Aggressive Invader from Africa: Biology, Spread and Biological Control of the Cassava Mealybug in India

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ABSTRACT

Cassava, an important tuber crop in southern and northeastern India, came under threat in April 2020 when the South American cassava mealybug (*Phenacoccus manihoti*) was detected in Kerala and soon spread through Tamil Nadu's Salem-Namakkal belt, where it disrupted the sago and starch industry. Native parasitoids proved ineffective, even harming the pest's natural predators. ICAR-NBAIR responded by introducing the host-specific parasitoid *Anagyrus lopezi*, mirroring successful biocontrol efforts in Africa and Southeast Asia. Field releases have since restored yields to 30-35 tonnes/hectare and delivered major economic gains, offering a sustainable, low-pesticide model for managing this invasive pest.

INTRODUCTION

Cassava (*Manihot esculenta Crantz*) (Euphorbiaceae), locally known as Tapioca, is an important tuber crop grown across Kerala, Tamil Nadu, Karnataka, Andhra Pradesh and parts of the North-East. Valued for its drought hardiness and ability to thrive on marginal soils, the crop underpins a sizeable sago and starch industry centred on the Salem-Namakkal belt of Tamil Nadu. For decades, cassava in India remained relatively

free of serious insect pests, with the situation changing only after the accidental introduction of the papaya mealybug in 2008. A far more aggressive invader followed in April 2020, when an unfamiliar mealybug was noticed damaging cassava in Thrissur district, Kerala. It was soon identified as the cassava mealybug, *Phenacoccus manihoti* Matile-Ferrero (Pseudococcidae: Hemiptera), a pest native to South America that had devastated cassava across Africa in the 1970s and 1980s before a celebrated biological control programme rescued the continent's food security (Sampathkumar *et al*., 2021).

Recognizing the Pest

Adult cassava mealybug females are small, soft-bodied insects, barely 2-3 mm long, covered in a white mealy (waxy) secretion and bearing short, finger-like wax filaments along the body margin. They form dense, cottony colonies at shoot tips, axillary buds and young, unfolded leaves rather than on stems generally, since they prefer the most tender, actively growing plant parts. Both nymphs and adults suck plant sap and inject a toxic saliva while feeding, which distorts and shortens the internodes, curls the leaves, and gives the shoot a characteristic stunted, 'bunchy top' appearance. Under heavy infestation, growing points die back, plant vigour collapses, and tuber bulking is severely compromised; in extreme cases the crop fails altogether, since the pest specifically targets the regenerative tissue, the plant needs to recover.

Figure 1: *P. manihoti* infestations and associated symptoms on cassava in Asia. **A.** *P. manihoti* populations at upper nodes. **B.** Heavy infestations and associated terminal shoot distortion. **C.** Stem deformation associated with *P. manihoti* infestations. **Photo courtesy:** Adapted from Parsa, S., Kondo, T. and Winotai, A. (2012). *The Cassava Mealybug (Phenacoccus manihoti) in Asia: First Records, Potential Distribution, and an Identification Key*. PLoS ONE, 7(10): e47675.

An Unwelcome Arrival and Rapid Spread

Following the first detection in Kerala, a four-state survey conducted between April and August 2020 found the heaviest mealybug build-up in the Salem and Namakkal districts of Tamil Nadu and in Thrissur district of Kerala, with shoot-tip densities running into the thousands at the worst-affected sites (Sampathkumar *et al*., 2021). The same species has shown a remarkable capacity to travel: it reached Thailand around 2008, almost certainly through trade in infested planting material, and within a few years had spread to Laos, Cambodia and Vietnam, depressing cassava yields by as much as 18 per cent in the worst-hit areas before classical biological control brought it under check (Wyckhuys *et al*., 2018). Climate-suitability modelling carried out even for countries that remain free of the pest, such as China, indicates that its preferred climatic envelope extends well beyond the regions presently invaded, which is a reminder that areas such as Karnataka, Andhra Pradesh and parts of the North-East could face future risk if the pest is allowed to spread unchecked through the movement of stem cuttings (Huang *et al*., 2024).

Economic Toll and Ecological Complications

Left unmanaged, the cassava mealybug threatens not only farmers' yields but also the sago, starch and chip-making industries that depend on a steady, good-quality supply of tubers from the Salem-Namakkal cluster. The problem is compounded by ecological

complexity: a detailed food-web study on the invaded mealybug's colonies in southern India recorded 45 associated species, spanning insects from six different orders as well as spiders, interacting at multiple trophic levels. Worryingly, several native parasitoid species were found attacking the mealybug's own natural predators rather than the mealybug itself, effectively weakening the very predator community that might otherwise have helped suppress the pest naturally (Gupta *et al*., 2021). This finding underlined why, in the absence of an effective native enemy, a deliberate, host-specific biological control intervention was considered necessary rather than optional.

