

Eelworms (nematodes) as both targets and tools for biocontrol in Indian agriculture*

Among the vast varieties of worms that occur in tropical agricultural ecosystems, eelworms (known as nematodes) are an important group, as they include both harmful plant-invading types (phyto-nematodes) and the beneficial types that attack insect-pests (entomophilic nematodes). Both the nematode groups are of substantial economic importance in the productive management of wide-ranging cropping systems, which constitute the source of livelihood for the multitude of farmers in India.

In Indian agriculture, the economic significance of nematode pests of crops has come to the fore following the intensification of agriculture during the Green Revolution era. Plant nematologists in the country have therefore been trying to develop cost-effective methods of nematode pest management, which are affordable to the smallholder farmers. Their research efforts have been focused on identifying beneficial cultural practices such as rotation, companion cropping, irrigation management, use of biocontrol agents and deploying nematode-tolerant cultivars. The current revival of interest in organic farming and the emerging focus on precision farming and export horticulture, together add to the urgency for developing a range of eco-friendly technologies/products for sustainable nematode pest management.

The beneficial group of nematodes, commonly called entomo-pathogenic nematodes (EPNs), can cause quick mortality in the major insect pests of crops through infection by associated bacterial pathogens. These are amenable for mass production and inundative (repeated) applications. Thus, future research should focus on promoting commercialization of EPN technology through suitable formulations

to improve their shelf-life and enhance their field impact potential.

To permit focused consultation among experts on ways and means to promote commercial mass production of promising bio-pesticide candidates, the Chennai-based Sun Agro Biotech Research Centre, which is an approved research laboratory for scientific and industrial research, convened a national workshop. Over thirty researchers, mainly from ICAR institutions and State Agricultural Universities participated in the workshop.

Inaugurating the seminar K. V. Peter, Vice Chancellor, Kerala Agricultural University, Thrissur, emphasized that it is important to treat the two groups of nematodes – pestiferous and beneficial – in their own context and evolve suitable technological innovations for their effective management/utilization. Releasing a compilation of the thirty-three papers submitted for the seminar, T. N. Ananthakrishnan appreciated the timeliness of the theme of the seminar, when the national planners are keen to promote the development and adoption of green technologies towards evolving sustainable crop management technologies. In his keynote address, R. J. Rabindra, Director, Project Directorate for Biological Control, Bangalore called for initiatives to strengthen research–industry partnerships towards advancing the pace of awareness building on benefits of using biopesticides. He also introduced two concept outlines for national-level initiatives – one on commercialization of EPNs, and the other on the scope for commercial mass production of bioagents for nematodes pest control – towards implementing the recommendations of the seminar. S. Chelliah exhorted the research community to focus on the practicality of bio-control technologies to ensure their wide-scale adoption.

There were five scientific sessions on different sub-themes. The first session led by R. Ahmed was on the scope of EPNs and included six papers which addressed the field performance for controlling the tomato fruit borer (*Helicoverpa armigera*),

the rice stem borer (*Scirpophaga incertulas*), the teak heartwood borer (*Aclerogystia cadamabae*) and the Kusum bug (*Leptocoris augur*), besides some pests of pulse crops. The importance of follow-up initiatives for building up farmers' awareness of benefits using EPNs, besides motivating private investors for establishing EPN production units was brought up. The second session had four papers, led by J. S. Prasad, examining the changing scenario of the nematode pest problems on rice and banana and the apparent role of changes in crop management practices on the extent of area-wide yield losses caused by nematode pests. The third session led by P. Sundara Raju had two papers dealing with potential for host plant resistance as nematode management tool, focusing on pathogen-related proteins in banana and microsatellite marker linked to resistance genes for root knot nematodes in rice. Ten papers were presented in the fourth session, covering alternative biotechnological approaches in nematode pest management, led by an overview on the scope in horticultural crops by M. S. Rao. The potential interventions found promising included organic amendments and several botanical products. The fifth session, led by A. Prakash, included six papers, with an overview by M. Nagesh, covering the potential of biocontrol technologies for nematode pests, especially on banana, betelvine, citrus and carnations.

During the plenary session, the five sessional highlights were presented and in conclusion, S. Sithanatham indicated the importance of policy support for promoting bio-pesticides and the need to strengthen public–private sector partnerships towards wide-scale awareness building of the benefits of using biopesticides for nematodes pest control as well as for enhanced use of EPNs as another group of promising biopesticides.

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