Studies on plant pathogenic nematodes infecting banana in Assiut Governorate

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The present work was conducted to study the following main points:

1- Survey of plant parasitic nematodes associated with banana orchards of certain areas of Assiut Governorate.

2- Identification of plant parasitic nematode genera.

3- Identification of root-knot nematode species:

3.1- Morphometrical characteristics.

3.2- Morphological characteristics (perineal pattern).

3.3- PCR-based methods.

4- Susceptibility of certain banana rootstocks to root-knot nematode under greenhouse conditions.

5- Isolation and identification of certain bio-agents from banana rhizosphere.

6- The effect of bio-agents on *Meloidogyne javanica* under laboratory and greenhouse conditions.

7- Effect of some marine algae on *M. javanica* under laboratory and greenhouse conditions.

8- Induction of resistance in banana plants against *M. javanica* using abiotic inducers (Salicylic acid, Acetyl Salicylic acid and Ascorbic acid) under greenhouse conditions.

Results can be summarized in the following:

1- A total of 325 soil and root samples were collected from three localities; Assiut center, Sahel-Selim, and El-Fath cultivated with banana plants. Results showed that *Meloidogyne*, *Pratylenchus*, *Helicotylenchus*, and *Rotylenchulus reniformis* were found with different population density in collected samples.

2- Morphometrical characteristics, Morphological characteristics (perineal pattern) and the PCR based marker (SCAR) observed that, *Meloidogyne javanica* is dominant in all banana orchards.

3- Studying the susceptibility of certain banana rootstocks to the *M. javanica*, showed that, the banana cultivars differed in their susceptibility to the *M. javanica*. Whereas Grand Nain was highly susceptible, Maghraby was susceptible however, Williams and Hindi were moderately resistant.

4- Twelve isolates of fungi and nine isolates of bacteria were isolated from rhizosphere of banana healthy plant.

5- *In vitro* assay of fungal culture filtrate and bacterial suspentions against percentage of J2 mortality were done.

Observed that,

- Fungal culture filtrate of isolates no. 3, 8 and 10 gave the highest percentage of J2 mortality.
- Bacterial isolates no. 2, 3 and 7 showed high mortality of J2 percentage.
- In this experiment, the J2 mortality percentage affected with exposure period time to fungal culture filtrate or bacterial suspentions as well as by the increase in concentration.

6- The best antagonistic isolates of fungi and bacteria against *M. javanica* were identified. As fungal isolates (no. 3, 8 and 10) identified as *Paecilomyces lilacinus*, *Trichoderma harzianum* and *Trichoderma longibrachiatum* while, bacterial isolates (no. 2, 3 and 7) were *Serratia marcescens*, *Bacillus thuringiensis* and *Pseudomonas aeruginosa* respectively.

7- Under greenhouse conditions, *Paecilomyces lilacinus* and *Bacillus thuringiensis* were significantly affected *M. javanica* populations and increased plant growth parameters as compared with control.

8- Marine algae extract at different concentrations were tested on *M. javanica* mortality percentage *in vitro*. All treatments were significantly decreased J2 viability and *Spirulina platensis* (blue-green algae) gave the highest percentage of mortality followed by *Sargassum vulgare*, *Chlorella vulgaris* and *Ulva fasciata*. There were a significant differences between the concentrations of the extracts and percentage of mortality. The best concentration of each extract was at 1000 µg/ml. Moreover, the exposure period affected on percent of mortality. The highest J2 mortality percentage was after 72 h.

9- Under greenhouse conditions, *S. platensis* was significantly affected on *M. javanica* populations and increased plant growth parameters as compared with control. On the other hand, *U. fasciata* showed the least activity on reduction population of *M. javanica* and on increased plant growth parameters.

10- Studying the induction of resistance with Salicylic acid (SA), Acetyl salicylic acid (ASA) and Ascorbic acid (AS) in banana plants against *M. javanica* under greenhouse conditions, results showed the variation in the reduction of *M. javanica* populations and increased plant growth with all inducers. SA and ASA at concentrations 100 and 200ppm either as foliar spraying or soil drenching significantly reduced nematode as influenced by the tested concentrations and type of treatments compared to control. However, AS had the least impact on nematode population either as foliar spraying or soil drenching.

11- SA treatment had the highest effect of plant growth (fresh shoot & root weights and lengths) more than ASA and AS.

12- Physiological responses revealed that the high level of total phenols, proline (shoot and root), carbohydrates, catalase, peroxidase and polyphenol oxidase activities in plants treated with SA as foliar spraying at higher concentration (200 ppm) gave the highest effect followed by ASA as foliar spraying. Low AS

concentrations (100 ppm) had the lowest effective compared with the inoculated untreated plants.