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Nematodes associated with plantains and bananas in southwestern Nigeria and strategies for their control

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The development and elongation of the primary roots provide a firm anchorage for the plant in the soil. Plant parasitic nematodes destroy the primary roots of bananas and plantains. The amount of research that have been done so far does not commensurate with the economic importance of nematodes on *Musa* spp. Moreover, nematodes are the unseen enemies of farmers. The objective of this research was to:

- examine the disease symptoms and yield patterns of infested plants;
- identify the nematodes involved;
- assess the methods of control used by farmers; and
- determine the practicability of various control methods.

Nematode survey

Plantains and banana plants that were blown over by winds from 25 farms were used for this research. On-spot assessment of plants was done to examine the disease symptoms and yield patterns. Soil samples were collected close to the roots of the plants using a hand trowel and nematode extraction from the soil was done using the pie-pan modification of Baerman's funnel techniques. Rhizomes were also collected for the extraction of endoparasitic nematodes which were extracted by chopping into smaller pieces in 5% NaOCl solution. This solution was then passed through different sieve sizes to extract the nematodes. The various nematodes were identified using Mai and Lyon's identification key.

Symptoms due to nematode infestation on the diseased plants were necrotic brown to black lesions in roots, galling on primary and secondary roots (for root-knot infested plants), reduced bunch size, and finally toppling-over of the plant. Many different species of plant parasitic nematodes were found to occur in the root zone of plantains and bananas. Those identified in this study were *Radopholus* spp. *Pratylenchus* spp. (meadow nematodes), *Meloidogyne* spp. (root-knot nematodes), and *Helicotylenchus* spp. (spiral nematodes). In other to acquire more knowledge the relative importance of these three species requires further investigation. Also, additional research is needed to identify and establish the pathogenecity of the other nematodes.

Control strategies appropriate for nematodes in plantains and bananas

The practicability of recommended nematode control methods in Nigerian context was examined. The use of nematode free planting materials on uninfested land is very essential.

The corm tissues were trimmed to remove all black or colored spots. Trimming could also be complemented with hot water treatment (20–25 m at 53–54 C). In some banana exporting countries, the suckers are dressed in nematicidal solutions or coated with nematicidal mud. For example, in Côte d'Ivoire, drying of corms in sun for two weeks before planting reduces the population of *Radopholus similis* by 80%. It is equally possible to get a nematode-free planting stock by using a plant grown by the meristem culture techniques. The use of *in vitro* plantlets after a 12-month fallow period in Côte d'Ivore controlled the spiral nematode.

Once a nematode-free planting stock is acquired, it is important to keep the land free of weeds and crops susceptible to nematodes. Thereafter, most of the control measures are cultural by applying large quantities of mulch to stimulate root growth and by propping fruiting stems to avoid uprooting. Nematicides such as Nemacur or Furadan are widely used in commercial plantations but because of their toxicity, nematicides should only be used by trained persons and instructions on pesticide labels strictly adhered to.

Studies on biological control of Black Sigatoka disease

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Our *Musa* programme is aimed at attaining a reasonable measure of control of black sigatoka disease using specific antagonistic microorganisms as microbial fungicides. By the use of our Leaf Segment Method (LSM) by which pathogenicity test is completed in about two days, a number of isolates of *Mycosphaerella fijiensis* from different parts of southern Nigeria had been compared for virulence on plantain and banana cultivars. The results indicated that an isolate of *M. fijiensis* may be selectively more virulent on a *Musa* cultivar than another, suggesting a measure of variability and growing host preference among isolates of the pathogen.

Two strains of *Bacillus subtilis* isolated from the phylloplane of banana and plantain proved strongly antagonistic against *M. fijiensis*, significantly ($P < 0.01$) depressing disease lesion development not only in leaf segment trials in the laboratory but also in greenhouse studies using potted plants. Although in field trials, treated plants consistently showed higher values of the youngest leaf spotted than control, the difference was statistically non-significant ($P > 0.05$).

Possible manipulations of the inoculum for enhanced effect under field conditions are presently being considered