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An *in vitro* Approach to Study Oxidative Stress in Tomato Roots during Root-Knot Nematode Infection

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INTRODUCTION & AIM

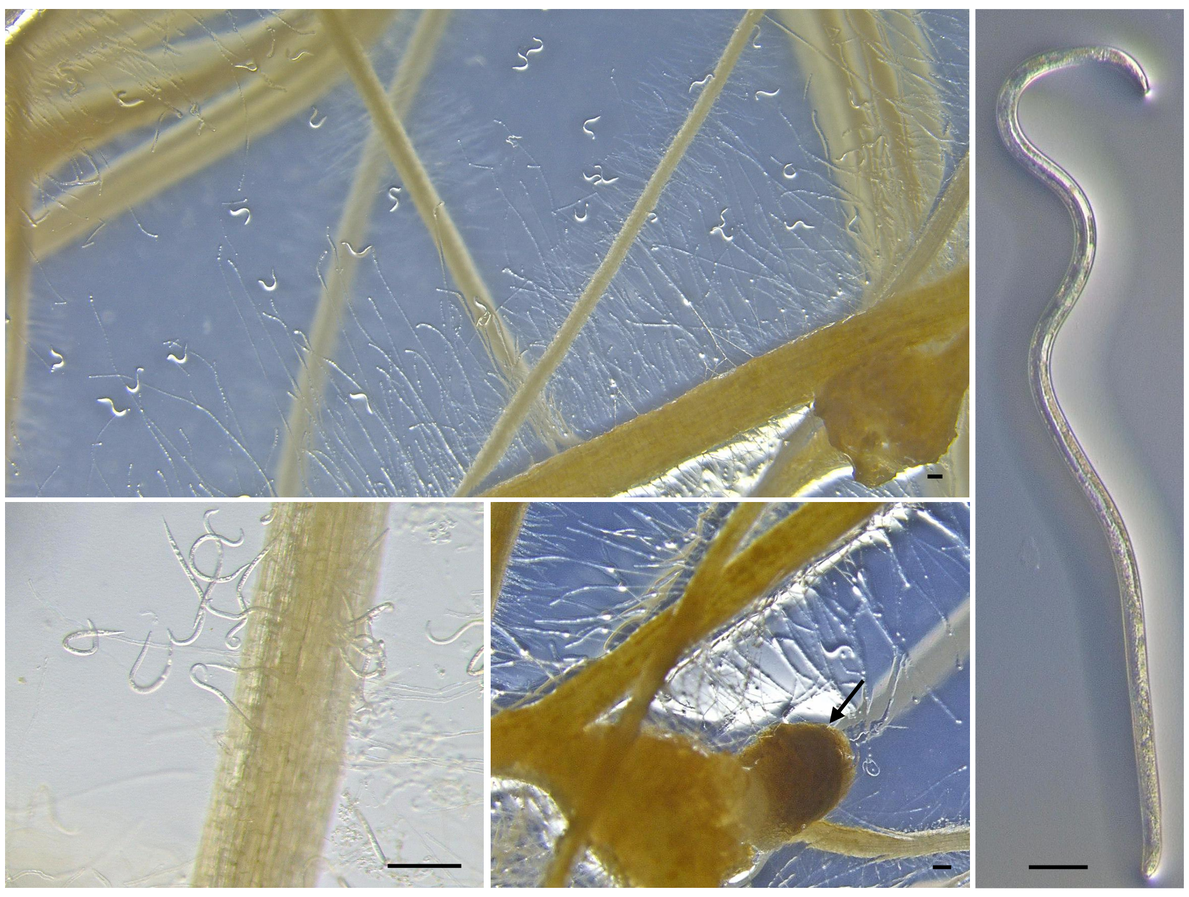
Root-knot nematodes (*Meloidogyne* spp.) are major agricultural pests that invade plant roots and reduce crop yield. These infections trigger oxidative stress in host tissues, leading to the production of reactive oxygen species (ROS) and activation of antioxidant defence mechanisms such as ascorbate peroxidase (APX). Understanding these physiological responses is key to improving crop resilience against root knot nematode attack.

This study aimed to assess oxidative stress responses in *Meloidogyne incognita*-infected tomato transgenic roots (HR) grown under controlled *in vitro* conditions, to provide insights into the redox alterations induced by nematode infection and their potential role in plant defence.

METHOD

Solanum lycopersicum transgenic roots were induced by *Rhizobium rhizogenes* (strain A4pRiA4::70GUS).

