Sub-theme:

Protecting plants protecting life

Title:

Diversity of nematodes of banana (*Musa* spp.) in Kenya with reference to altitude and banana types

Presented by:

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Introduction

Banana is a popular fruit worldwide

It's ranked 4th as the world's most important food commodity

Banana consumption is preferred due to its nutritive value

Kenya is estimated to have a total of 2% of its arable land under banana production

Introduction cont’

Production is concentrated in central highlands, Rift valley, Western and parts of Eastern (35.6%)

PPN are recognized as a greatest threat to its production

Its production has declined significantly in Kenya for the past two decades

Problem Statement

Distribution of PPN has been stable in the past

However, a shift in temps along altitudinal gradients, linked to climate change in E. A. Mountains might affect PPN stability

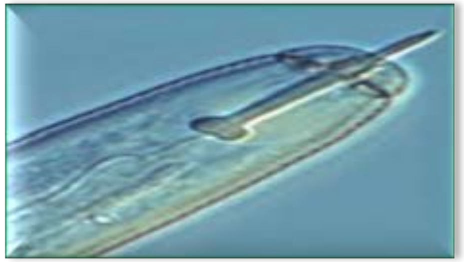
Detrimental impact on the E.A.H. Banana genotypes

Nematicides: Health problems & env. pollution

Biological control: environmentally sensitive
& economical

Genotype distribution: (depends on local tastes, eating habits, mkt demand & Env. factors

- Monocrop continuously
- Location of Kenya



The study explores a possibility in variability of nematode attack at diverse gradients as opposed to their traditional conspicuous distribution at restricted gradients

Justification

- In the recent past, Africa has been listed as one of the most vulnerable continents to climate change and climate variability (Talwana *et al*., 2015)

- Highland bananas may experience significant losses out of pressure posited by pests and diseases by a 2° C rise in temperature (Thornton and Cramer, 2012)

- Thus, the distribution of plant parasitic nematodes geographically may be influenced (Erima *et al*., 2017).

- Little information on the relationship between climate change and PPN distribution in banana production systems

Objectives

General objective: To determine the occurrence, abundance and distribution of plant parasitic nematodes associated with Cavendish and EAHB types at different altitudes in selected banana production areas in Kenya and pathogenicity of *Pratylenchus goodeyi* for improved banana yields

Specific objectives

i To identify PPN associated with EAHB & Cavendish banana cultivars in mid and high altitudes in selected banana production areas of Kenya

ii To assess population densities and distribution of PPN associated with EAHB & Cavendish banana cultivars in mid and high altitudes in selected banana production areas of Kenya

Methodology

1: To identify PPN associated with EAHB & Cavendish banana cultivars

Sampling fields.
(Soil & root)
Purposive sampling

Extraction using modified Baermann technique (100ml soil & 5g fresh roots)- left 48hrs undisturbed.

Counting & Identification (morphological)

Methodology cont’

2: To assess population densities and distribution of PPN associated with EAHB & Cavendish banana cultivars

Identified and counted nematode genera;

$$\textbf{Absolute frequency} = \frac{\textbf{Number of samples containing genera}}{\textbf{Number of samples collected}} \times 100$$

- ✓ Relative abundance of each genus

Simpson’s index of diversity ; $(Ds) = \sum (ni/N)^2$

Where; ni = Number of individuals of genera,

N = Total number of genera in the sample

Methodology cont’

- ✓ Nematode genera diversity calculated;

  Determine genera variation in the areas sampled;

