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“Bridging the gap between increasing knowledge and decreasing resources”

## Containing Nematode Diseases in Crops by Fungal Endophytes: Current Standings and Prospects

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### Abstract

Plant-parasitic nematodes, particularly root-knot nematodes, cause major problems in important crops in the tropics and subtropics. To control nematode diseases, different strategies are being applied, including chemical and various cultural practices. In spite of these measurements, nematode populations are difficult to contain for numerous reasons. Additionally, the application of nematicides is becoming increasingly restricted due to human health and environmental concerns. Supplementary approaches to control nematode diseases are therefore necessary. Over the past two decades, screening of crop plants in the tropics has led to the identification of several interesting fungal endophytes that have the ability to reduce nematode infection. Although the responsible mechanisms are in most cases still obscure, there are strong indications that these isolates may affect nematode development in several ways: directly, by producing nematocidal metabolites, indirectly, by inducing specific plant defense mechanisms, or both. Biological, molecular and biochemical studies now indicate that the effects of some endophytes against nematodes are indeed multifactorial. Endophyte inoculated roots can negatively affect nematode infection, development fecundity and female-male ratio. Root exudates of endophyte inoculated plants can repel nematodes and some endophytes can produce nematostatic or nematocidal metabolites. With all these elements combined, this can lead to a significant containment of the nematode population in the long term. The molecular and chemical characterisation of these individual elements will at the same time contribute to a better and faster screening of endophytes and plant genotypes and therefore an optimal endophyte nematode mediated resistance in plants can be achieved. The use of habitat-adapted endophytic fungi may thus provide a safe, efficient, reliable and affordable approach to control nematode diseases in crops, which can be combined with other integrated pest management strategies.

**Keywords:** Biocontrol, crop protection, endophytes, induced resistance, integrated pest management, plant-parasitic nematodes