Journal of Civil Engineering and Environmental Technology
p-ISSN: 2349-8404; e-ISSN: 2349-879X; Volume 10, Issue 1; January-March, 2023, pp. 61-61

http://www.krishisanskriti.org/Publication.html

# Functional Trait analysis of Nematode Diversity Associated with Rhizosphere and Surrounding Soil of Medicinal Plant *Withania Somnifera*

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**Abstract—***Nematodes are the most numerous and ubiquitous microscopic micro or mesofauna distributed in soils worldwide. These organisms have different feeding habits and occupy all consumer trophic levels within the soil food web, making them important bioindicators for soil ecological studies. The medicinal plant* Withania somnifera *is highly susceptible to plant-parasitic nematodes. The present study investigates the ecological functions performed by soil nematode diversity associated with* W. somnifera *using a functional group approach. Taxonomic identification and functional traits analysis of 37 nematode species associated with the rhizosphere and surrounding soil of* W. somnifera *were conducted over two years. The functional traits analyzed included tail shape, body shape, C-P Score (colonizer-persister score), and feeding habits. The results showed that most rhizosphere nematodes were plant-feeding, K-selected persisters (C-P score 5) with conoid tail shapes and spiral body shapes, while most surrounding soil nematodes were fungivorous, r-selected colonizers (C-P score 2) having a slender tail and slender body shapes.The observed variation in ecological traits suggests adaptations to different modes of movement and behaviors in the soil. For example, spiral or other stout morphotypes in the rhizosphere nematodes, with a C-P score of 5, indicates reduced mobility and an adaptation for root ectoparasitic or endoparasitic behaviour, which might affect plant growth and health through damage or disease. In contrast, slender body and a C-P score of 2 in surrounding soil nematodes might be an adaptation to move efficiently in the free soil, have a generalist feeding behaviour, and contribute to nutrient cycling and decomposition by feeding on microorganisms and organic matter. The reported functional traits of nematodes in the rhizosphere and surrounding soil of W. somnifera provide valuable insights into the complex interactions between soil biota and plant systems and highlight the importance of considering functional diversity in ecological studies.*