CAUSATIVE ORGANISM
Nutmeg root rot disease is the most serious disease of nutmeg in Grenada. It is caused by a fungus, *Pythium* spp., which enters the roots and kills them. Once the roots are dead the plant cannot get sufficient nutrients and this results in dry tips, smaller leaves and fruits, wilting and eventual death of the tree. The soil fungus, *Pythium*, thrives in areas of excess soil moisture and poor drainage. Trees of any size and age may be affected. Affected trees will decline and die either rapidly or slowly.

SYMPTOMS

*Late foliage symptom*
The absence of feeder roots prevents the uptake of moisture, and the soil under diseased tree stays wet even though the tree appears wilted. The small fibrous feeder roots on diseased trees may be absent in the advanced stages of this disease; if present, they are usually blackened, brittle, and dead.

*Early foliage symptom - stage I*
The growing tip of the branches dies at first.

*Foliage symptom - stage II*
Leaves of trees with root rot are small, pale green and frequently have brown tips. Foliage is sparse, giving the tree an unthrifty appearance. Diseased trees frequently set a heavy crop of small fruit.

*Early root symptom - stage III*
The sloughing off of the feeder roots is the disease symptom. The roots of the tree become dark and die.

**Note:** Suspected diseased trees can be checked by digging out a few feeder roots (fine roots). Hold the roots in the hand and pull to see if the outer part of the root is sloughing off. If it is so the tree has root rot. Check the roots from all around the tree.
DISEASE CONTROL

The disease can be spread by moving contaminated nursery stock of nutmeg and other plants, on equipment and shoes, in seed from fruit lying on infested soil, or by other types of activity by people or animals in which moist soil is moved from one place to another.

The fungus produces spores which use water for transport and therefore, *Pseudomonas* spreads easily and rapidly with the movement of water over or through the soil. Entire areas can therefore become infested. Control is best achieved by an integrated approach of prevention, cultural practices, and treatment.

- **Plant on well-drained soil.** Root rot develops in soils that have poor internal drainage because accumulated moisture permits the spores of the fungus to form and to infect the roots. In new plantings, avoid soils favorable to root rot development; in established plantings, manage soils carefully so that moisture does not accumulate in the soil. Dig drains between plots (where they do not exist).

- **Use disease-free nursery stock.** It is recommended that disease-free plants be used, especially when planting new areas.

- **Spread**
The fungus survives on dead plant material and is subsequently spread by run-off water.

- **Survival**
Do not allow the dead root/tree material to persist on the ground, they harbour spores. *Heap and burn dead plant material from diseased trees.*

- **Pruning**
Prune trees regularly, to allow sunlight to dry soil surface and reduce the level of fungal spores.

- **Establish a barrier.** If the disease situation is such that the fungus can spread downhill in surface runoff or drainage water into another part of the nutmeg grove, a physical barrier should retard spread. Establish the barrier at least two tree rows beyond where tests indicate the fungus is present. Warning signs should be placed by the barrier to prohibit the movement of personnel between the root rot area and healthy sections of the grove.

- **Bio-pesticide**
Potassium phosphonate may give effective control for the root rot diseases. During preliminary work on diseased trees this bio pesticide was applied either by trunk injection or as a collar drench. The results appear to be promising; however, trees need to be evaluated for a minimum period of one year before firm recommendations can be made.

  Trunk injected potassium phosphonate boosts the plant defense mechanism, thereby avoiding the spread of the disease within the tree.

  Since the tree injection with potassium phosphonate works by boosting plant defense mechanism, only trees at early stage of infection can be treated.

- **Chemical**
Phosetyl-Al and Metalaxyl were tried on diseased trees as injections and soil drench. Phosetyl-Al performed well. Further research on residue levels need to be conducted before recommendations to use these chemicals can be made. This is because there may be problems with food safety issues if the chemicals are used.

For assistance and more information, please contact:
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