  Shannon-Weiver index;

$$H^1 = - \sum_{i=1}^{S} Pi \ln Pi$$

Where: Σ ="the sum of"

s= Number of genera identified

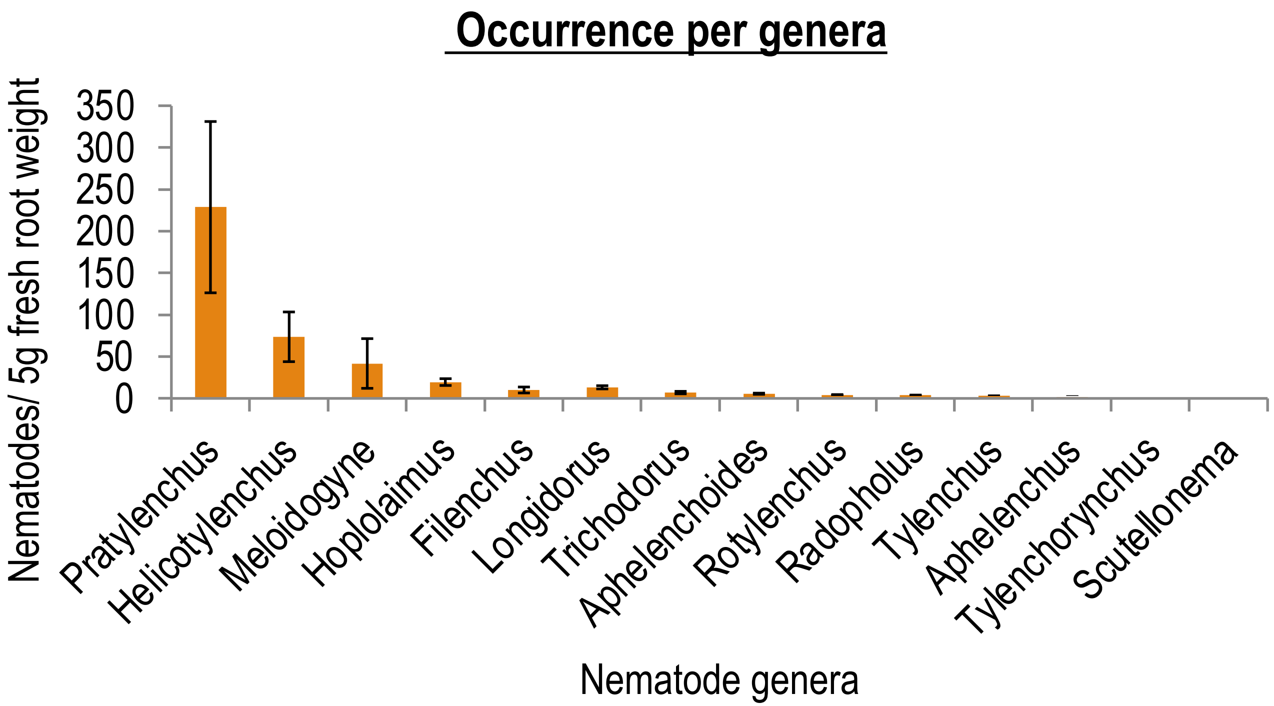
pi = *R. abundance of the* i^{th} *genera in the community*

In = natural log (Shannon and Weaver 1963)

