GUAVA ROOT-KNOT NEMATODE: A Potentially Serious New Pest in India

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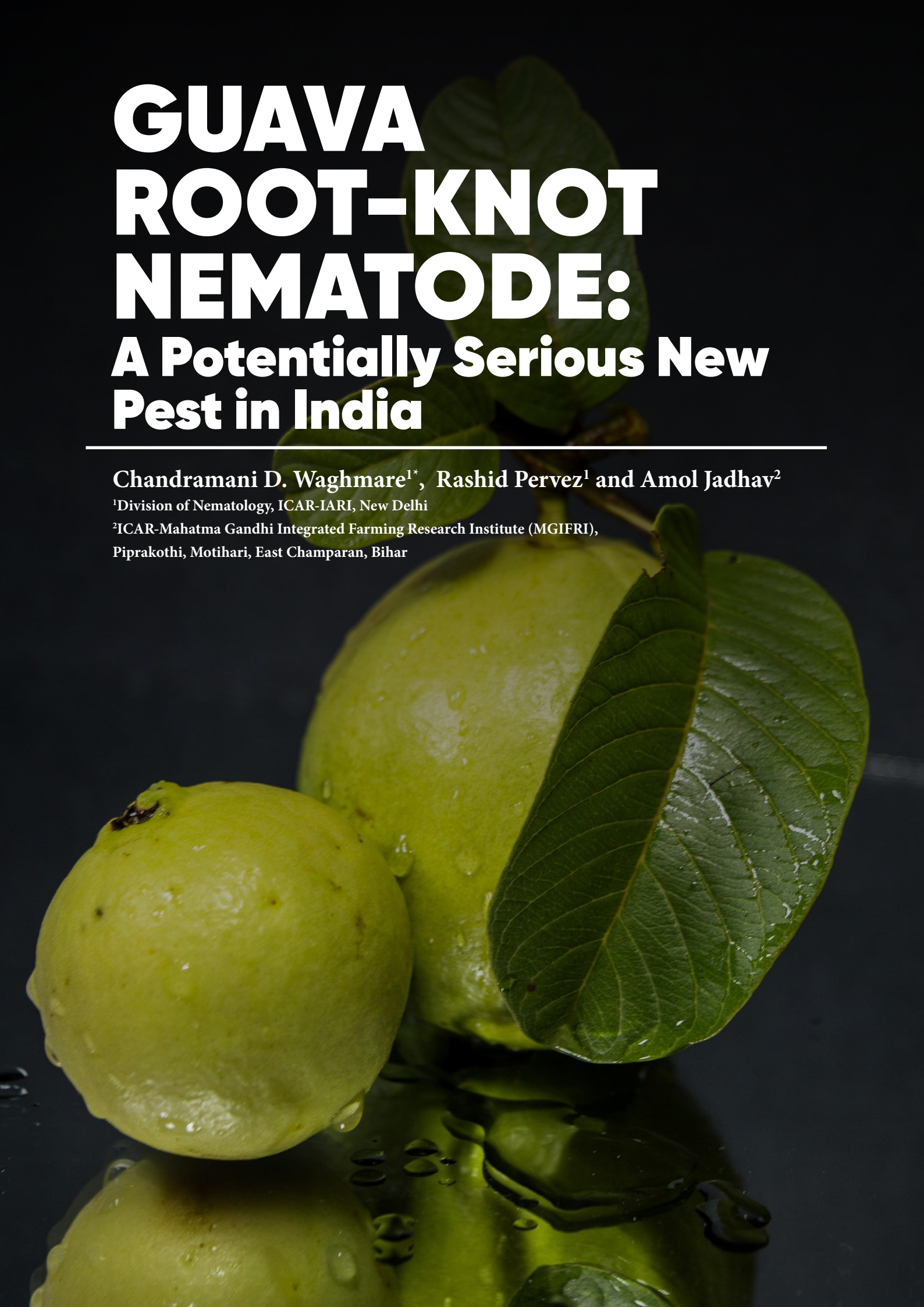

Meloidogyne enterolobii, commonly known as the guava root-knot nematode, has recently been identified as a significant threat to Indian agriculture. First recorded in India in guava, this nematode is now recognized for its highly pathogenic nature, causing severe yield losses and contributing to guava orchard decline. Its presence has been reported across major guava-growing regions, particularly in Tamil Nadu, where it has been linked to devastating economic losses.

PEST STATUS AND IMPACT

The guava root-knot nematode was inadvertently introduced into India, with public and private nurseries playing a key role in its interstate spread through infected guava planting materials. Efforts have been made to contain its spread, but its establishment across different regions remains a growing concern. Unlike other root-knot nematodes, *M. enterolobii* is highly virulent and capable of overcoming nematode-resistant genes in crops, making it particularly challenging to manage.

This nematode is one of the most destructive root-knot species globally, attacking several major crops, including guava, tomatoes, cotton, soybeans, peppers, and sweet potatoes. Its rapid reproduction rate allows it to multiply quickly, reaching high population densities in the soil within a short period. One of its defining features is the ability to cause extensive gall formation on plant roots, much larger than those induced by the common Southern root-knot nematode (*M. incognita*). This ability to parasitize resistant crops exacerbates its impact, making control measures even more difficult.

