

Enhancing Plant Defense Mechanisms and Managing Plant-Parasitic Nematodes through Ascaroside Signaling

Rabia Nur Aksu¹, Aydan Terzioglu¹, Busra Sadic Ulu², Tufan Can Ulu¹, İ. Alper Susurluk³,
Edwin E. Lewis⁴

¹ Bilecik Seyh Edebali University, Faculty of Agriculture and Natural Sciences, Department of Plant Protection, 11230, Bilecik, Türkiye

² Transitional Zone Agricultural Research Institute, 26200, Eskisehir, Türkiye

³ Bursa Uludag University, Faculty of Agriculture, Department of Plant Protection, 16059, Bursa, Türkiye

⁴ Department of Entomology, Plant Pathology and Nematology, University of Idaho, Moscow, ID 83844, United States

*Corresponding author: tufan.ulubilecik.edu.tr

Nematodes, like insects, produce specific pheromones known as ascarosides, which regulate key behaviors, growth, and development. First identified in *Caenorhabditis elegans*, ascarosides are secreted in species-specific blends and concentrations across all nematode species. Studies have shown that certain ascarosides act as plant elicitors, inducing physiological responses that trigger plant defense mechanisms and inhibit pathogen proliferation. Notably, ascr#1, ascr#5, and ascr#18 have been shown to increase the production of defense-related compounds such as reactive oxygen species, salicylic acid, and jasmonic acid. These ascarosides also promote callose formation in some plant species, aiding in pathogen suppression. Additionally, plants can metabolize ascr#18 and release ascr#9 through their roots, suggesting a potential role for ascr#9 in managing plant-parasitic nematodes. While ascarosides can be chemically synthesized, entomopathogenic nematodes (EPNs) offer an alternative source of these pheromones. Liquid culture mass production of EPNs in fermenters produces billions of nematodes, but the remaining liquid medium is often discarded. This by-product could serve as a valuable alternative source for obtaining ascarosides. This review provides a comprehensive overview of the role of ascarosides in triggering plant defense responses, methods for their production, and their potential applications in managing plant-parasitic nematodes.

Keywords: Pheromone, elicitor, jasmonic acid, by-product

Acknowledgement: This study was supported by Scientific and Technological Research Council of Turkey (TUBITAK) under the Grant Number 223O257. The authors thank to TUBITAK for their supports.