The 9th National Fungus Day of Egypt
اليوم الوطنى التاسع لفطريات مصر

مركز البحوث الزراعية
Agricultural Research Center
ARC
المعمل المركزى للزراعة العضوية
Central Lab. of Organic Agriculture

Chemical Nematicides versus Myco-Nematicides: Human & Plant Health Prospects

Presented By

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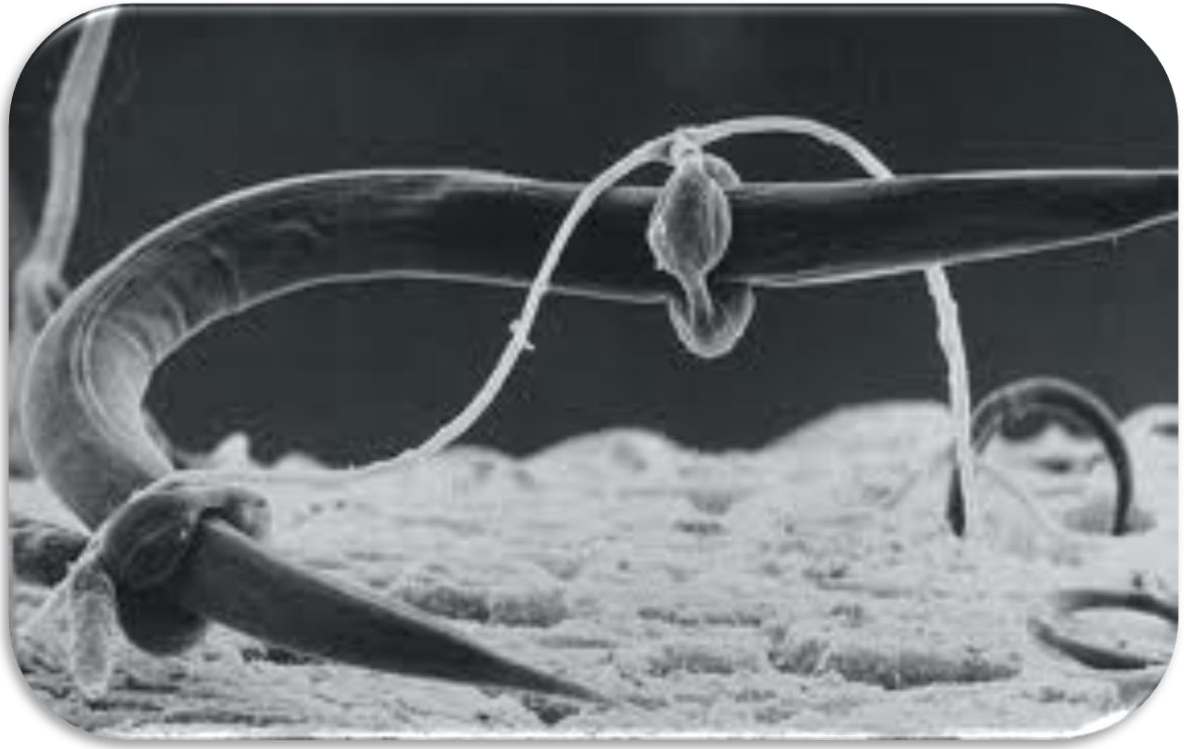


Plant Parasitic Nematodes

- Microscopic worms causing economically high yield losses in plants cultivated worldwide.

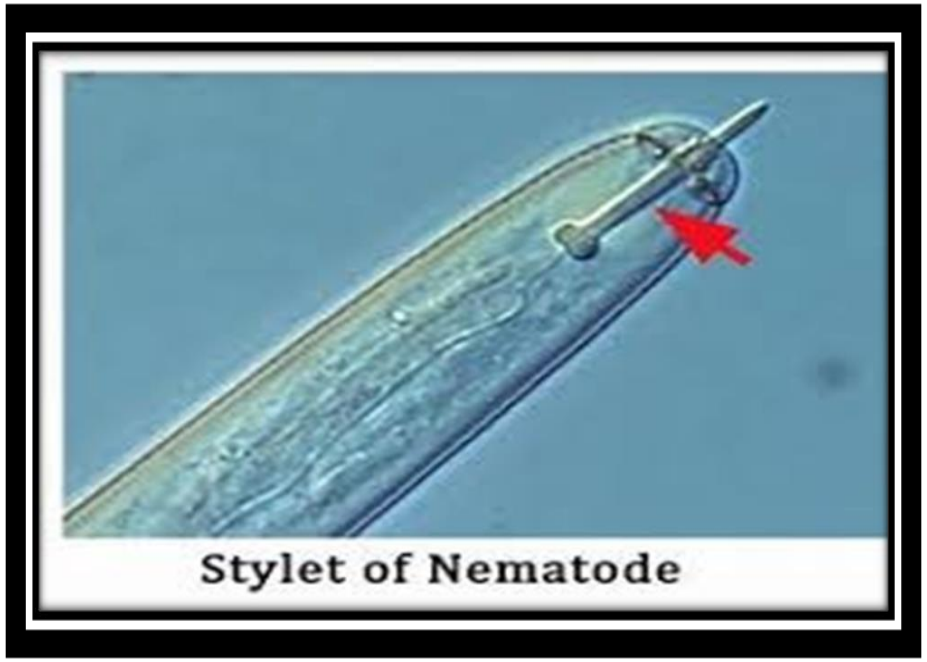
- Over 6000 known species of plant parasite nematodes