SURVEY FINDINGS AND ECONOMIC IMPACT

Studies conducted in major guava-growing districts of Tamil Nadu have confirmed the presence of M. enterolobii in several orchards, leading to widespread guava decline. The nematode is often found in association with Fusarium spp., collectively causing a complex disease that results in yellowing, wilting, leaf scorching, defoliation, significant yield reduction, and plant mortality within months. Similar symptoms were observed during extensive surveys, highlighting the urgency of addressing this issue.

In Brazil, where *M. enterolobii* (previously referred to as *M. mayaguensis*) has been extensively studied, it has been documented as a polyphagous plant-parasitic nematode inflicting severe damage on a wide variety of crops. Its ability to parasitize multiple host plants, including those with built-in nematode resistance, poses a significant challenge for sustainable agricultural practices in India and beyond.

FIRST RECORDS IN INDIA

The root-knot nematode *M. enterolobii* has been newly recorded in India, particularly affecting guava orchards. It has been responsible for a drastic decline in guava production across India and other regions of the world. Studies have confirmed that the association of *M. enterolobii* with guava is highly pathogenic, severely affecting plant health and productivity.

In Tamil Nadu, *M. enterolobii* has been identified as a major factor behind significant yield losses in guava orchards. This was the first recorded instance of its impact on guava in India. Previously, reports from Brazil highlighted its polyphagous nature, as it inflicted severe damage on multiple plant species. Surveys conducted in major guava-growing districts of Tamil Nadu confirmed the presence of *M. enterolobii* across all these regions, reinforcing its widespread and destructive nature.

SYMPTOMS AND DAMAGE

Guava decline, a complex disease, has been closely linked to the parasitic activity of *M. enterolobii*. Affected trees exhibit symptoms such as:

- Formation of large, irregular galls on the roots
- Yellowing and wilting of leaves
- Scorching of leaf margins
- Premature leaf drop
- Significant yield reduction
- Plant death within months
- Severe yield reduction, leading to plant death in advanced stages

Figure 1. Galling on soybean roots from the Southern root knot nematode

Figure 2. Galling on tomato roots from the guava root-knot nematode.

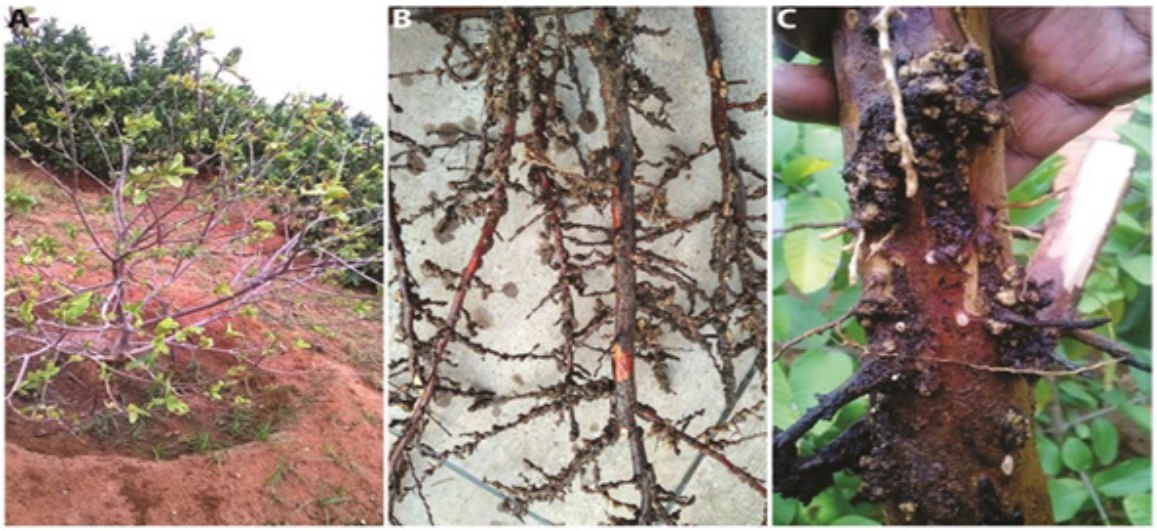

Figure 3. Symptoms of damage due to guava root-knot nematode, M. enterolobii on guava shoots and roots. A, Yellowing of leaves and defoliation on a young guava tree; B, profuse galling on the roots (Courtesy: Dr. M.R. Khan and Dr. R.K. Walia), C, Compound galls on stem and collar region of guava (Courtesy: Dr. S. Nakkeeran)

These symptoms were consistently observed during surveys conducted in guava-growing districts. The rapid and severe impact of the nematode underscores the urgent need for effective management strategies to mitigate its spread and safeguard agricultural productivity.

