

Short Communication**A New Record of *Phytophthora ramorum* causing Leaf Fall and Shoot Rot of Nutmeg (*Myristica fragrans*)**

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Severe defoliation of green leaves of nutmeg (*Myristica fragrans*) was observed in major nutmeg growing areas of Thrissur, Ernakulam, Idukki and Kottayam districts of Kerala, India during the south west monsoon period 2011. Infection was observed on leaves, shoots and fruits. Symptoms first appeared as dark brown water-soaked lesions on the midrib of the leaves which enlarged and spread along the lateral veins to leaf lamina resulting in blighting. Petioles of the infected leaves showed black discoloration. On young shoots, black lesions were observed which enlarged in size resulting in rotting and drying up of shoots from tip downwards. Leaf and stem infections resulted in extensive defoliation (Fig. 1a-c).

The symptoms on fruits appeared as showing water-soaked lesions on fruit surface, which later spread all over the area resulting in rotting of the rind which got separated from the internal tissues. As the infection progressed, rotting spread to internal tissues, then to mace and kernel and emitted foul smell. Infected fruits showed cottony fluffy mycelial growth on outside and inside the fruits. Fruit stalk also showed black discoloration. Affected fruits splitted and dropped off prematurely (Fig. 1d).

The pathogen associated with the disease was isolated from all infected parts on potato dextrose agar (PDA) medium. The pure culture of the pathogen was maintained on PDA slants at 4C. The pathogenicity was tested by inoculation of pure culture of the organism on three-month-old nutmeg seedlings in polybags and on detached twigs of nutmeg. Inoculations were made with mycelial disc, with and without pin prick injury and also by spraying zoospore suspension (1×10^6 zoospores ml^{-1}) on leaves, petiole, stem and fruits of nutmeg. On artificial inoculation with mycelial disc, leaves and petioles showed infection at two days after inoculation (DAI) in both cases with and without injury. On leaves, typical dark brown water-soaked lesions appeared on the inoculated midrib area which later enlarged and spread to the petiole. On petiole, infection started as brown lesion and then spread to the entire leaf lamina. Infection

was also noticed on the twig and at the petiole junction. Leaf defoliation was observed 3 DAI. On young shoots, the symptom appeared as dark brown discoloration resulting in rotting and drying of the entire stem. Symptoms also appeared on fruits 3 DAI in both cases, as dark brown water-soaked lesions, which enlarged and caused rotting and splitting of fruits (Fig. 1 e).

On spray inoculation by zoospore suspension, symptoms appeared 3-4 DAI. Symptoms first developed at the tip of leaves which later spread downward to other parts of the lamina. Leaf petiole and shoot showed dark brown discoloration and leaves defoliated within 10-12 DAI. On fruits, dark brown lesions appeared at stalk region which spread all over the rind leading to rotting and splitting of fruits. Infection spread to inner pericarp, kernel and mace resulted in rotting of these parts.

The pathogen was reisolated from all infected parts and compared with the original culture. The cultural and morphological characters of the pathogen were also studied. The pathogen produced white fluffy growth on PDA medium and the microscopic observations of the culture showed coenocytic, hyaline hyphae and lemon shaped papillate sporangia of size $19.98-56.61 \mu\text{m} \times 19.98-29.97 \mu\text{m}$ (Fig. 1f, g). Based on cultural and morphological characters, the pathogen was tentatively identified as *Phytophthora ramorum* which was later confirmed by National Centre for Fungal Taxonomy (NCFT), New Delhi (ID No. 4089.10).

Naseema and Sulochana (1994) reported a leaf spot disease of nutmeg caused by *Pestalotia* sp. from Kerala. Jennifer et al. (2002) and Rizzo et al. (2002) reported Sudden oak death disease by *Phytophthora ramorum*. However, it is the first world report of *Phytophthora ramorum* causing leaf fall and shoot rot of nutmeg.

