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Cassava Tuber Rot, (*Phytophthora palmivora*) – An Emerging Threat to Cassava Production

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Abstract

Cassava, *Manihot esculenta*, is a perennial shrub in the family Euphorbiaceae grown primarily for its storage roots which are eaten as a vegetable. Tuber rot of cassava is a serious problem in Tamil Nadu. The disease is primarily caused by *Phytophthora palmivora*, and many secondary invaders also get associated with the disease at later stage. Phytophthora root rot is prevalent in waterlogged soils. The disease causes yield losses up to 80% and severe incidence was recorded in black soils, where the cassava was grown frequently. Biocontrol agents (*Trichoderma viride*) were very effective in reducing fungal growth of the disease.

Introduction

Cassava is a major staple food in the developing world, providing a basic diet for over half a billion people. It is one of the most drought-tolerant crops, capable of growing on marginal soils. Tuber rot disease has been reported in Africa and Tropical America causing yield loss upto 80%. Three species of phytophthora viz. *P. drechsleri*, *P. erythroseptica* and *P. cryptogea* are recorded as primary pathogen in these countries. In India, Cassava tuber rot was recorded during 1995 from cassava plantations around Salem District in Tamil Nadu. The causal agent has been identified as *Phytophthora Palmivora* var. *palmivora*.

The disease is endemic to certain pockets. Severe incidences were repeatedly recorded from Athur, Rasipuram and Namakkal Taluks around Salem. The disease incidence was high in Athur (40.5%) which caused 48.5% tuber yield loss. More than 67% crop loss has been recorded from certain heavily infected gardens. Rainfall is the most important factor favouring disease infection. Higher the rainfall, higher will be the disease incidence. Heavy soil (Black) with poor drainage facilities favours the disease. Presence of hard soil layer which prevent percolation of water to downward cause poor drainage and leads to severe infection. The rotten tubers left during harvest and ploughed *in situ* serve as inoculum for the next crop and help the pathogen to survive longer periods in the soil. Flooding type of irrigation helps the pathogen for its distribution in the whole field. Lack of organic matter content and narrow C:N ratio of the soil reduce population of saprophytic organisms and biocontrol organism viz *Trichoderma* and favour the pathogen.

Symptoms

The pathogen attacks both mature and young plants, causing sudden wilting and severe soft rotting of the swollen roots. The affected plants give rise to rotten tubers. The plants can be easily pulled without pressure

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from the ground. Two-third reductions in tuber yield have commonly been observed in affected fields in Tamil Nadu. The disease is characterized by the appearance of dark-colored round to irregular shaped water-soaked lesions (15–30 mm in diameter) on mature tubers in the field. White mycelial mats of the fungus develop around these lesions. On advancement of infection, the lesions enlarge causing internal browning, oozing of internal fluids, and shriveling of the tubers. The infected tubers emit a characteristic foul smell and rot within 5–7 days depending on the soil conditions. However, no external symptoms are visible on leaves and stem of infected plants. Hence, early detection of the disease is very difficult. The pathogen *P. palmivora* produces uniform white mycelial colony on agar medium. The mycelium is coenocytic and hyaline. It produces apical, pear-shaped papillate sporangia freely liberated on sterile water. The pathogen can be isolated from freshly infected brown and marginal areas of internal tuber tissues.



Figure 1: Cassava tuber rot

Causal Organism

The fungus *Phytophthora* is constantly associated with cassava tuber rot disease. The pathogen was identified as *Phytophthora palmivora*. The pathogen can be isolated from freshly infected tubers as well as directly from soil by baiting techniques as well as by selective media. Cacao pool tissues and carrot discs are effective in trapping the pathogen from soil. The V8 juice agar medium and PVP medium are efficient selective media for *Phytophthora* isolation from soil. The main mode of survival of the pathogen in the soil is through infected tubers. The longevity in air dry soil was only 6 weeks as against 30 weeks in moist soil.

Managements

- The disease can be controlled by cultural practices such as providing good drainage, use of lighter soils, early harvest, crop rotation with cereals, and fallowing.

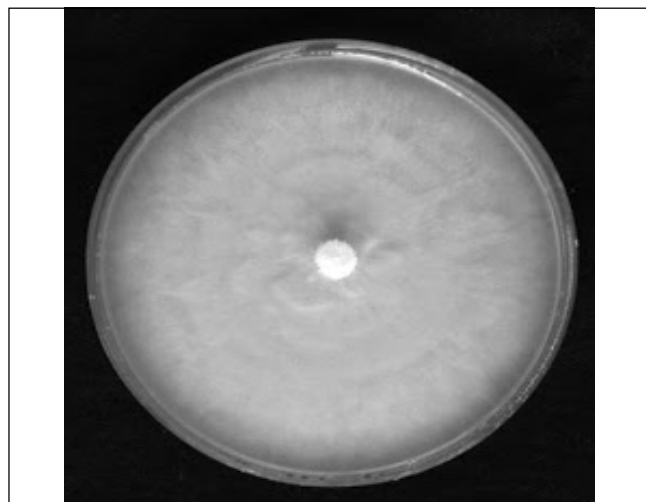


Figure 2: *Phytophthora palmivora* culture

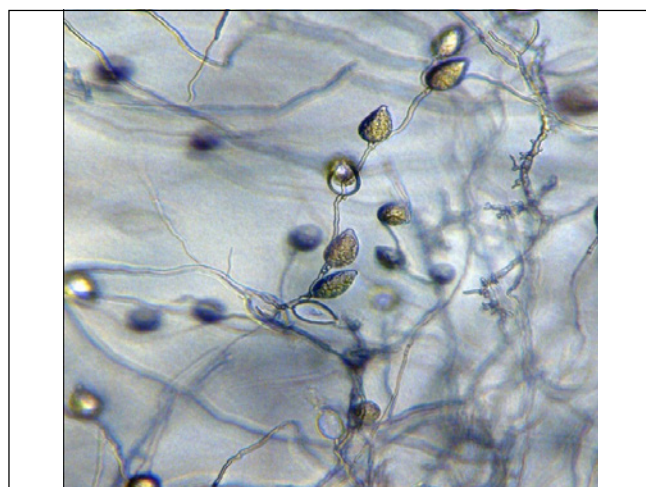


Figure 3: *Phytophthora* sporangia

- Wide spacing tends to discourage the spread of root pathogen. Crop residues should be removed and burnt, and healthy planting material should be used for planting.
- Breaking the hard pan by deep plowing (45–60 cm), ridge planting, regulating irrigation, improvement of drainage condition, strict adherence to sanitation, and use of *Trichoderma* sp. showed substantial reduction of cassava tuber rot and increased the quantity of marketable tubers.
- The sett treatment (30 g/l for 15 min.) and soil application (1 kg/ha) of *Trichoderma viride* recorded the lowest tuber rot incidence (7.33%) and highest harvest index (66.9%).
- *Trichoderma viride*, *T. harzianum*, and *Pseudomonas fluorescens* are found effective against cassava tuber rot.

Conclusion

The occurrence of Cassava tuber rot disease in South India becoming major constraints in cassava production by causing major economic loss up to 70% in tuber yields.

The disease tuber is diagnosed by brown watery lesions with foul smell, making it unfit for market use. The disease might have spread through the transport or exchange of planting material as Cassava is vegetatively propagated through stem cuttings. Development of integrated disease management practices is essential to combat the disease.

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