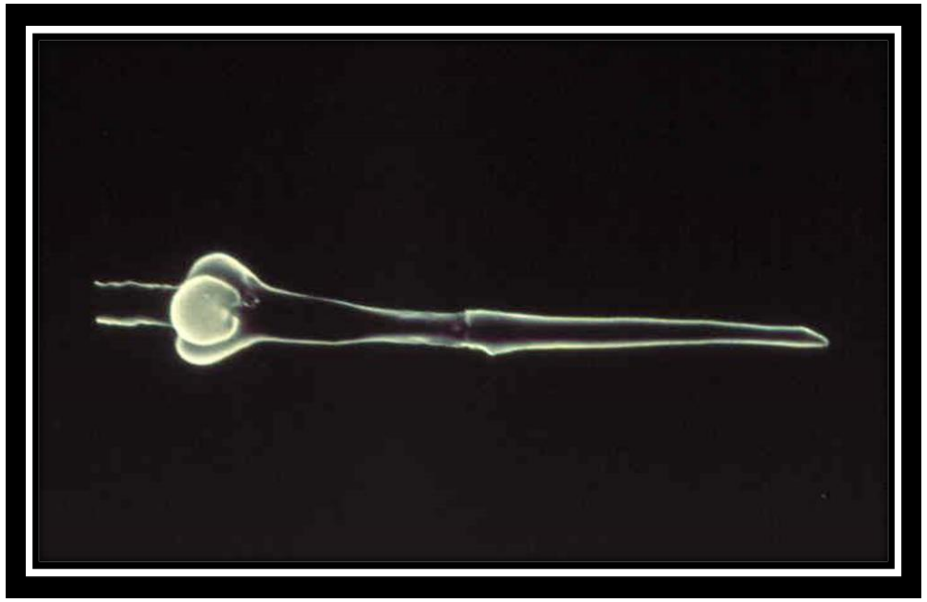
- Attacks almost all plants

Cause huge losses to most of economic crops

Plant parasitic nematode

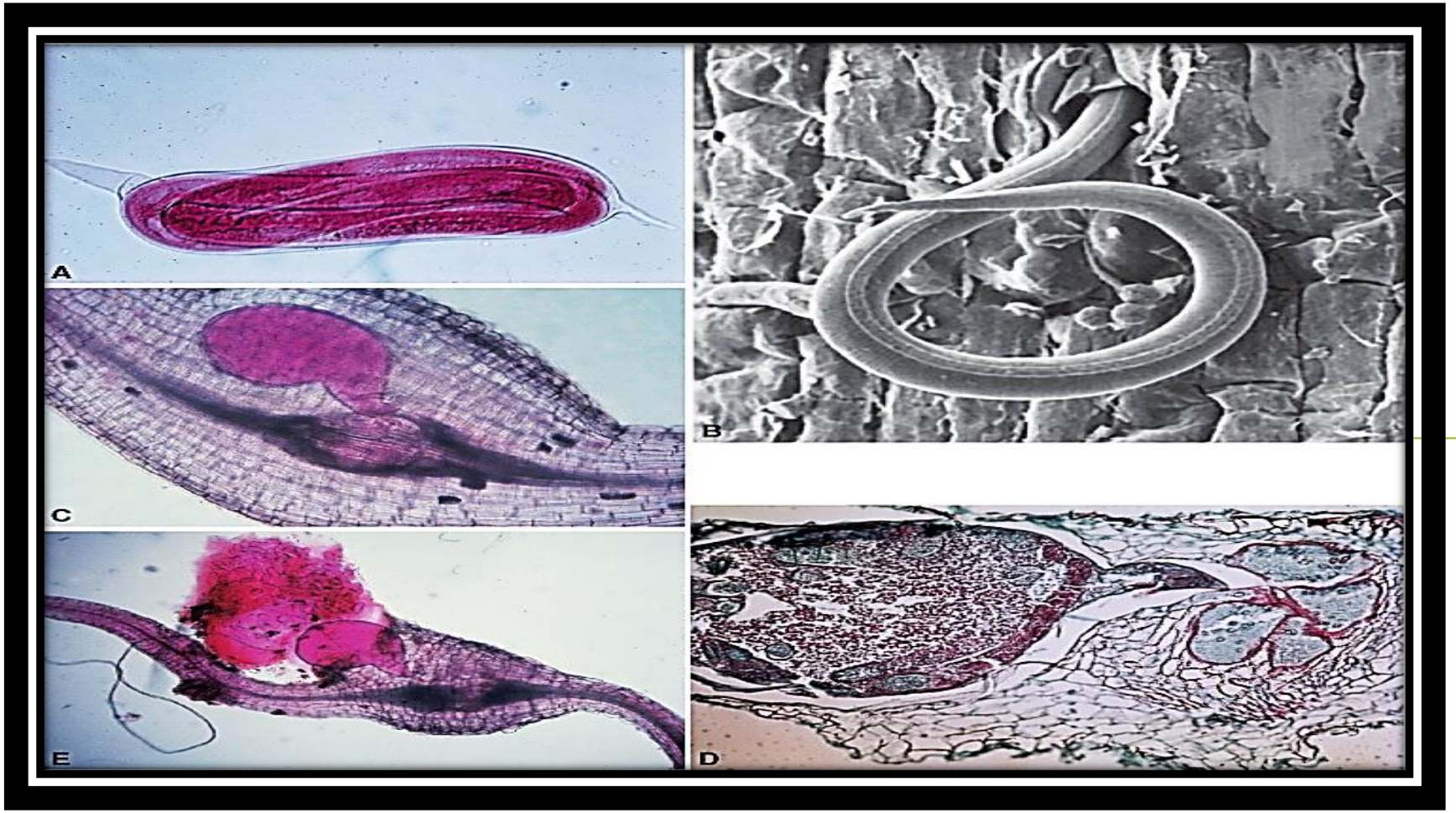
The most important morphological feature of plant parasitic nematodes is the presence of stylets that enable them to penetrate root cells and withdraw the contents.





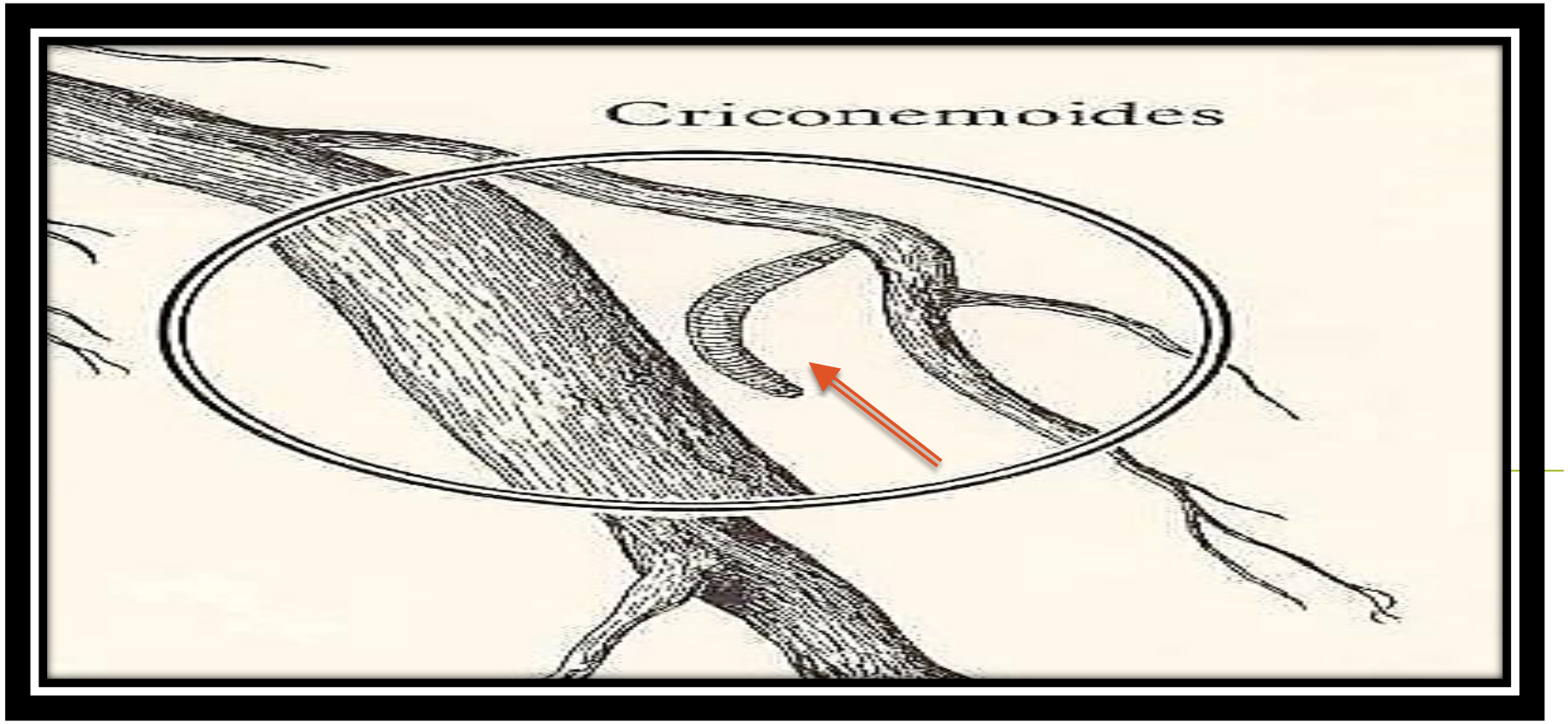
According to the Feeding Habitat, Phyto-Nematodes Classified in to:

1. Endoparasitic Nematodes



EX: Root-Knot Nematodes & Lesion Nematoted

2. Ectoparasitic Nematodes

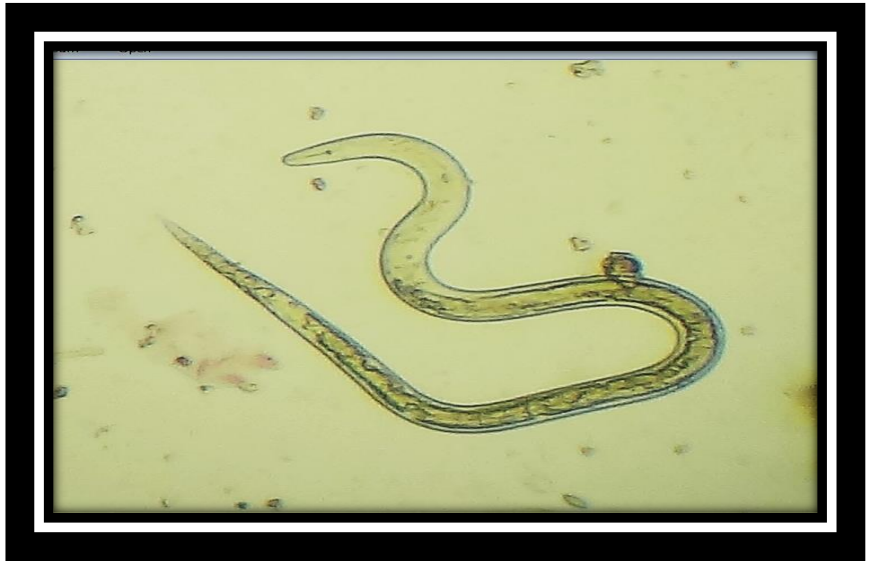


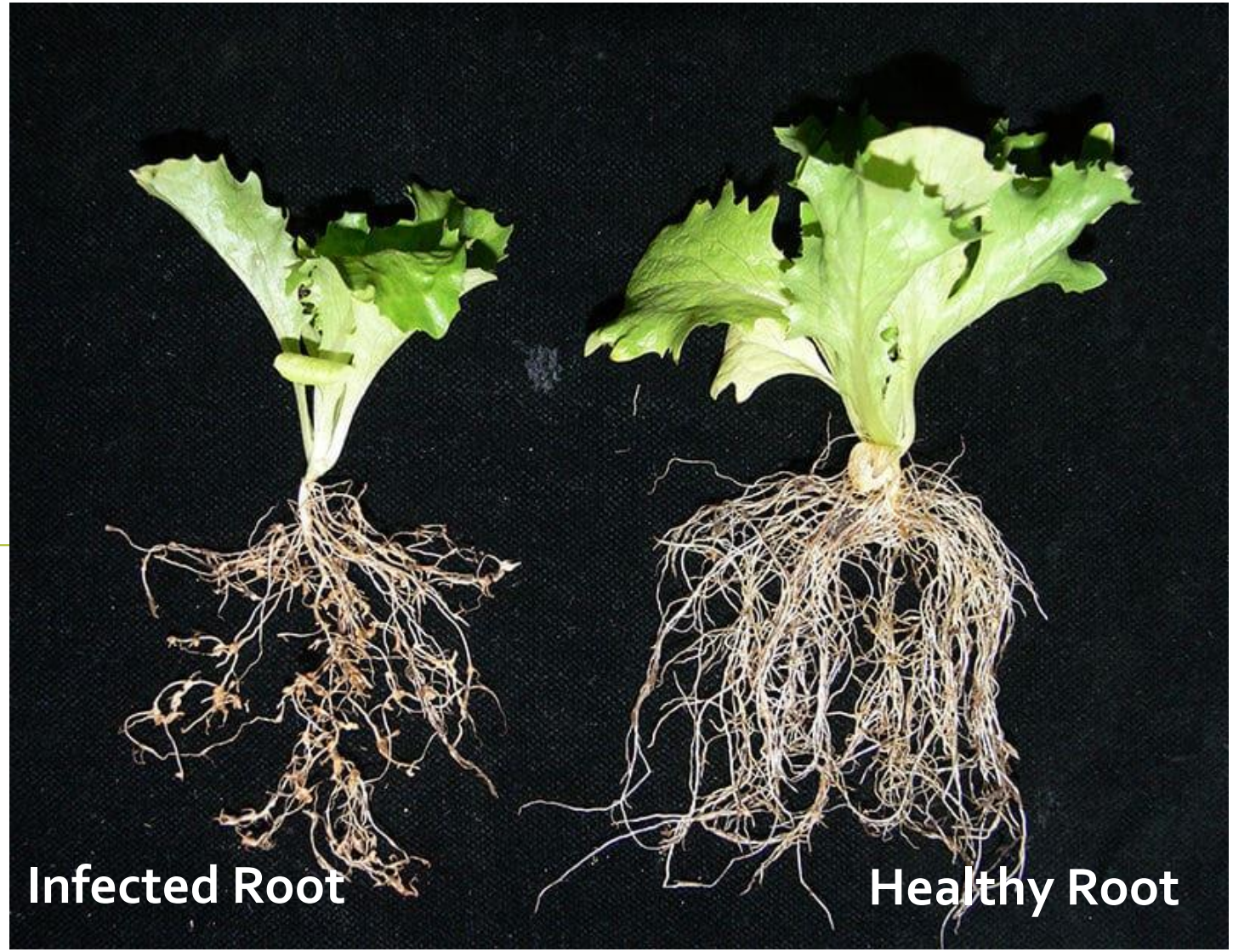
Ex: Ring Nematodes

3. Semi-Endoparasitic Nematodes

Ex: Cyst Nematodes

Root-Knot Nematodes "*Meloidogyne Spp.* Spp."

