the Pasyala Agriculture Farm at the following maturity stages:

Malwana special selection 1 : Colour stage 6 - Pericarp 25% orangish red, spintern tip yellow and rest red .
Malaysian yellow: Colour stage 4 - Pericarp 100% yellow , and spintern tip yellow.
Malaysian red: Colour stage 5 - Pericarp 100% red and spintern tip red.

Laboratory investigation of fruit samples: Fruits with symptoms were subjected to careful visual examination . The symptoms were recorded and microscopic studies were conducted on infected areas by taking sections, surface scrapings and selotape impressions.

Isolation of fungi from the diseased fruits: The causative organisms present in the diseased fruits were isolated on potato dextrose agar medium (PDA). Pieces (2-4 mm^2) of diseased tissue i.e. pericarp and aril, cut from the leading edge of the lesion were surface sterilised in 3% NaOCl for 2-3 min. The surface sterilised tissues were thereafter cut into 1-3 mm^2 pieces using a sterile blade and placed on PDA medium. The plates were incubated at 28 ± 2^0C for 6 d. Observations were made at 48 h intervals. The resulting fungi were sub-cultured on fresh PDA plates and identified by their cultural, morphological and reproductive characters.

Pathogenicity test

a. Preparation of spore suspension:

Suspensions of conidia were prepared by suspending mycelia scraped from 4-5 d old cultures of *Colletotrichum gloeosporioides* and *Gliocephalotrichum microchlamydosporum*, 10-14 d old cultures of *Botryodiplodia theobromae* separately in 3 ml sterile distilled water and shaking for 3 min. The resulting suspension was filtered through a 3 layered sterile gauze. The concentration of spore suspension was adjusted using a heamocytometer to 10^5 spores or conidia/ml .

b. Inoculation:

Healthy fruits harvested at the Pasyala horticulture farm were transported to the laboratory within 4 h . Sets of fruits were surface sterilized with 3% NaOCl solution and arranged on plastic trays lined with moist tissue. Fruits were then wounded by punching with a 2 mm long sterile needle. The wounded sites were inoculated with 0.02 ml of a spore suspension

containing 10^5 spores / ml of respective fungal isolates. Ten fruits were inoculated with each isolate. Trays containing the inoculated fruits were covered with glass plates and incubated at 28 ± 2^0C. In the control, the wounded sites were treated with 0.02 ml of sterile distilled water instead of the spore suspension. The symptoms and the time taken for such symptoms to develop were recorded. The above experiment was repeated using unwounded fruits. In this experiment the spore or conidial suspensions were placed on the intact surface of the skin of fruits.

c. Re-isolation of pathogens from the diseased fruits:

The causative organisms present in the inoculated diseased fruits were isolated on PDA as mentioned above. The characters of the re - isolated fungi were compared with their original isolates.

RESULTS

Symptomatology:

Three types of symptoms were observed. They are as follows :

(a) Brown spot symptom:

Light brown, water - soaked areas developed initially in the pericarp and pulp which later enlarged, and turned dark brown in colour. Greyish brown mycelia were observed on infected areas when moist conditions were present. At the latter stages of infection, yellowish sporulating fungal mycelia were observed. Complete deterioration of fruits occurred after 8 days.

(b) Anthracnose:

During early stages, symptom development was similar to brown spot disease. However, infected areas were less extensive and aerial growth of mycelia was not observed at the latter stages of infection. The spots appeared as black, circular lesions which increased in size and became large, sunken spots. Concentric, orangish - pink conidial masses were observed in the affected pericarp under humid conditions after 5-6 days.

(c) Stem-end rot:

A dark brown lesion on whole fruit was observed within four to five days after harvest. During the latter stages of infection dark coloured hyphal masses developed on rotted tissues. The symptom was observed

most often at the stem-end in infected fruits. The flesh became soft, brown and semiliquid. The skin became soft, wrinkled and black in colour, encrusted with pycnidia.

The three fungi from brown spot, anthracnose and stem-end rot were identified as *Gliocephalotrichum microchlamydosporum* J.A. Mey, B.J. Wiley & E.G. Simmons, *Colletotrichum gloeosporioides* (Penz.) Sacc. and *Botryodiplodia theobromae* Pat. respectively based on their cultural, morphological and reproductive characters.[5] The identification of *Gliocephalotrichum microchlamydosporum* was further confirmed by the International Mycological Institute, IMI367090 (G0250).

Inoculation studies:

The three types of symptoms were observed in all fruits inoculated with the respective fungi after wounding. Brown spot and stem-end rot did not develop on fruits inoculated without wounding. However, anthracnose developed on the unwounded fruits inoculated with *C. gloeosporioides* . No symptoms developed on any of the controls.

DISCUSSION

The results of this study confirm that *Botryodiplodia theobromae* , *Colletotrichum gloeosporioides* and *Gliocephalotrichum microchlamydosporum* are the causative organisms of stem - end rot, anthracnose and brown spot disease symptoms respectively, in rambutan. These three diseases occurred commonly in the three cultivars of rambutan fruits obtained from the Western Province of Sri Lanka.

Gliocephalotrichum microchlamydosporum and *Botryodiplodia theobromae* caused infections only when wounds were present on the surface of fruits, whereas *Colletotrichum gloeosporioides* infected both wounded and unwounded fruits. Hence, the avoidance of fruit injury during harvest should prevent the incidence of brown spot and stem- end rot . It has been reported[8] that harvesting rambutan fruits with 1 cm of the fruit stalk intact prevents injury to the fruit and as a result also the occurrence of post-harvest diseases. Therefore, if the harvesting method recommended by Meah *et al.* (1991), is adopted by the growers in Sri Lanka, the occurrence of brown spot and stem - end rot could be prevented.

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