

A window to the world of nematodes

Dr. QUDSIA TAHSEEN Professor Department of Zoology, AMU, Aligarh, India E-mail: gtahseen@gmail.com

Nematoda

•••the most abundant and genetically diverse multicellular phylum on earth.

Nathan A. Cobb



"If all the matter in the universe except nematodes were swept away, our world would still be recognizable... we could find its mountains, hills, valleys, rivers, lakes, and oceans represented by a film of nematodes."



Oldest fossil 120-135 MYA







Phylum



Most numerous animals **Second most numerous** species Size: mostly microscopic Longest is 26 feet (in Blue whale) Simple morphology No circulatory system No respiratory system No skeleton



THE UBIQUITOUS CREATURES







• Over 3 billion nematodes can be present in 1 acre of land.

One pound of soil of a cultivated fertile field contains 10-20 species.

Science

C. elegand

□ Many species occur in the top 30 cm (12 in) of soil.

Current Opinic

Genetics

& Development

Highly diverse and versatile

Multicellular with endless variations under a deceptively simple anatomical pattern.

Sometimes described as a typical example of a simple metazoan (eNelson et al., 1982).

However, simplicity lies in the eye of beholder: nematodes are highly diverse in almost every respect, including morphology.





HARD CORE....

Automated space board experiments performed on batches of *Caenorhabditis elegans*

Miniscule research worms kept in special aluminum canisters aboard the <u>doomed space shuttle</u> <u>Columbia</u>

survived after plunging from the spacecraft and hitting the ground with an impact 2,295 times the force of Earth's gravity.

Nematodes impact human life in many ways



- cause numerous diseases of humans and live-stocks
- important pests of many crops
- role in mineralization
- powerful models to study development, aging and many diseases including cancer
- bioindicators of environmental quality

Annual worldwide loss caused by nematodes in crops consumed by humans 11 to 14% for a total of about \$80billion



Sasser, 1989



Animal Parasit Nematodes



Wuchereria













Insect Parasites

mosquitoes, moles crickets, citrus weevils



Insect Parasitic Nematodes

Tools for successful

The Essential Resource for Insecticidal Nematodes

insect control

Insect parasitic nematodes may be the right choice for controlling your insect problem while minimizing pesticide use. This site will answer all your questions. For more information, check out the companion Video or Ask the Experts for a personalized response!





Plant Parasites



- Over 6000 known species Present in all ecological niches
- Attack almost all plants
- Cause 10% losses to crops
- Reduce ornamental growth
- Big problem on tree crops





Pathogenicity of nematodes

- Direct damage
 Stress factor
- Interaction with other organisms
- Virus transmission

Detritivores / Bacterivores







As nematodes live everywhere and in everything, it is reasonable to ask,

"Why?" What special properties of nematodes have allowed this degree of diversity and adaptation?



ADAPTATIONS

What decides the nematodes to be one of the most adapted animals?

Great degree of phenoplasticity

Cuticular modifications

be smooth (most Enoplidae),

annulated (Desmodoridae, Desmoscolecidae, most Monhysteridae),

punctated (Cyatholaimidae, many Chromac Comesomatidae),

complicated and compact structures (many Chromadoridae).





Cuticle and associated structures in some fresh water nematodes



Labial modifications in fresh water nematodes

























High resolution images of fine structures and surfacial details made available by SEM











5 µm



Conspicuous amphids: great aid in chemoreception

Amphids in fresh water forms









Feeding adaptation: diversity revolves mostly around the evolution of stoma and one or more pharyngeal bulbs

Species live at freezing point inside lacunae in arctic ice and prey on other lacunary nematodes

Predators with big hooks or teeth in more or less complex arrangements

Curved, swiveling teeth in can-opener-like arrangements, used to pry open the silicate frustule of diatomaceous algae, or to slice the cuticle of prey









Labial modifications and stoma in fresh water nematodes







Female genital opening in aquatic nematodes



Male tails in fresh water nematodes



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Tail termini in aquatic nematodes











Thanks for your time