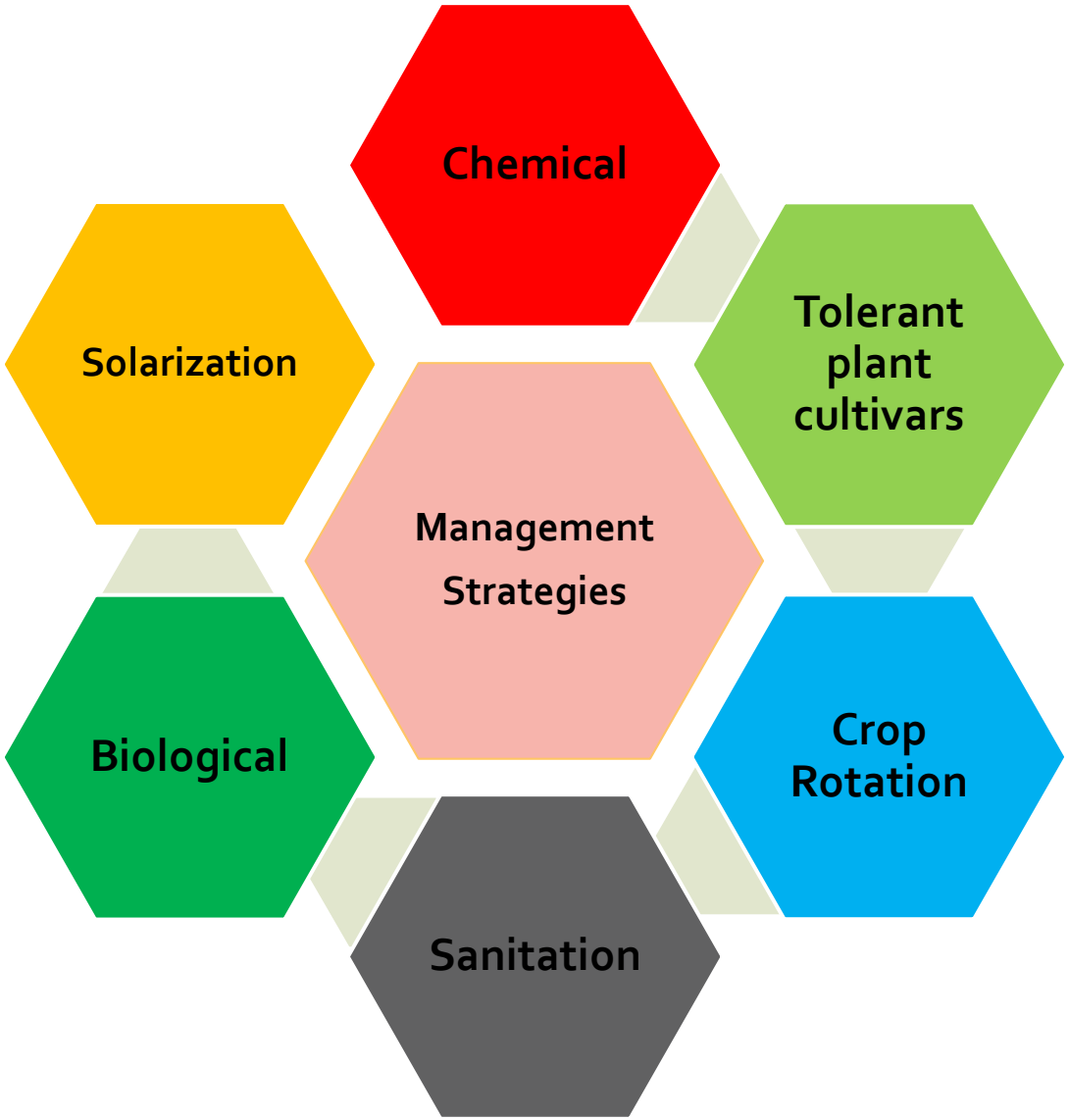




Infected

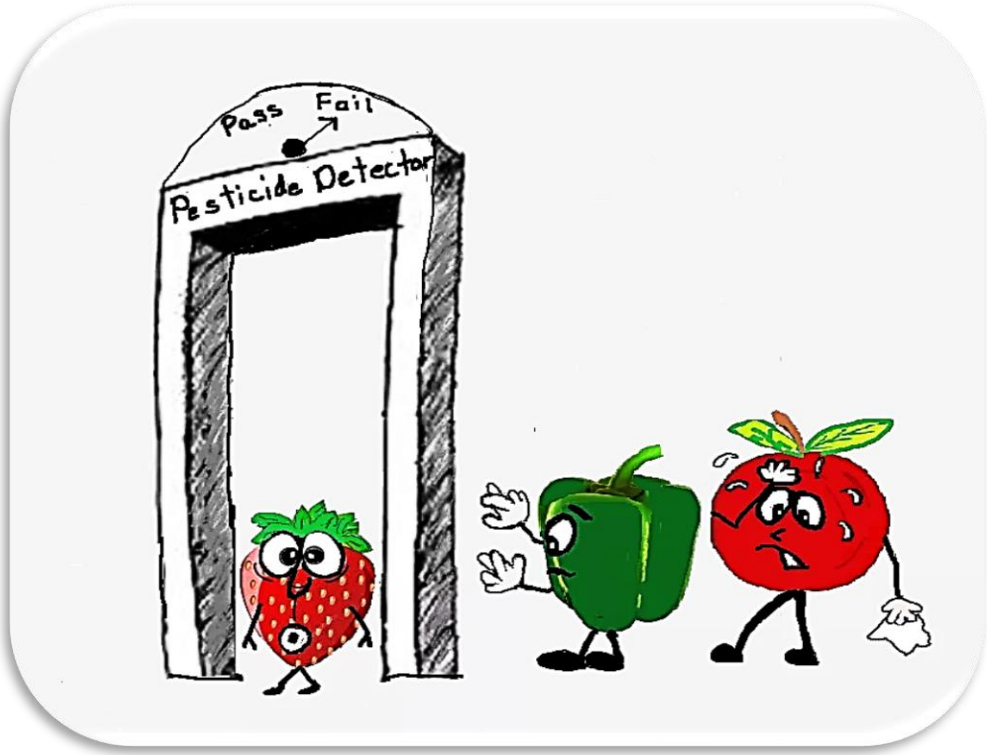
Not Infected

Management Strategies



Chemical Nematicides

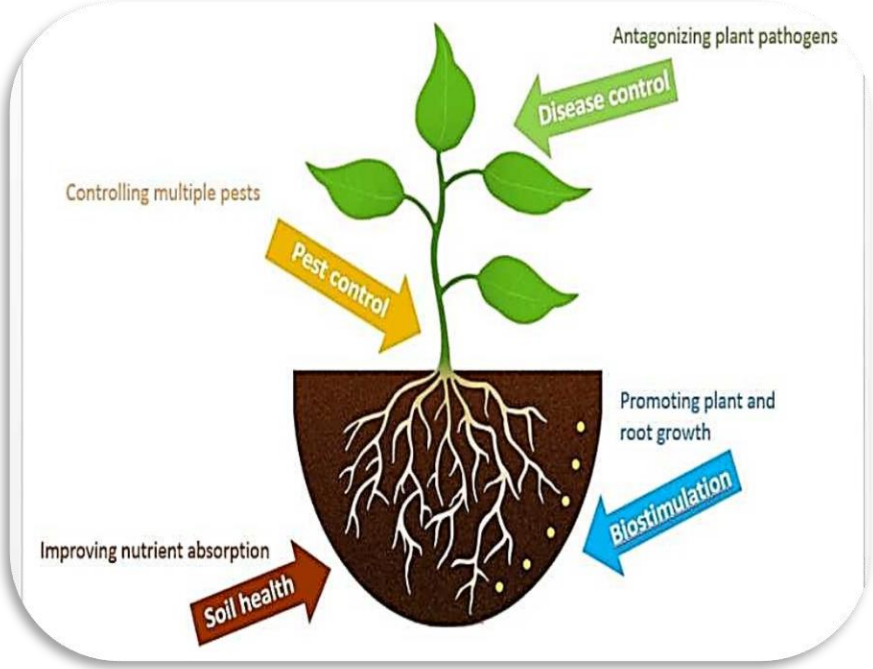
A nematicide is a type of chemical pesticide used to kill plant-parasitic nematodes. Nematicides have tended to be broad-spectrum toxicants possessing high volatility or other properties promoting migration through the soil.