The Biological Control Success Story

Drawing on the lessons learnt in Africa and South-East Asia, the ICAR-National Bureau of Agricultural Insect Resources (ICAR-NBAIR), Bengaluru, sourced the host-specific encyrtid parasitoid wasp, *Anagyrus lopezi* (Encyrtidae: Hymenoptera), from IITA, Benin, and from Thailand, and put in place a mass-production protocol consistent with organic farming principles (Sampathkumar *et al*., 2021). The parasitoid was subsequently released across the affected cassava tracts of Tamil Nadu and Kerala in partnership with state agriculture and horticulture departments, sago industries, Krishi Vigyan Kendras and State Agricultural Universities. Field experience with this parasitoid elsewhere shows that it can parasitise anywhere between roughly 12 and 46 per cent of a mealybug population, with the parasitisation rate rising as mealybug density increases, giving the system a useful, self-reinforcing quality once it establishes (Fanani *et al*., 2024).

The impact in India has been substantial. At a Cassava Field Day organised by ICAR-NBAIR on 13 November 2025 at Rasipuram in Namakkal district, scientists reported that the programme had restored cassava yields to 30-35 tonnes per hectare, improved the crop's benefit-cost ratio from 0.857 to 1.525, and delivered an estimated annual economic gain of about ₹3,480 crore. Reduced reliance on chemical pesticides has additionally brought annual savings of around ₹286 crore. More than 500 farmers, scientists, policymakers and industry representatives attended the event, where the initiative was described as an exemplary model of classical biological control (ICAR, 2025).

Complementary Management Practices

Classical biological control now carries the bulk of the management burden, but farmers can help protect and extend its benefits. Planting material should never be sourced from infested fields or moved across districts and states without inspection, since infested stem cuttings remain the principal pathway by which the mealybug spreads to new areas. Indiscriminate insecticide spraying is best avoided wherever the parasitoid has established, as broad-spectrum chemicals can kill *Anagyrus lopezi* along with the pest and may also favour ants that protect mealybug colonies from natural enemies (Gupta *et al*., 2021). Where infestation is severe and natural enemies are still scarce, need-based use of neem-based formulations or entomopathogenic fungal biopesticides can be considered under expert guidance, with synthetic insecticides reserved strictly as a last resort. Any new sighting of the pest, particularly in districts not yet known to be affected, should be reported promptly to the nearest Krishi Vigyan Kendra or state agriculture department to support continued surveillance.

CONCLUSION AND WAY FORWARD

India's response to the cassava mealybug stands out as a clear demonstration of how classical biological control can offer a sustainable, low-cost alternative to chemical-intensive pest management, restoring both

yields and farmer incomes within a few years of a serious invasion. Continued vigilance will be essential to sustain this success: regular monitoring, protection of the introduced parasitoid from disruption by pesticide misuse, and farmer awareness campaigns will all matter as the pest's potential range extends into Karnataka, Andhra Pradesh and beyond. Sustained collaboration between ICAR institutes, state departments, universities and farming communities offers the best safeguard for cassava-based livelihoods and the wider sago and starch industry that depends on them.

REFERENCES

Fanani, M.Z., Rauf, A., Maryana, N., Nurmansyah, A., Hindayana, D., Rahayu, A., Setyono, S. and Roestamy, M. (2024). Suppression of the cassava mealybug populations, *Phenacoccus manihoti* (Hemiptera: Pseudococcidae) by natural enemies. ASEAN Journal of Science and Engineering, 4(2): 317-330.

Gupta, A., Sampathkumar, M., Mohan, M., Shylesha, A.N., Venkatesan, T., Shashank, P.R., Dhanyakumar, O., Ramkumar, P., Sakthivel, N. and Geetha, B. (2021). Assessing adverse impact of the native biological control disruptors in the colonies of the recent invasive pest Phenacoccus manihoti Matile-Ferrero (Hemiptera: Pseudococcidae) in India. Global Ecology and Conservation, 32: e01878.

Huang, Y., Li, T., Chen, W., Zhang, Y., Xu, Y., Guo, T., Wang, S., Liu, J. and Qin, Y. (2024). Analysis of the distribution pattern of Phenacoccus manihoti in China under climate change based on the Biomod2 model. Biology, 13(7): 538.

ICAR (2025). ICAR-NBAIR showcases breakthrough in biological control of cassava mealybug in India. Press release, 13 November 2025, Indian Council of Agricultural Research, New Delhi. Available at: https://icar.org. in/ en/ icar- nbair- showcases breakthrough-biological-control-cassava-mealybug-india

Parsa, S., Kondo, T. and Winotai, A. (2012). The Cassava Mealybug (Phenacoccus manihoti) in Asia: First Records, Potential Distribution, and an Identification Key. PLOS ONE, 7(10): e47675.

Sampathkumar, M., Mohan, M., Shylesha, A.N., Joshi, S., Venkatesan, T., Gupta, A., Vennila, S., Venkatachalam, S.R., Vijayakumar, M., Subramanian, M., Yoganayagi, M., Ashika, T.R. and Bakthavatsalam, N. (2021). Occurrence of cassava mealybug, Phenacoccus manihoti Matile-Ferrero (Pseudococcidae: Hemiptera), a new invasive pest on cassava in India and prospects for its classical biological control. Current Science, 120(2): 432-435.

Wyckhuys, K.A.G., Wongtiem, P., Rauf, A., Thancharoen, A., Heimpel, G.E., Le, N.T., *et al*. (2018). Continental-scale suppression of an invasive pest by a host-specific parasitoid underlines both environmental and economic benefits of arthropod biological control. PeerJ, 6: e5796.