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Marigold in Controlling Nematodes Attack on Plant

Anusha Saha*

Editorial Office, European Journal of Zoological Research, Belgium

*Corresponding Author: Anusha Saha, Editorial Office, European Journal of Zoological Research, Belgium,
E-Mail: zoologisci@peerjournals.com

INTRODUCTION

The root-knot, reniform, cyst, burrowing, and lesion nematodes, all of which have spear-like mouthparts used to puncture plant roots and collect nutrients, are the most common soil-borne plant-parasitic nematodes affecting agricultural systems in Hawaii. These worms wreak havoc on a wide range of crops, causing enormous economic losses. Crop production and quality are lowered after worm infection, either directly due to root deformation caused by nematode feeding or indirectly due to propensity to infection by other pathogens produced by nematode penetration into the roots.

Rotating crops with plants that are not hosts of plant-parasitic nematodes, utilizing resistant plants if available, and using chemical nematodes are the most common ways for managing nematodes in agriculture. Other techniques include soil solarization and organic amendments, trap crops, microbial biocontrol agents, and plants that are parasitic nematode hostile. This article focuses on the latter option, specifically the use of marigold plants to manage plant-parasitic nematodes present in Hawai'i and other parts of the world.

Mechanism by which marigold suppresses nematode pests

While marigolds (*Tagetes* species) are commonly grown as decorative bedding plants, research has shown that they are highly poisonous to plant-parasitic nematodes and can inhibit a wide range of nematode pests (up to 14 genera). The nematode species targeted, as well as the marigold species and cultivar, influence the nematicidal potential. *Tagetes patula*, *Tagetes erecta*, and *Tagetes minuta* are the most commonly utilised marigold species for nematode management. A biochemical interaction known as allelopathy is the primary mechanism by which marigolds control plant-parasitic nematodes.

Allelopathy occurs when a plant produces substances that are harmful to other plants, microbes, or creatures like nematodes. Marigold plants contain a variety of potentially useful chemicals, one of the most dangerous of which is thienyl. Marigold tissues, particularly roots, are rich in this sulfur-containing chemical. It is thought to be the major chemical responsible for marigold's nematicidal activity, as it contains nematicidal, insecticidal, fungicidal, antiviral, and cytotoxic properties. Thus, nematodes can be killed by touching soil containing marigold bioactive chemicals or by penetrating the root system of a marigold plant. Marigold has been found to have nematicidal activity in the roots of growing plants, but not in root or leaf extracts. According to some studies, these nematicidal qualities are the consequence of a series of events in marigold roots induced by nematode penetration and movement through the root tissue, and the end product of these reactions is assumed to be nematode death. Thus, nematodes can be killed by touching soil containing marigold bioactive chemicals or by penetrating the root system of a marigold plant.

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growing, but not when it is incorporated as crop residues or root extracts. Several additional plants with nematode-killing properties, such as sunn hemp (*Crotalaria juncea*), are thought to produce nematode-killing substances when absorbed into the soil, eliminating the need for root penetration.