Advantages	Disadvantages
• Effective in reducing the total nematode population soil in short time • Easily manner of Application	• Serious Soil and Ground water Pollution • Affect Negatively The Beneficial Soil Microflora • Genetic of Plant May Get Altered • Nematode Resistance in Long Run • Nematicide Residue in Fruits • Negative Effects on Human Nervous System , Liver , Kidney and Lungs • Carcinogenic • DNA mutation

Biological Control

The use of living organisms or their metabolites to suppress the population of plant parasitic nematodes in soil to reduce their damage on the infected crop



Biological Nematicides may be

- Fungi
- Actinobacteria
- Bacteria
- Microalgae

Nematophagous Fungi

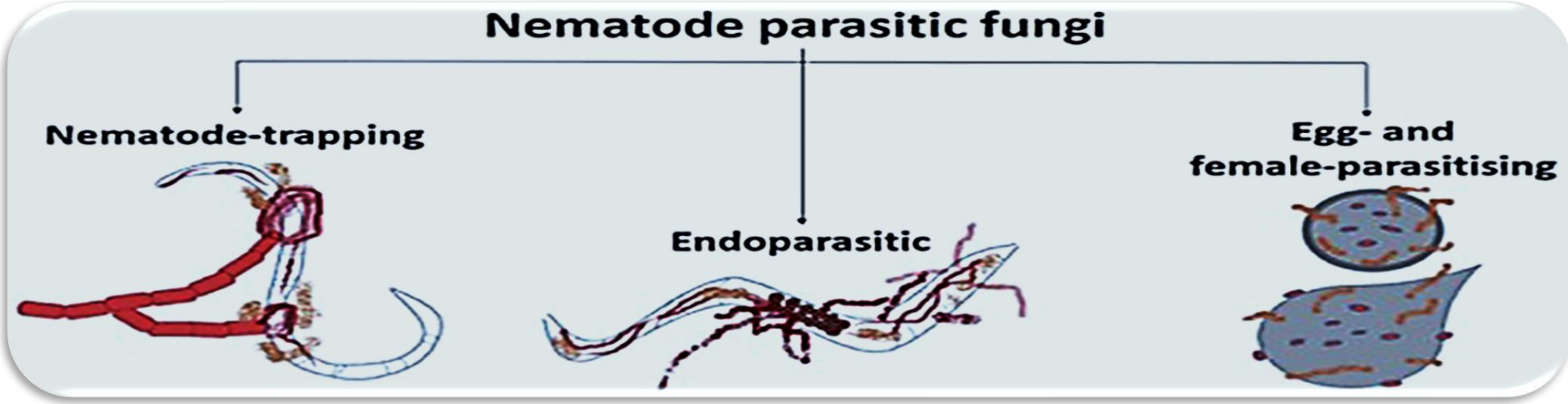
- Nematophagous fungi are those that can capture, kill and digest nematodes.
- Based on the mechanisms by which they attack nematodes, nematophagous fungi are classified into four general groups:

(i) Nematode-trapping fungi that use specialized trapping structures differentiated from hyphae;

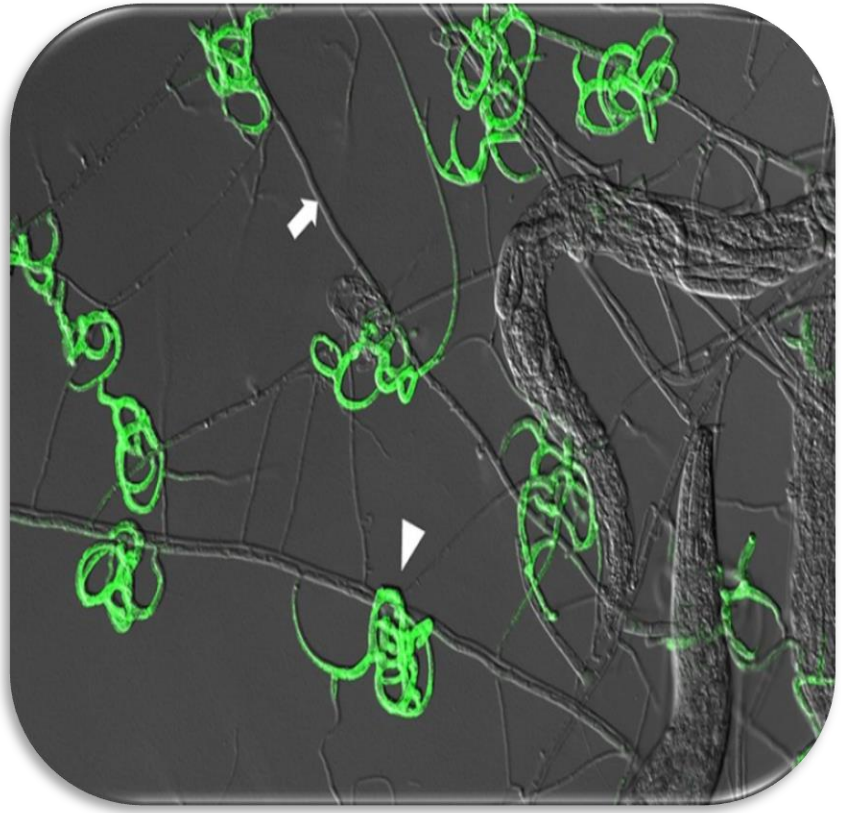
(ii) Endoparasitic fungi that use their spores to invade larvae;

(iii) The opportunistic fungi that invade or colonize nematode eggs, or cysts with their hyphal tips; and

(iv) Toxin-producing fungi that immobilize nematodes before invasion



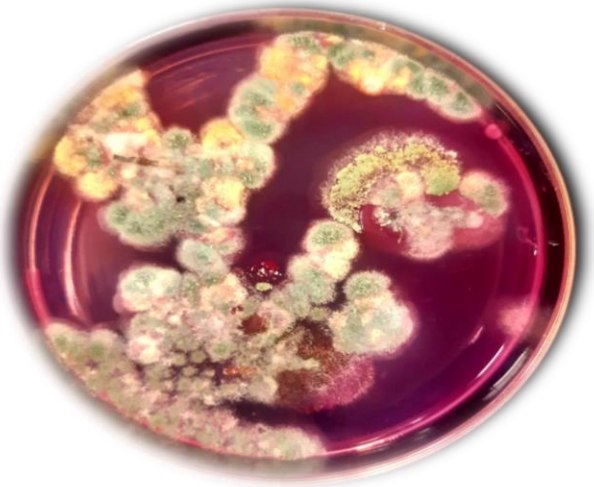
How to Develop Myco-Nematicides??!