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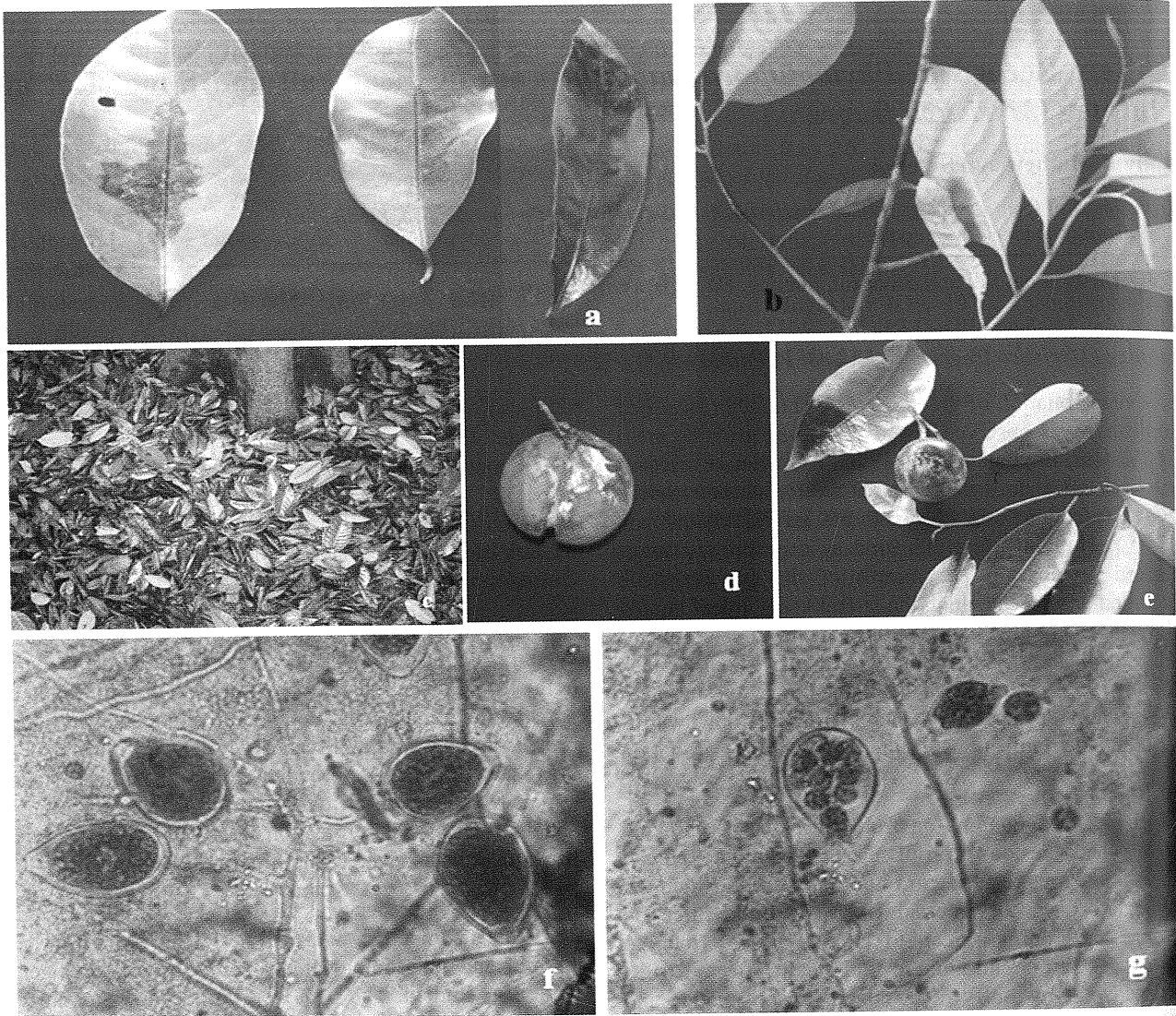


Figure 1. Symptoms on nutmeg under natural conditions: a = lesions on leaves; b = lesions on shoot; c = defoliation of infected leaves; d = lesions on fruit; e = symptoms after artificial inoculation; f = sporangia of *Phytophthora ramorum*; g = zoospore release

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