Results

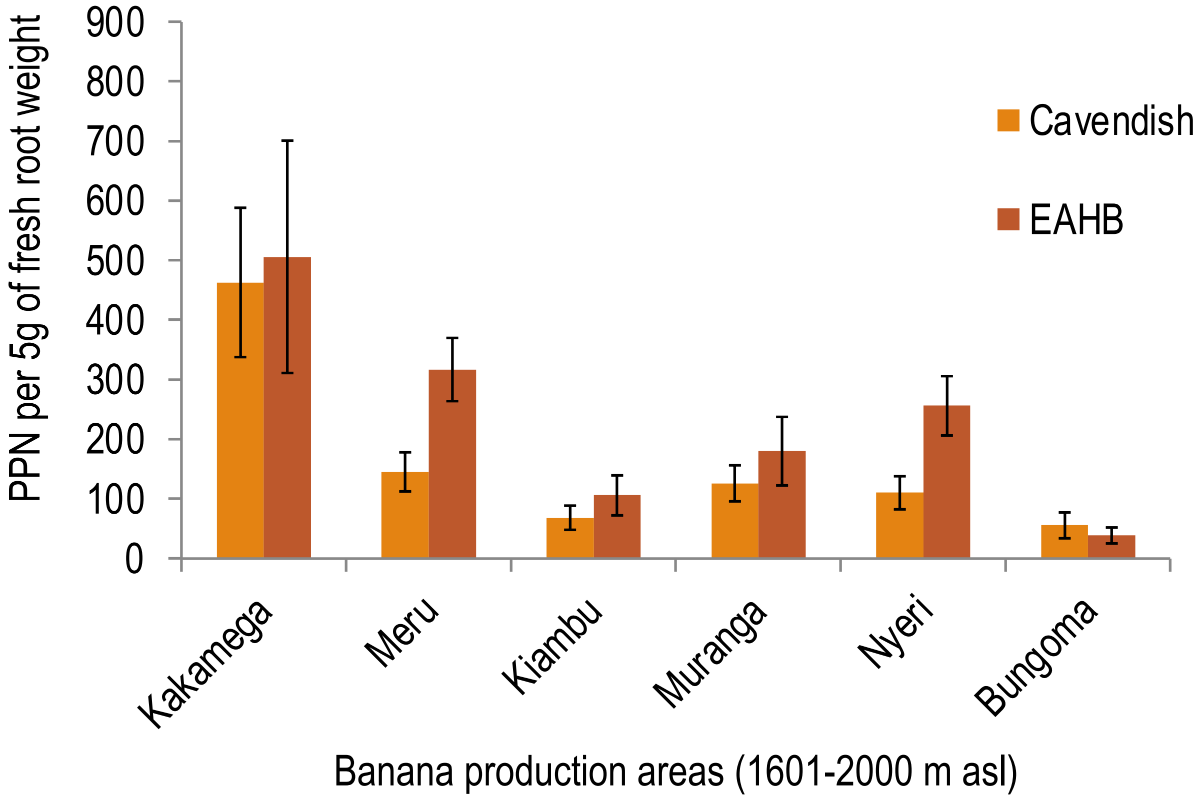
Objective 1: Occurrence of PPN on banana

- 14 genera of PPN were found to be associated with *Musa* spp. in mid and high altitudes
- The four most important nematodes of banana (*Pratylenchus*, *Helicotylenchus* , *Meloidogyne* and *Radopholus* spp.
- The importance of the other 10 genera has not yet been established.



Results cont’

PPN in high altitude areas (1601-2000 m asl)



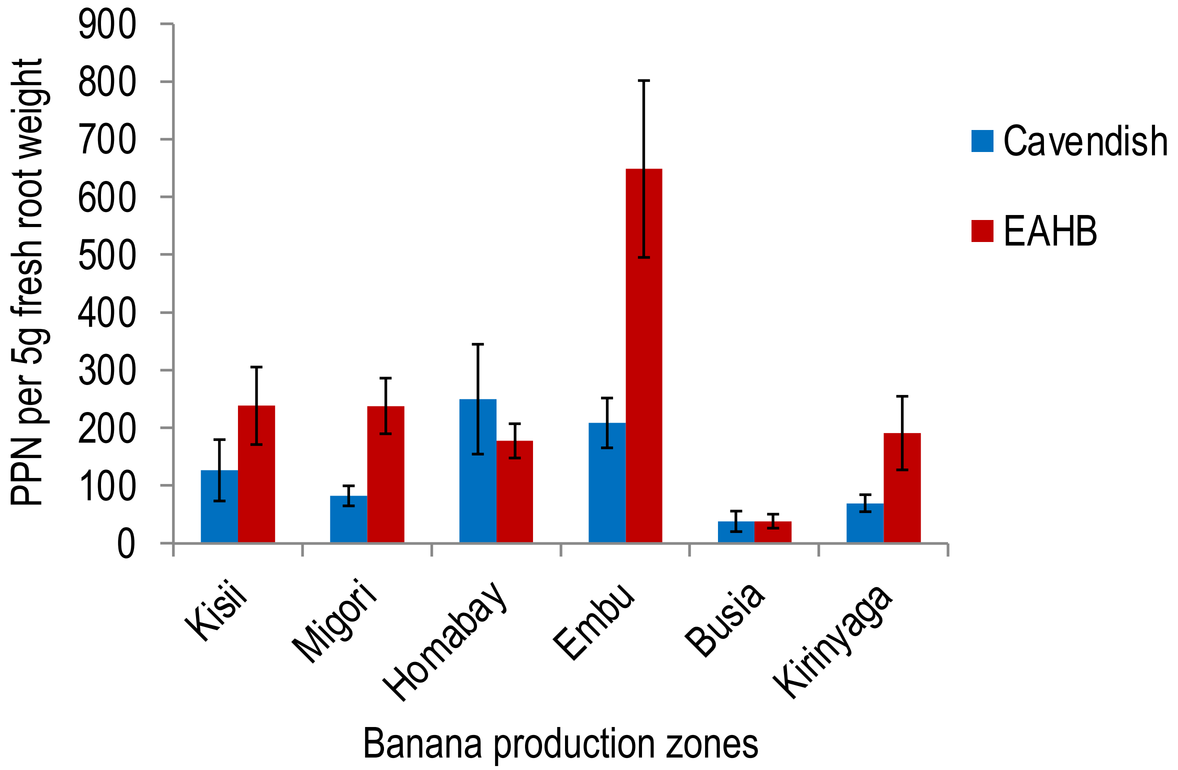
- High PPN densities isolated from Kakamega with EAHB supporting more populations than Cavendish. Differences not statistically significant ($p > 0.05$)