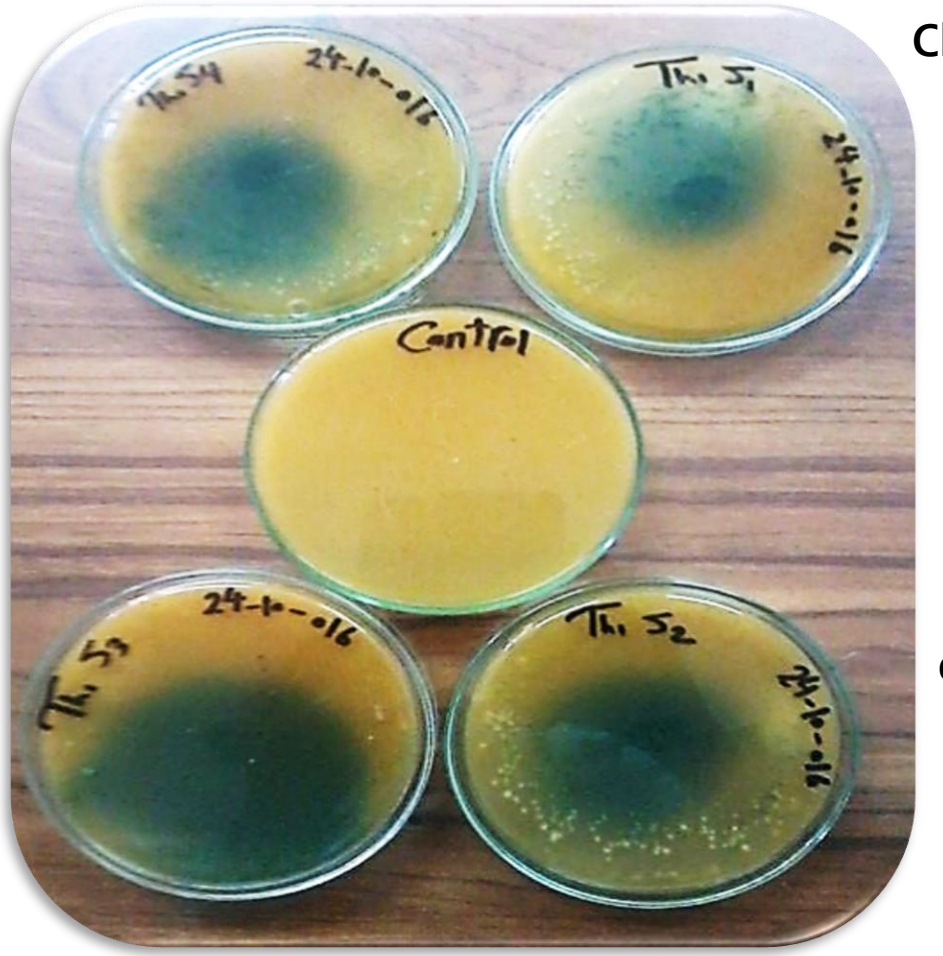
1. Sampling

Selection of healthy plant rhizosphere soil that is reach in natural beneficial microorganisms and organic matter

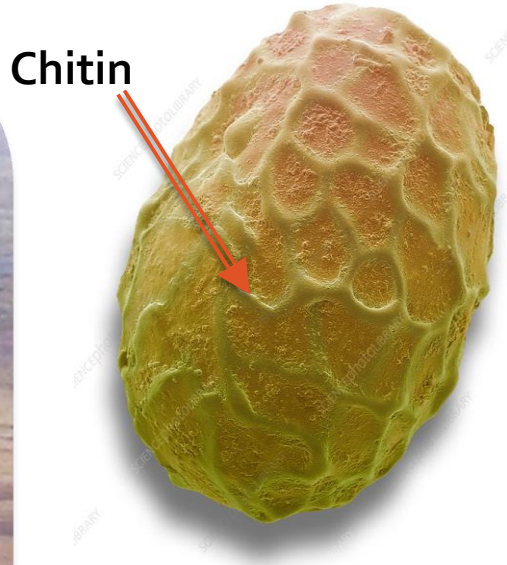
2. Isolation & Purification



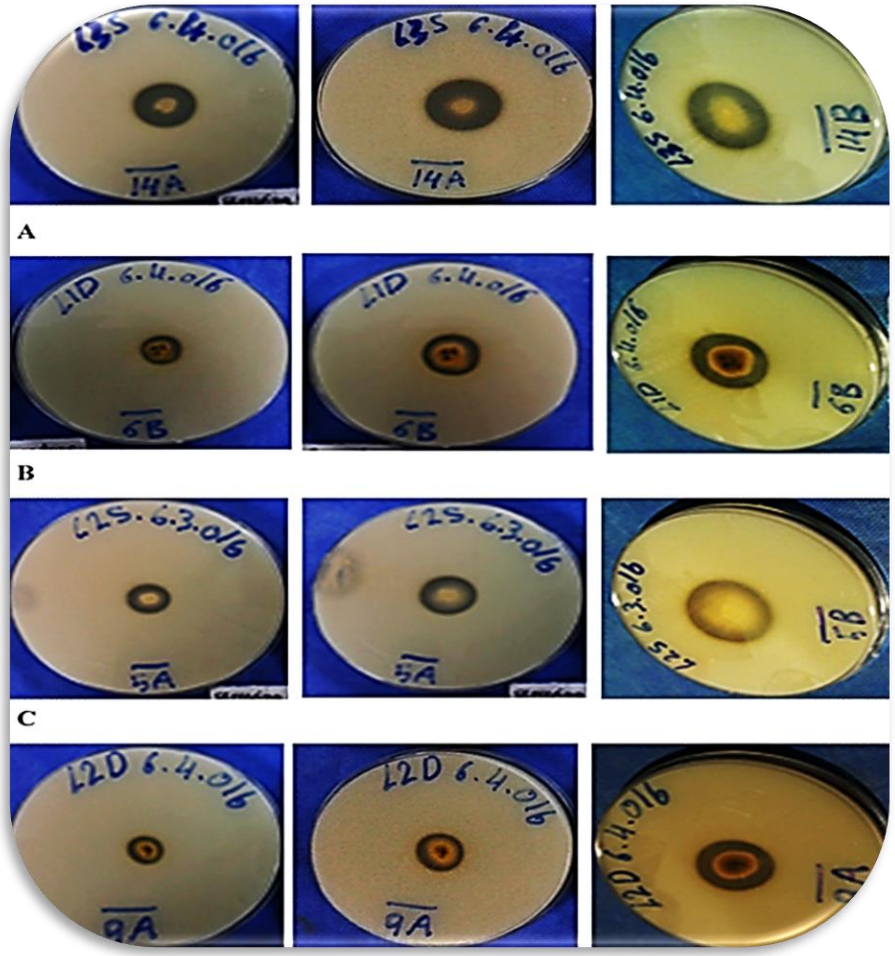
3. Selection Based on Hydrolytic Enzymes Production



