

Nutmeg Diseases: A Looming Threat to Farmers

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According to some legends, a small bag of nutmeg would have helped the owner to live financially secured for the rest of his life. Therefore, mankind has seen much blood shed for this little brown seed. “The gruesome, grisly tale of how the Dutch tortured and massacred people of the nutmeg producing Banda Islands in Indonesia in an attempt to monopolize the nutmeg trade” as explained by culinary historian Michael Krondl delineates the value of this spice.

Nutmeg (*Myristica fragrans*) is indigenous to Australasia and tropical regions of South East Asia. The tree is native to the Moluccas or the Spice Islands of Indonesia and is mainly cultivated in Indonesia and West Indies. Besides its place of origin, nutmeg is also cultivated on a commercial scale in India, Malaysia, Caribbean Islands, New Guinea and Sri Lanka. The major consumers of nutmeg are USA, Japan, Europe and India.

Though nutmeg is endowed with its intrinsic medicinal properties, physicians caution that “one nut is good for you, the second will do you harm and the third will kill you.” This was a warning from The Salerno School, which was the storehouse for all medieval Europe’s medical knowledge. The warning was issued because the spice contains myristicin, which, if consumed in large doses might lead to hallucination as well as palpitation, nausea, pain and dehydration.

Nutmeg is one among the major spice crops in India and is extensively cultivated as an intercrop in coconut and areca nut gardens and is considered as an integral component in spice-plantation crop-based cropping systems. Nutmeg is sensitive to various stresses induced by several biotic as well as abiotic factors, which have the potential to adversely affect the yield leading to heavy crop losses.

Fruit Drop

The disease appears as water-soaked lesions at the base or any part of the fruit, which later turn brownish followed by premature splitting of the pericarp and rotting of mace and seed. The half-matured or unripe fruits are more vulnerable to the disease, which makes its appearance during the monsoon and is favoured by incessant rainfall. As the disease progresses, the internal tissues rot completely and infection on peduncle (fruit stalk) leads to shedding of fruits.

A diverse spectrum of fungal pathogens like *Diplodia natalensis*, *Thielaviopsis paradoxa*, *Colletotrichum gloeosporioides* and *Botryodiplodia theobromae* are reported to be associated with the disease. Adopting strict phytosanitation by removing and destroying the disease affected fruits coupled with aerial sprays with Bordeaux mixture (1%) when the fruits are half matured can reduce the spread of the disease to a considerable extent.

Leaf Spot and Shot Hole

The disease was first reported from Meghalaya and now is prevalent in all nutmeg cultivating tracts with a potential to cause large-scale destruction of the crop. The disease is restricted to the foliage, and the pathogen infects leaves at different stages of maturity. However, young leaves are more prone to infection.



Fig 1: *Colletotrichum* leaf spot

The initial symptoms appear as small necrotic spots of 2-3 mm diameter surrounded by yellow chlorotic halo on both sides of the leaf (Fig. 1). Several such spots coalesce together to form bright necrotic patches covering about 50% of the leaf area, reducing the effective photosynthetic area. In the advanced stage of disease development, withering of affected leaf tissues leads to formation of shot holes, which is the most characteristic symptom of the disease. Despite the heavy damage there is no defoliation.

Cladosporium oxysporum, *Colletotrichum gloeosporioides* and *Alternaria* sp. are found to be associated with leaf spot. The disease can be managed effectively by spraying carbendazim (0.1%) or Bordeaux mixture (1%). Care should be taken to ensure first spray is given during October followed by one or two sprays at monthly intervals depending on the disease severity.

Root Rot

The aerial symptoms of root rot include foliar yellowing and subsequent defoliation. As the disease advances, the tree declines due to eroding roots. The fruits become dry and shrivel. The pathogen invades the root system forming a black layer over the root, which ultimately penetrates the wood, kills the tree resulting in die back. The disease is caused by *Rosellinia pepo*. Root rot caused by *Fomes noxius* and the brown root rot incited by *F. camoensis* are also reported from Indonesia.

Once the disease is noticed in the field, drench the basins with recommended systemic fungicides as a therapeutic measure. However, in the advanced stage of disease development, the infected trees shall be isolated by digging trenches of enough breadth and depth. The trees that are beyond recovery should be removed and destroyed.