- Meru and Nyeri were second & third, with high PPN populations. EAHB supporting more PPN than Cavendish. Differences statistically significant ($p \leq 0.05$)

- Bungoma least affected with Cavendish supporting high number of PPN than EAHB. Differences not statistically significant ($p > 0.05$)

Results cont'

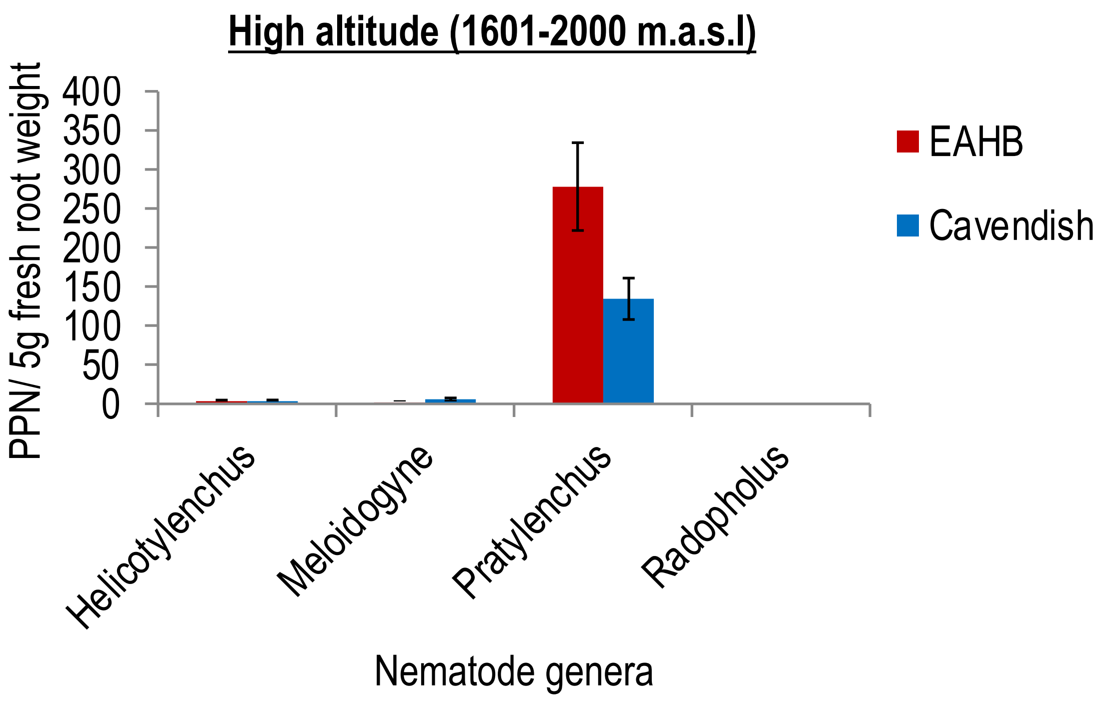
PPN in mid altitude areas (1100-1600 m asl)



