

Note

Involvement of *Lasiodiplodia theobromae* (Pat.) Griffon and Maubl. in fruit rot of coconut in India

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Sporadic incidence of fruit rot disease of coconut (*Cocos nucifera* L.) was observed in a cultivator's garden at Cheppad, Alappuzha District of Kerala State, India, during January 1996. The associated fungus was identified as *Lasiodiplodia* (*Botryodiplodia*) *theobromae* (Pat.) Griffon and Maubl. Symptomatological features of the disease have been described. The fungus induced fruit rot on artificially inoculated nuts. It was re-isolated and the pathological role of the fungus in the disease has been confirmed.

Keywords: Coconut; Diseases; Fruit rot; *Lasiodiplodia theobromae*

Coconut palm (*Cocos nucifera* L.) and its different parts including the fruits (popularly called nuts) are vulnerable to attack by various pests and diseases (Britton-Jones and Cheesman, 1940; Menon and Pandalai, 1958; Ohler, 1984; Karthikeyan and Bhaskaran, 1996). A sporadic incidence of abnormal rotting-drying of nuts *in situ* that was apparently suggestive of a pathological syndrome, was observed. The disease was noticed during January 1996 in 6-15 year-old West Coast Tall palms in a cultivator's garden at Cheppad, Alappuzha District of Kerala State, India. Preliminary studies were carried out on the symptomatology, identification of the pathogen involved, and reproduction of symptoms by artificial inoculations.

Materials and Methods

Nuts of naturally infected coconut bunches were examined for external and internal symptoms in 1996. The nuts with fruit rot symptoms were brought to the laboratory. The epicarp of six infected nuts from two palms was cut into small pieces of approximately 5-mm size. The pieces were surface-sterilized in 0.1% mercuric chloride solution for 1 min and rinsed thrice in sterile distilled water, transferred aseptically on to potato-dextrose agar (PDA) medium in petri dishes, and incubated at $30 \pm 1^\circ\text{C}$. On observation, only one type of fungus was found to grow from the pieces into the medium. The fungus was sub-cultured and the pure culture sent to CAB International Mycological Institute, United Kingdom, for identification.

Pathogenicity of the fungus was tested *in vitro* using approximately six-month-old nuts of West Coast Tall palms. Bunches were harvested carefully using ropes to avoid injury from field palms and transported to the laboratory. The separated nuts were cleaned with sterile water using cotton wool. One-week-old pure culture of the fungus in PDA with a portion of the medium was used as inoculum (Lutchmeah, 1988).

The ends of the nuts (apex and stalk end) were separately inoculated by placing the inoculum under two categories, viz., with and without pin-prick injury. The injury was made using a sterile dissection needle. At the stalk end, the inoculation was done retaining the calyx intact and the inoculum placed around the periphery of the calyx. Six nuts per side per category were used. An equal number of controls (without inoculum) were maintained for comparison. The nuts were individually placed in polyethylene bags (with moist cotton wool kept inside for maintaining humidity) which were closed tightly. The experimental nuts were incubated under laboratory conditions (maximum day temperature at 32°C), and examined at regular intervals for up to 15 days. The symptom appearance was recorded and re-isolations of the fungus performed as described earlier.

Results and Discussion

Nuts in bunches at different stages of development were affected (a few to all nuts in individual bunches). The early symptoms appeared to be dark grey to brown lesions with wavy to

undulated margins, mainly starting from the apex of the nuts. The lesions progressed covering a larger area of the nut, finally involving the entire nut. The affected nuts were desiccated, shrunk, and deformed. In some cases, the contents leaked owing to the splitting of such nuts (Figures 1 and 2). Since the infection usually originated from the apex, the nuts remained attached to the bunches. When cut open, the infected nuts revealed extensive rotting of the epicarp which spread to meso- and endocarps as well, especially in 6-8 month-old nuts.



Figure 1 Fruit rot symptoms — naturally infected coconut bunch



Figure 2 Fruit rot symptoms — naturally infected nut

The fungus cultured from affected nuts was identified as *Lasiodiplodia theobromae* (Pat.) Griffon and Maubl. (IMI 370516), formerly known as *Botryodiplodia theobromae*. It did not sporulate readily in the culture medium. In scrapings from the surface of naturally infected nuts, *Colletotrichum gloeosporioides*, *Chlamydomyces palmarum*, and *Fusarium* sp. were also observed. However, in isolations, only *L. theobromae* was obtained in culture, and hence, tested for pathogenicity.

In inoculated nuts, lesions appeared at points of inoculation within three days. They had undulated raised margins which turned to brownish-dark brown and spread as in natural infec-

tion (Figures 3 and 4). Although only the apex of the nuts was usually infected naturally, the stalk end inoculations also resulted in infection and the calyx peeled off rapidly due to decay of the underlying tissues. Infection appeared in all the inoculated nuts; however, injury favoured infection. The fungus was re-isolated from the epicarp of artificially infected nuts. In control nuts, no symptoms appeared.

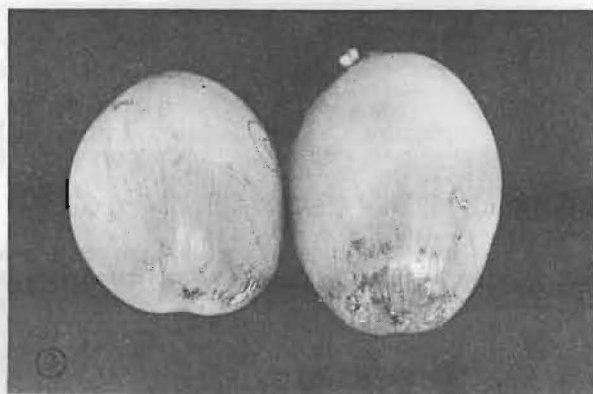


Figure 3 Fruit rot symptoms at the apex on artificial inoculation (left — control)



Figure 4 Fruit rot symptoms at the stalk end on artificial inoculation (left — control)

The fungus *L. theobromae* has been reported as an ubiquitous pathogen; in coconut, its involvement in root (Menon and Pandalai, 1958) and leaf (Warwick *et al.*, 1993) diseases is known. The fungus causing coconut fruit (nut) rot has been recorded in Brunei, Indonesia, and Vietnam (Johnston, 1965). In India, it has been reported to occur on seed coconuts (Raju, 1984; Raju and Reddy, 1984). In the present study, incidence of fruit rot in immature nuts of coconut and the pathological role of *L. theobromae* in the disease is elucidated. The extent of occurrence of the disease and its impact on yield are still to be determined. It is possible that under specific conditions, *L. theobromae* gains entry into the developing nuts leading to the disease.

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