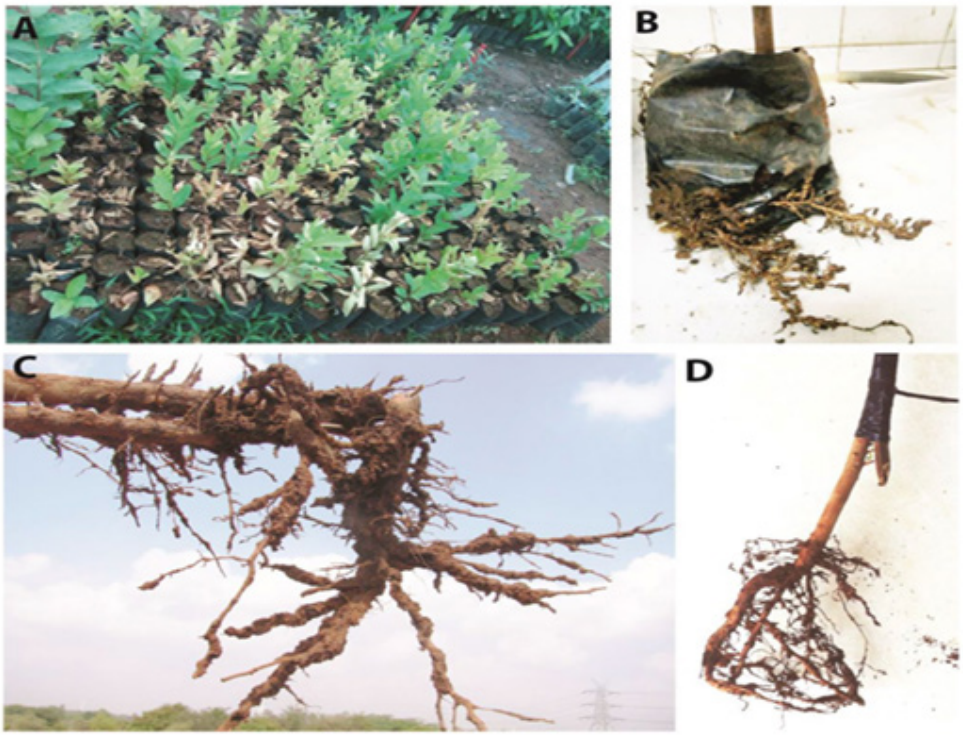

Figure 4. Symptoms of damage due to guava root-knot nematode, M. enterolobii on guava nursery plantlets. A, nematode-infested guava rootstocks after grafting showing yellowing and drying; B, seedling in polybag revealing galled roots, C, galled roots in guava seedling; D, root galls in a guava graft (A-D).

LIFECYCLE AND BIOLOGY

The lifecycle of *M. enterolobii* progresses swiftly, with eggs hatching into juvenile nematodes that move toward plant roots. Once inside, they establish feeding sites, leading to the formation of characteristic galls. Each female nematode can lay between 400 to 600 eggs, completing its life cycle within approximately four weeks under warm conditions (Fig. 5). This rapid reproduction rate exacerbates the nematode's impact, allowing infestations to expand quickly and intensify crop losses.

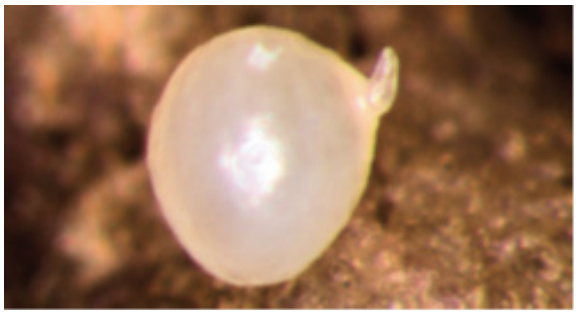

Figure 5. A mature female of the guava root-knot nema¬tode

HOST RANGE AND SPREAD

This nematode has a broad host range, including several agronomic crops (such as, cotton, soybean, and tobacco), vegetable crops (including tomato, pepper, and cucumber), and fruit crops (notably guava, banana, and grape). Many ornamental plants and weed species also act as hosts, making control efforts more complex. It spreads easily through infected soil, plant material, irrigation, and farm machinery, further increasing its risk to agriculture.

MANAGEMENT STRATEGIES

Given its adaptability and ability to overcome resistance in crops, M. enterolobii requires an integrated management approach:

- Crop rotation: Alternating with non-host crops to reduce nematode populations.
- Resistant varieties: While resistance options are limited, ongoing research aims to develop more tolerant plant varieties.
- Soil treatment: Nematicides may be used cautiously, but sustainable alternatives are preferable.
- Sanitation practices: Cleaning farm equipment and using certified planting material to prevent spread.
- Biological control: Beneficial nematodes and soil microbes offer an eco-friendly management alternative.

CONCLUSION

The guava root-knot nematode presents a serious challenge to Indian agriculture, particularly affecting guava orchards. Its rapid spread, ability to infect resistant crops, and severe impact on yield make it a formidable pest. Early detection, strict quarantine measures, and sustainable pest management strategies are essential to controlling its spread and mitigating its impact on food security and agricultural livelihoods. Continued research and farmer awareness will play a crucial role in managing this emerging threat.