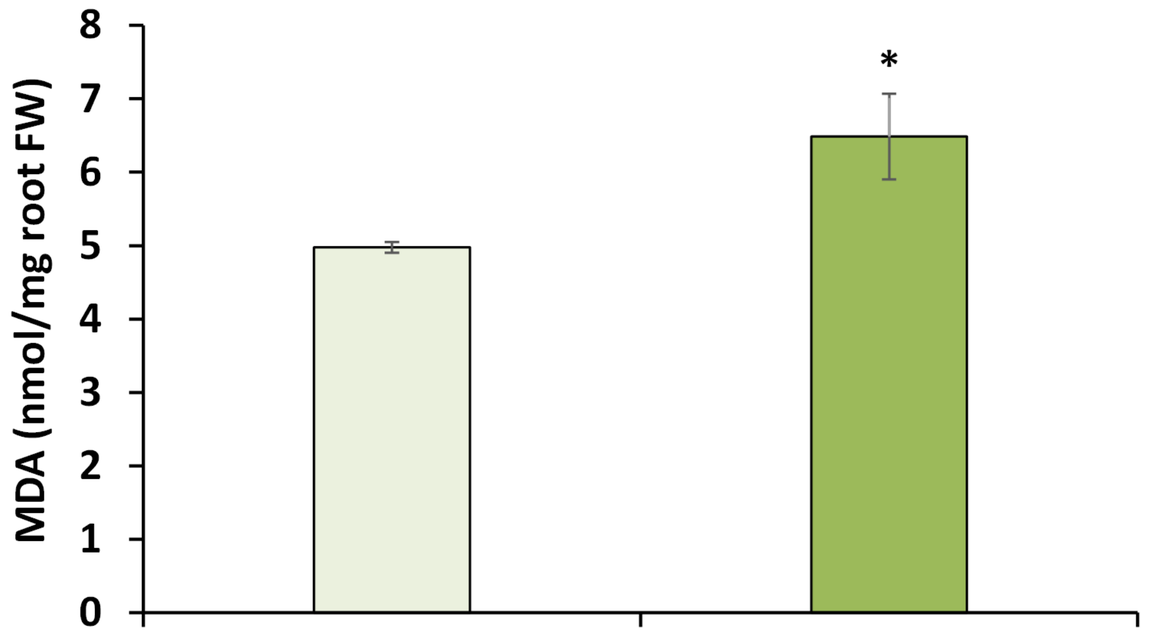
HRs were maintained in liquid **Schenk and Hildebrandt (SH)** medium. (Samples Collected: **7, 14, and 21 days)**.



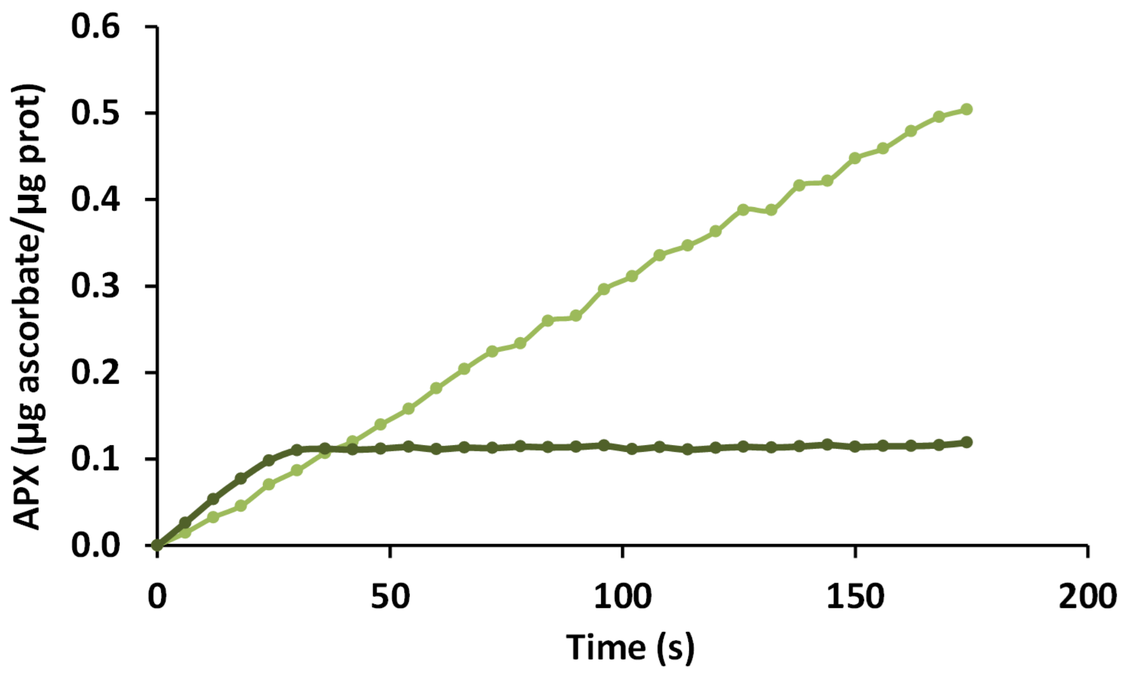
S. lycopersium roots were inoculated with sterile *Meloidogyne incognita.* **Lipid peroxidation: TBARS** assay measured malondialdehyde **(MDA)** equivalents via spectrophotometry **(440, 532, 600 nm)**. **Antioxidant activity:** Ascorbate peroxidase **(APX)** activity quantified spectrophotometrically at **470 nm.**

RESULTS & DISCUSSION

M. incognita infection triggered oxidative stress in *S. lycopersicum* transgenic roots grown under controlled *in vitro* conditions. Lipid peroxidation increased, infected roots showed higher **TBARS** levels, indicating elevated membrane damage.



Ascorbate peroxidase **(APX)** activity increased up to **25%** in infected roots compared to non-infected controls, but saturated faster.



CONCLUSION

Nematode infection induced **ROS accumulation** that stimulated antioxidant enzyme activity. Increase in **APX** activity may indicate a localized plant defence response, attempting to restore cellular redox balance within the nematode-infected sites.

FUTURE WORK / REFERENCES

Future work will tackle a characterization of antioxidant enzymes and oxidative stress markers profile, such as Guaiacol Peroxidase **(GPX),** Glutathione Reductase **(GR),** Superoxide Dismutase **(SOD),** Hydrogen Peroxide **(H_2O_2),** etc.