- High PPN densities isolated from Embu. EAHB supporting more populations than Cavendish. Differences statistically significant ($p \leq 0.05$)
- Least affected was Busia. Differences not statistically significant ($p > 0.05$)
- In Homabay, Cavendish supported higher nematode densities that EAHB

Results cont’

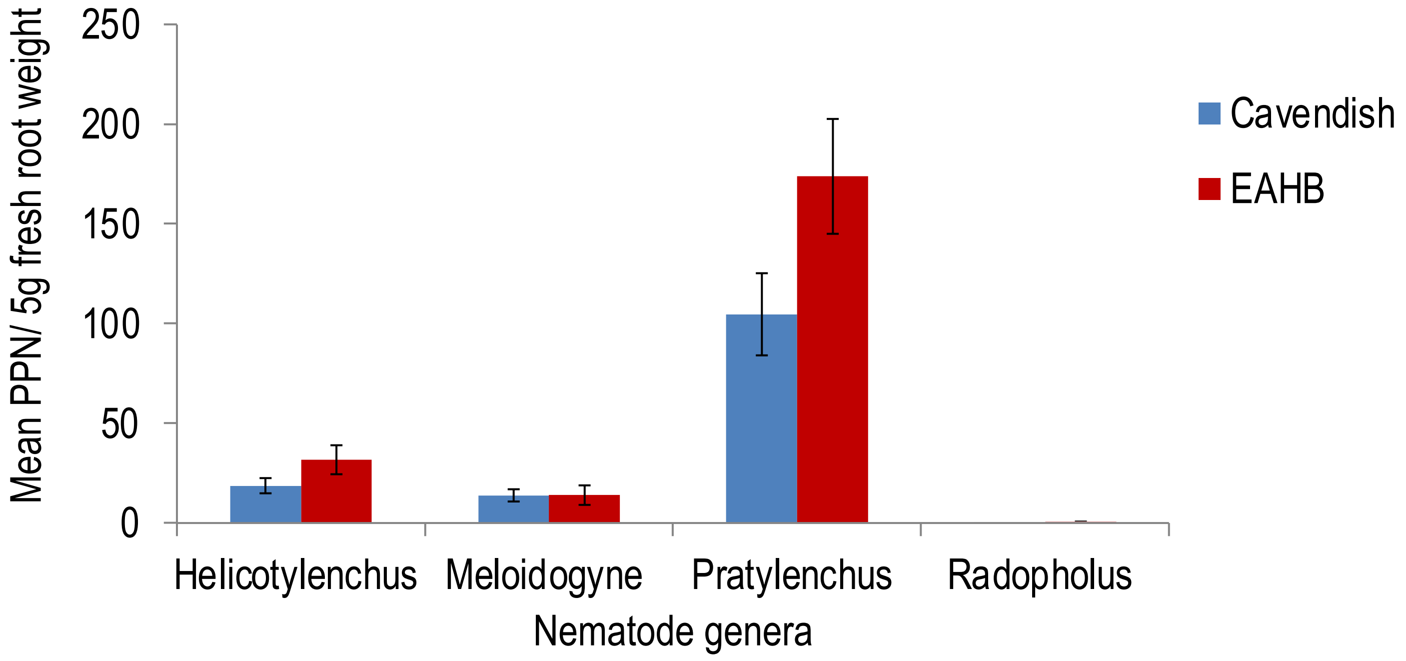
Objective 2: Abundance & distribution of PPN on bananas



- *Pratylenchus goodeyi* was the most abundant species
- *Radopholus similis* barely detected

