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Study on the Identification of Fungal Pathogen Causing Yam
Rot in Lesser Yam (*Dioscorea esculenta*) in Batticaloa District,
Sri Lanka

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Abstract

Dioscorea esculenta commonly known as the lesser yam is cultivated in Batticaloa district of Sri Lanka a small scale. Pathogenic fungi reduce the quantity and quality of yam produced. Pathological investigations were carried out to find out the fungal organisms associated with yam rot of lesser yam. Eight pieces (2 mm in diameter) of the infected yam tissues were picked from the point of advancement of rot and inoculated on a solidified Potato Dextrose Agar (PDA) medium. Two replicates were made for each of the 4 yam tuber samples and the 8 plates were inoculated. The inoculated plates were incubated at room temperature (30°C) and observations were made daily for possible fungal growth. Sub-culturing was done to obtain pure cultures of the isolates. Cultural characteristics of the fungi were observed and recorded. The identification of the isolates was done by examining the isolates macroscopically and microscopically. The causative fungal pathogen was identified as *Fusarium solani* (Mart.) Sacc. based on the colony and microscopic characteristics of the pathogen. *Fusarium solani* produced white cream mycelia. Macroconidia are three to four-septate, slightly curved, 28-42 x 4-6 µm. Microconidia are abundant, cylindrical to oval, one to two-celled, 8-16 x 2-4.5 µm. Pathogenicity test carried out confirmed this fungal species as the pathological agent of the lesser yam rot. The finding of the causal organism of the yam rot disease would be very useful in choosing effective control measures to extend the life span of yam in storage.

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1. Introduction

Yam is the common name for some species in the genus *Dioscorea* (family Dioscoreaceae). These are perennial herbaceous vines cultivated for the consumption of their starchy tubers. *Dioscorea esculenta* commonly known as the Lesser Yam, is a yam species, but with a smaller corm than most other yams. In Tamil, it is known as "Cheruvalli Kizhangu". It is a climber which needs support and goes coiling around the support. The corm is edible. It is mostly grown in Asia (Saikia, 2011). In Sri Lanka, it is cultivated in small scale. The disease causing agents reduce the quantity of yam produced and also reduce the quality by making them unappealing to the consumer. Yam is prone to infection right from the seedling stage through harvesting and even after harvesting in storage (Amusa et al., 2003). Yams are subjected to several diseases. There are different genera of fungi that have been reported in association with storage deterioration in yam tubers (Okigbo and Ikediugwu, 2000). Knowledge of the fungi responsible for yam rot will be of tremendous help in finding effective control measures to extend the life span of yam in storage.

2. Methodology

Four yam tubers with symptoms of rot were obtained from a farmer field in Batticaloa district. The diseased yam tubers were packaged in polyethylene bags and taken to the Microbiology laboratory of Faculty of Agriculture, Eastern University, Sri Lanka where they were assessed for fungal presence. Rotted yam tubers (Figure 1) were rinsed in distilled water, surface sterilized with 70% ethanol and cut open with a sterilized knife. Eight pieces (2 mm in diameter) of the infected yam tissues were picked from the point of advancement of rot with a flamed sterilized forceps and inoculated on a solidified Potato Dextrose Agar (PDA) medium. Two replicates were made for each of the 4 yam tuber samples and the 8 plates were inoculated. The inoculated plates were incubated at room temperature (30°C) and observations were made daily for possible fungal growth. Sub-culturing was done to obtain pure cultures of the isolates. Stock cultures were prepared using slants of PDA in McCartney bottles and stored in a refrigerator at 4°C. Cultural characteristics of the fungi were observed and recorded. The identification of the isolates was done by examining the isolates macroscopically and microscopically. The colony characteristics, spores and mycelium either septate or not were taken note of. These structural features were matched with standards in Barnett and Barry (1972) and Booth (1971).



Fig 1. Rotted yam- source of inoculums

Four fresh healthy tubers of yam were washed with tap water and distilled water, respectively and thereafter sterilized with 70% ethanol. Cylindrical discs (3 mm) were removed from the tubers with a sterile cork borer. About 3 mm discs of 5 days old cultures of the isolate were used to plug the holes created in the tubers.

The inoculated tubers were each enclosed in a sterile polyethylene bag and incubated for 1 week at room temperature (28-32°C). A micro-humid environment was provided by enclosing sterile water soaked aseptic cotton wool in each set up. Reisolation was carried out using a sterilized and flamed scalpel. Small pieces of rotted tissue about 2 mm from the advancing edge of the rot were removed from the infected tuber and aseptically inoculated into PDA media in Petri dishes and were incubated for 3 days at room temperature. Sub-culturing was done to get pure cultures of the organisms. The colony and microscopic features of the organisms were identified according to the standards of Barnet and Barry (1972) and Booth (1971).

3. Results and Discussion

During the isolation and identification of the causative organism of the rotted yam tuber, all the four isolates were similar in their colony and microscopic features and the fungal species was identified according to the standards of Barnet and Barry (1972) and Booth (1971) as *Fusarium solani* (Mart.) Sacc. (Figure 2). *Fusarium solani* produced white cream mycelia. Macroconidia have three to four septa on average, are slightly curved. They are three to four-septate (usually three-septate), slightly curved, 28-42 x 4-6 µm. Microconidia are abundant, cylindrical to oval, one to two-celled, 8-16 x 2-4.5 µm.

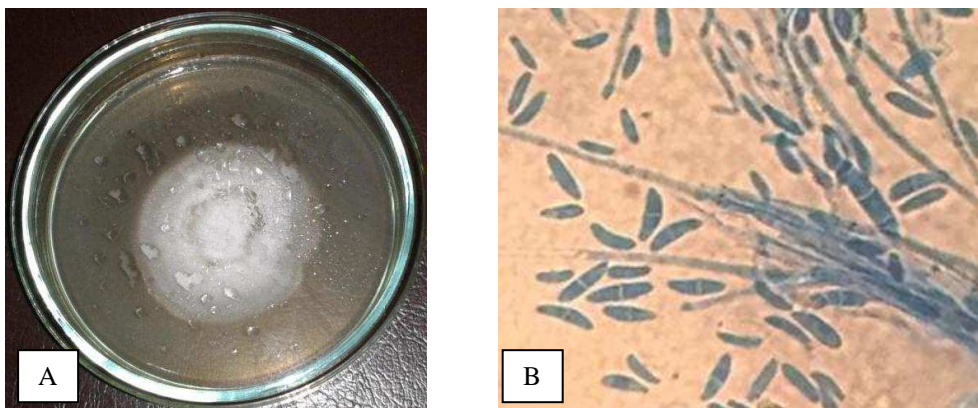


Fig. 2. (a) Culture of *Fusarium solani*; (b) shows the micro and macro spores

The *Fusarium solani* produced dry rots light brown to orange brown in colouration. The organism associated with the rot of lesser yam in this study was *Fusarium solani* (Mart.) Sacc. This fungus has been associated with postharvest rots of a variety of yams (Ogundana et al., 1970; Okigbo, 2004). Rotting in storage probably starts in the soil and progresses in storage. In most cases, microorganisms gain access into yams through natural openings and wounds that occur during harvesting and transportation from field to storage barn (Ogundana et al., 1970). The soil adhering to the harvested tubers contain many microorganisms that could be pathogenic to the tubers (Osagie, 1992).

4. Conclusion

The causative organism of the yam rot of lesser yam (*Dioscorea esculenta*) was confirmed as *Fusarium solani* (Mart) sacc. based on the colony and microscopic features of the fungus.

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