Thread Blight

The thread blight is a major concern, especially in abandoned and less attended plantations and is considered as one among the most prevalent diseases of nutmeg. This infection becomes severe during post-monsoon period and under heavily shaded conditions. Two types of thread blights are reported in nutmeg. The white thread blight caused by *Marasmius pulcherima* is characterized with the formation



Fig 2: White thread blight

of fine white hyphal aggregates manifested as threads.

These mycelial threads traverse along the stem underneath the leaves in an irregular or fan-shaped manner leading to blighting of affected portions. The affected leaves remain attached to the stem (Fig. 2). The second type viz., horse hair blight caused by *Marasmius equicrinus* (Fig. 3) manifests as fine black silky threads which form an irregular, loose network on the stem and leaves subsequently leading to foliar and stem blight. In the later stages, the dried leaves detach from branches and remain suspended.



Fig 3: Horse hair blight

The disease can be managed by timely adoption of cultural practices and plant protection measures. Intensity of the disease can be reduced considerably by regulating shade in plantations. Adopting phytosanitation by collecting and destructing disease affected plant parts during May, before the onset of monsoon reduces population density of the pathogen. Prophylactic sprays with Bordeaux mixture (1%) during May - June before the onset of monsoon and repeated sprays during August - September considerably reduces the disease.

Pink Disease

The disease is fatal to foliage, branches and fruit. This manifests in the form of strings or

threads composed of fine parallel, mycelial filaments growing more or less superficially along the lower surface of branches and twigs. Subsequently, the infection advances to the petiole and spreads over the leaf blade, which later withers and turns brownish. In the later stages, the infection extends to the branches and fruits.

The affected parts fall off and fruiting bodies of the pathogen develops, which may be sessile or have short stripes attached directly to the mycelium (Fig. 4). *Botryobasidium salmonicolor*,



Fig 4: Defoliation due to pink disease

a soil dwelling fungus is the causal agent of the disease. Pre-monsoon sprays with Bordeaux mixture (1%) and repeated sprays during post-monsoon considerably reduce the disease intensity.

Nut/ Fruit Rot

The disease is of common occurrence in several parts of Kerala which appears during the monsoon. The disease causes severe crop loss due to premature fruit fall. The disease initiates as water soaked, dull green to dark brown lesions on the rind near the stalk portion of the fruit (Fig. 5).

The brownish lesions later rot, which further spread to the entire fruit, will eventually lead to fruit fall. The rotting may extend to the mace also, which reduces the quality of the spice. The affected fruits are covered with greenish black spots with brownish tissue beneath.



Fig 5: Fruit rot due to *Coryneum*

The disease is caused by *Coryneum myristica*. Two prophylactic sprays with Bordeaux mixture (1%), one in May - June before the onset of monsoon and second spray during August - September considerably reduces the disease.

Leaf and Fruit Fall

Leaf and fruit fall caused by *Phytophthora meadii* is reported from major nutmeg growing areas of Thrissur, Ernakulam and Kottayam districts of Kerala.

The disease appears during monsoon and leads to severe defoliation (Fig. 6 a) and fruit fall. The symptoms manifest as dark brown water-soaked lesions formed on the midrib of the leaves (Fig 6 b) which later enlarge and spread along lateral veins to lamina resulting

in blighting of the leaves. The petioles of infected leaves turn black and blackish lesions appear on young shoots which enlarge in size resulting in rotting and drying up of shoots from the tip downwards. Prophylactic spray with Bordeaux mixture (1%) before the onset of monsoon (May - June) and during August -



Fig 6a: Leaf fall due to *Phytophthora*

September is essential to manage the disease. Once infection starts, remove and destroy the infected leaves and fruits to reduce the inoculum build up.

Nutmeg is generally considered as a money-minting crop. However, the nutmeg growing regions are normally vulnerable to the vagaries of weather and the looming threat of erratic changes in weather could increase the



Fig 6b: Leaf fall due to *Phytophthora*

vulnerability further. A thorough knowledge about the biotic factors, especially the diseases, the season of occurrence and management measures, which includes both prophylactic and curative ones to be adopted, is imperative to