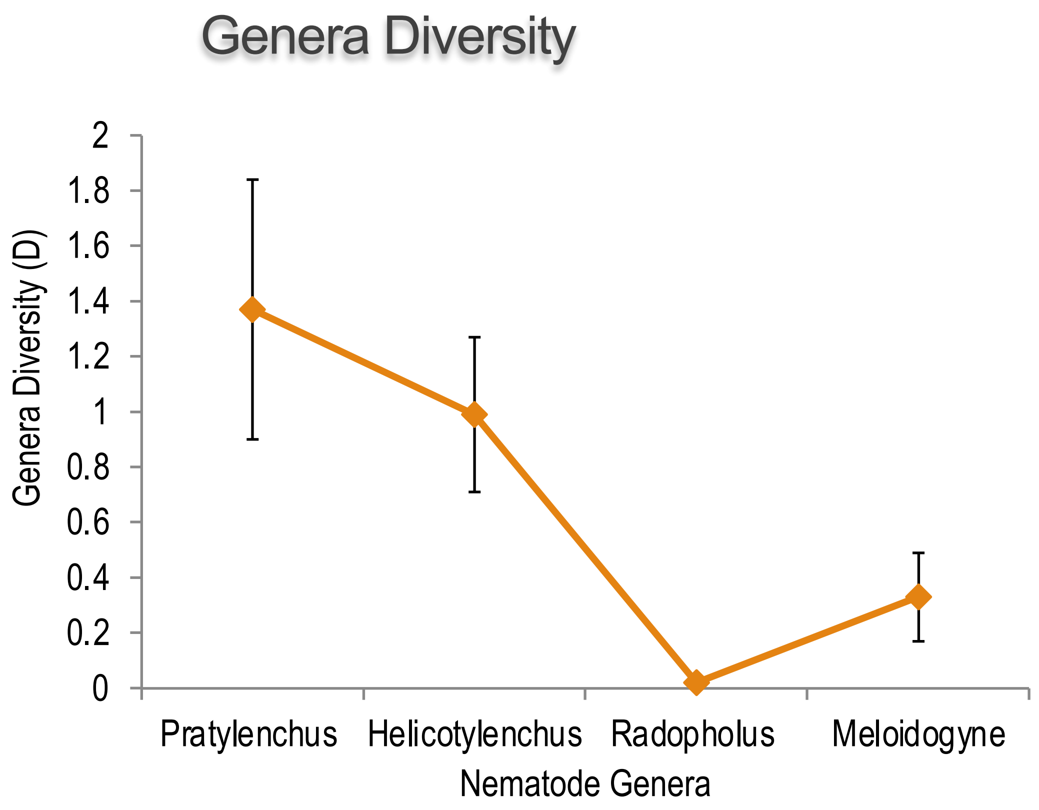
Results cont'

Mid altitude (1100-1600 m asl)



- *Pratylenchus* spp. the most abundant genera. Differences on EAHB & Cavendish were significantly different ($p \leq 0.05$).
- *Radopholus* spp. detected in low densities

Results cont’



- Genera diversity was not significantly ($p > 0.05$) different among PPN .
- Shannon Weiner indices revealed slight variations

Conclusion

- The major PPN attacking bananas in Kenya across mid and high altitudes are *P. goodeyi, H. multicinctus, Meloidogyne* spp. *and R. similis. P. goodeyi* is the dominant nematode in banana fields across mid and high altitudes

- The distribution of parasitic nematodes is no longer linked to certain altitudes as previously observed. The EAHB tolerated high densities of major PPN than the Cavendish cultivar at both mid and high altitudes

Recommendations

1. Further research is needed to determine yield losses to bananas and measures to control these species

2. Climate change has shifted the distribution of PPN from their previously known traditional habitats to new areas and this trend is likely to continue. Therefore, more studies are needed to measure nematode adaptation and development in these new eco-regions for their effective management

Acknowledgements

Theme: *"Enhancing Phytosanitary Systems for Healthy Plants, Safe & Sustainable Trade"*

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