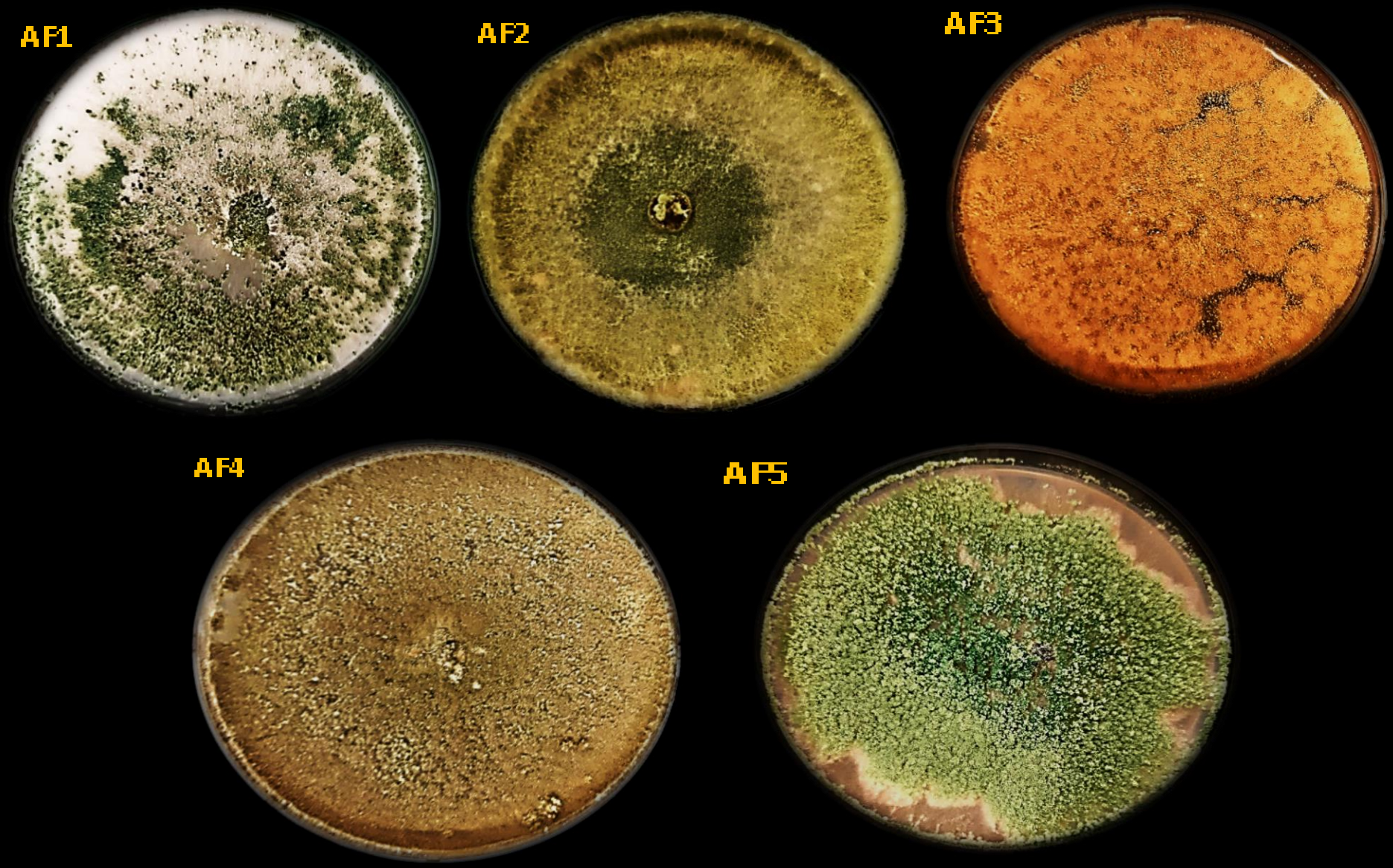
Chitinase Production by soil fungi



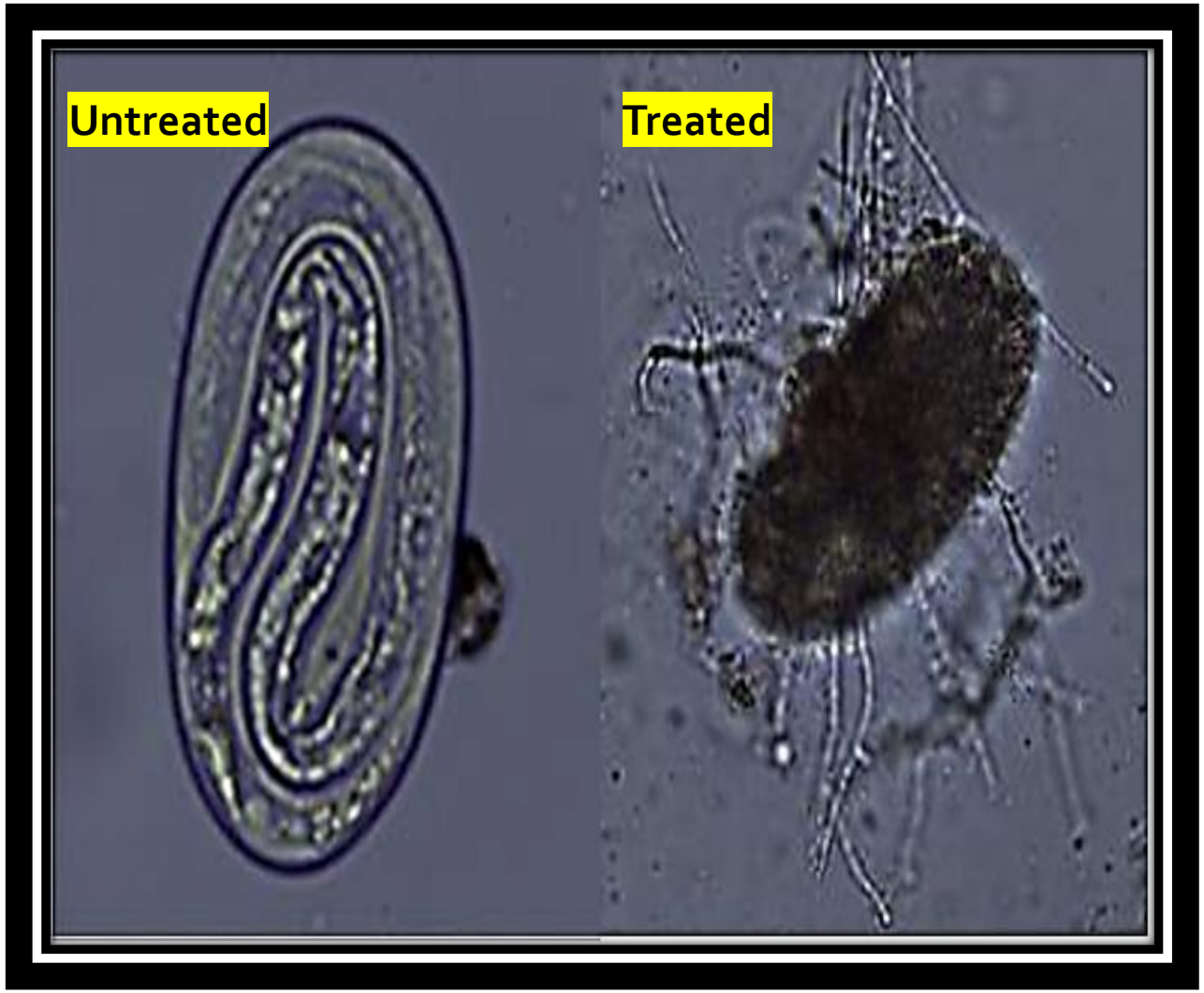
Chitin is the main component of Nematode egg shell. So chitinolytic fungi can be developed and introduced as safe weapons against plant parasitic nematodes.



Purification of The Most Prominent Chitinolytic Fungal Isolates

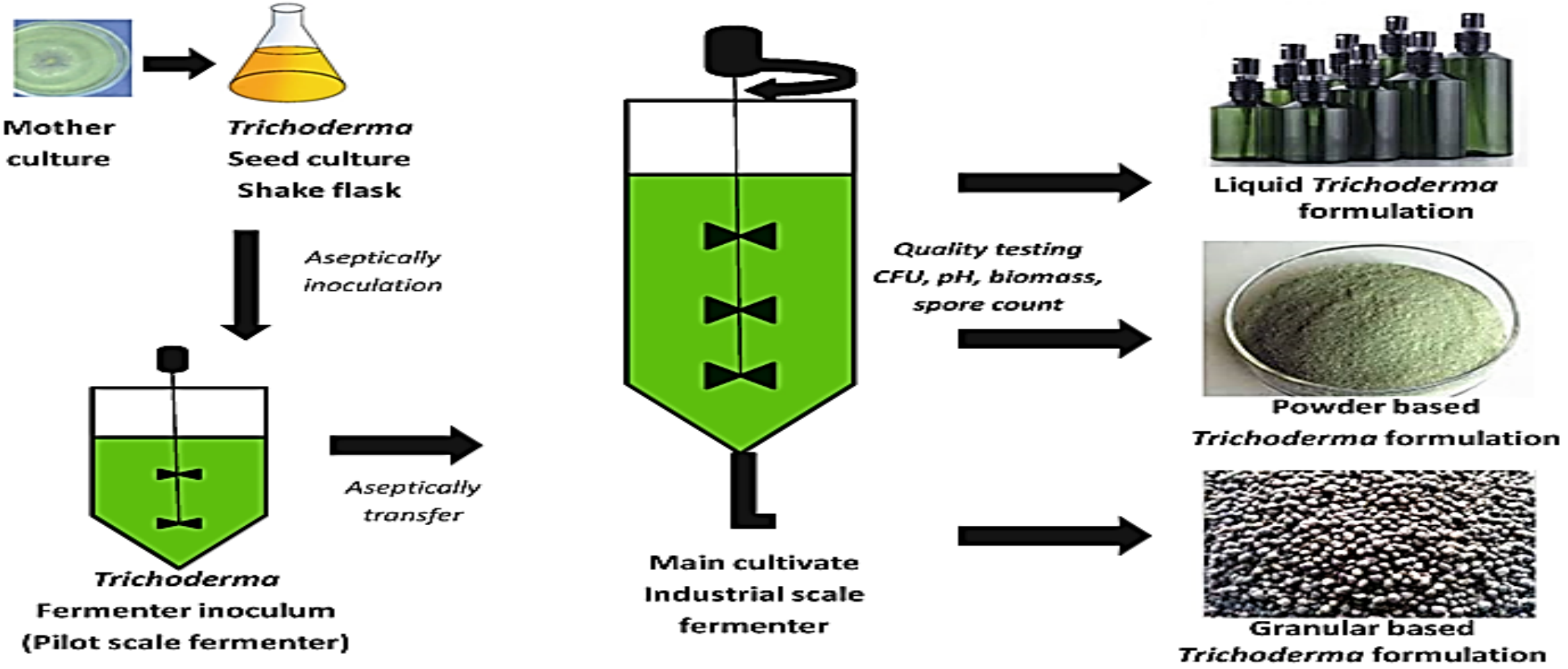


4. *In Vitro* Screening of The most Prominent Fungi Against Nematode



Lysis effect of chitinolytic fungal isolates on larvae and eggs of root-knot nematodes

5. Formulation and Large scale production of Myco-Nematicides



Product development process of different formulation of *Trichoderma* sp. using submerged batch fermentation

6. Application

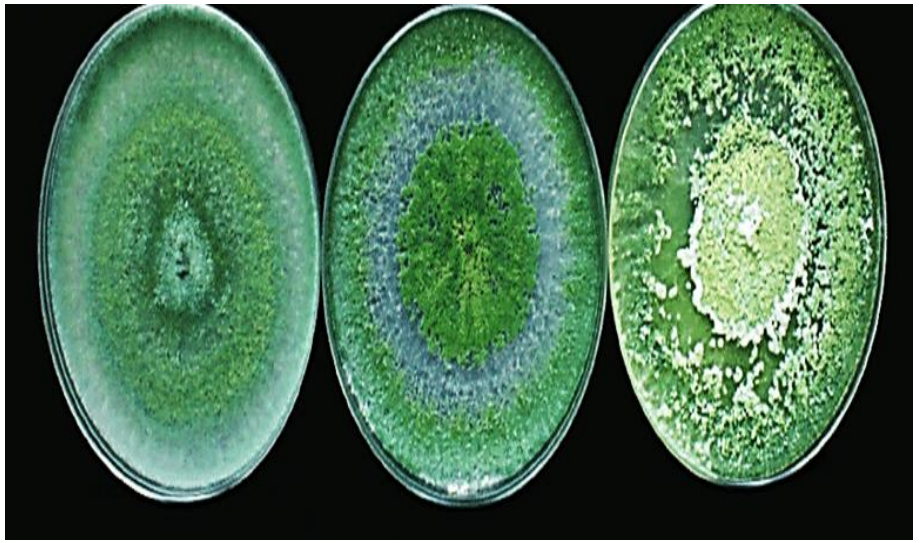
Effect of Periodically Application of Novel *Trichoderma Asperrelloids* Formulation on Tomato Roots Infected with Root-Knot Nematodes Under Open Field Conditions

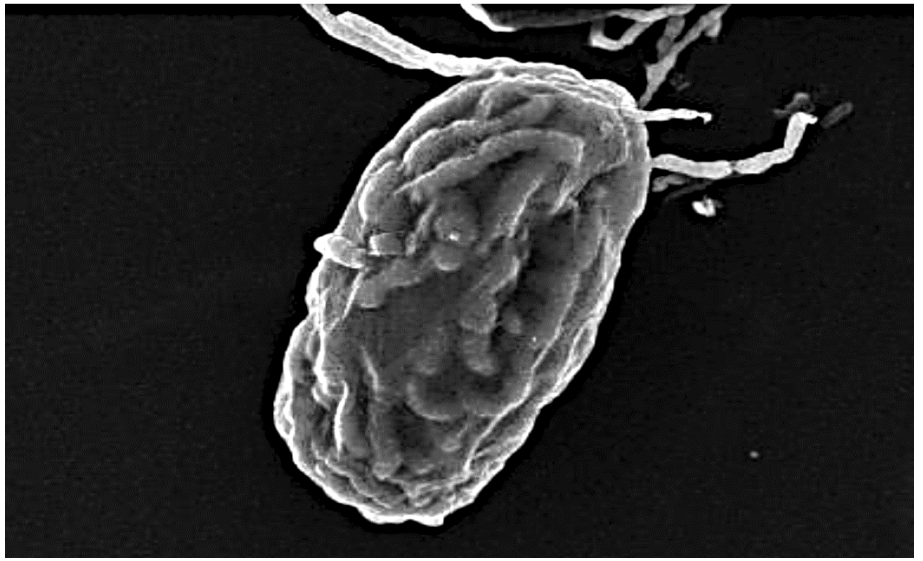
Untreated Control

Treated

Trichderma spp. as A Promising Model of Bionematicide

- *Trichoderma* spp. acts as prominent biological control agents as they can protect the root system against plant parasitic nematodes attack
- They can colonize the root surface and is strongly parasitic to eggs and egg masses of plant parasitic nematode
- They are a good producer of chitinases and proteases which enable them to degrade the nematode egg shell and larvae
- They are strong competitors for place and nutrients
- Easy to be produce in large scale and easy to be applied in soil





Conclusion

- Climate change is the most significant problem that recognized recently as threat to food system sustainability and food security.
- The over application of chemical nematicides contribute to climate change through greenhouse gas emissions (GHG) and toxic soil depositions.
- At this crucial time, there is a pressing need to more sustainable crop production practices.
- In this respect, filamentous fungi can be an interesting biocontrol alternative.
- They are able to reduce the damage caused by plant-parasitic nematodes directly by parasitism, antibiosis and by the production of lytic enzymes.
- They also proved to minimize harm by space and resource-competition and by providing higher nutrient and water uptake to the plant.
- Therefore, the use of beneficial soil fungi as nematicidal agents is a promising strategy in agriculture against plant-parasitic nematodes.

THANK YOU