Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 03, Issue: 05 (SEP-OCT, 2023)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

A Comprehensive Guide to Integrated Pest Management (IPM) for Tapioca Cultivation

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Abstract
Integrated Pest Management (IPM) stands as a comprehensive and environmentally conscious strategy for effectively managing pests in agricultural settings. This concise summary offers an introduction to the fundamental principles and advantages of implementing IPM strategies for tapioca, underscoring its pivotal role in fostering sustainable and resilient crop cultivation. IPM encompasses an array of approaches, including cultural, biological, chemical, and mechanical methods, all orchestrated to mitigate the harm inflicted by pests while upholding the integrity of the surrounding ecosystem. Central to IPM's methodology is the vigilant surveillance of pest populations, proactively identifying potential threats before they burgeon into crises. Equally integral is the emphasis on preventative measures, harnessing techniques that range from crop rotation to the cultivation of pest-resistant varieties. The reduction of reliance on chemical pesticides remains a core tenet of IPM, a move that not only mitigates environmental harm but also curtails economic expenditure for farmers. By enhancing biodiversity and fortifying the overall health of crops, IPM not only bolsters food security and economic viability but also cultivates ecological equilibrium within agricultural systems. This abstract extends an invitation to readers to delve further into the complete article, offering a comprehensive exploration of how IPM promises to revolutionise pest management practices in tapioca cultivation and secure the future of agriculture through its holistic and sustainable approach.

Keywords: Tapioca, cassava, Integrated Pest Management (IPM), crop production, mealybugs, and mites

Introduction
Tapioca cultivation holds significant importance, especially in the state of Tamil Nadu, India. Tapioca holds a prominent position in Tamil Nadu's horticultural landscape, with cultivation spanning approximately 3,00,000 hectares and yielding an impressive 6 million metric tonnes of the crop, which accounts for 64% of the total production in India.[1] This crop is of paramount importance in several districts across Tamil Nadu, including Salem, Namakkal, Erode, Tiruvannamalai, Villupuram, Dharmapuri, and Karur [2], providing sustenance and livelihoods for over 0.3 million farmers, a significant proportion of whom belong to tribal communities. The tapioca industry is a cornerstone of the region's economy, with approximately 400 sago and starch processing facilities relying on this versatile crop across the state.[3]

Insect pests pose a significant threat to tapioca cultivation, leading to substantial economic losses in affected regions. Moreover, sporadic pest incidence along the western

zone of Tamil Nadu is an alarming threat to farmers in the tapioca processing industries. Pests, such as the tapioca shoot borer and mealybugs [4], can damage tapioca plants, reducing crop yields. Damage caused by pests can result in lower starch content [5] and increased susceptibility to post-harvest diseases, rendering the tubers less suitable for processing and consumption.

Integrated Pest Management (IPM) Principles

IPM focuses on minimising pesticide use through a combination of cultural, biological, and chemical control methods, ultimately promoting more environment-friendly and economically viable agricultural practices in cassava cultivation.

The principles of IPM include the following:

1. **Prevention:** The primary goal of IPM is to prevent pest problems from occurring in the first place.
2. **Monitoring and Scouting:** Regular and systematic monitoring of pest populations is crucial in IPM.
3. **Integrated Control:** IPM integrates multiple pest control methods, including biological control, cultural control, chemical control, and mechanical control. The goal is to use a combination of methods that are the least harmful to the environment.

Pest Threats to Tapioca

The major insect pests that inflict a huge loss to tapioca farmers are tabulated in the following table **(Tab. 1)**.

Table 1: Common pests of cassava

S. No	Common name	Scientific name	Family	Order
1.	Cassava scale	*Aonidomytilus albus*	Diaspididae	Hemiptera
2.	Black scale	*Parasaissetia nigra*	Coccidae	Hemiptera
3.	Whitefly	*Bemisia tabaci*	Aleyrodidae	Hemiptera
4.	Spiralling whitefly*	*Aleurodicus disperses*	Aleyrodidae	Hemiptera
5.	Rose thrips	*Retithrips syriacus* *Rhipiphorothrips cruentatus*	Thripidae	Thysanoptera
6.	Mite*	*Tetranychus urticae*	Tetranychidae	Acarina
7.	Rugose spiralling white fly	*Aleurodicus rugioperculatus*	Aleyrodidae	Hemiptera
8.	Cassava mealy bug*	*Phenacoccus manihoti* [6]	Pseudococcidae	Hemiptera

(*****) Indicates a serious pest of cassava in Tamil Nadu.

Implementing IPM Strategies for Tapioca

Let us cover the different aspects of IPM practices in Tapioca.

Cultural Control:

- Start by selecting settlings that are free from pests for planting.
- In the surrounding area, eliminate and dispose of weed plants like Abutilon, Acalypha, and Euphorbia, as these plants can serve as alternative hosts for pests.

Physical Control:

- Implement the use of yellow sticky traps, placing them at a rate of 15 traps per hectare to attract and eliminate adult pests.
- Collect and incinerate stems that are infested with scales.

Biological Control:

- Deploy natural predators such as *Spalgis epius* and *Scymnus coccivora* [8], which prey on the cassava mealybug.
- Introduce *Chrysoperla zastrowi sillemi* at a rate of 10,000 per hectare to combat the pest during its larval stage.
- Foster the conservation of spiralling whitefly parasitoids, namely, *Encarsia haitiensis* and *E. guadeloupae.*
- Under warm and highly humid conditions, leverage the entomopathogenic fungus *Neozygites fumosa*, which triggers epizootics in pest populations [7].

Chemical Control:

- Practice restraint by avoiding the use of synthetic pyrethroids and refraining from prolonging crop growth.
- For mite control, consider the application of acaricides, including Fenazaquin 10% EC at a rate of 1250 ml per hectare, Fenpyroximate 5% EC at 250–340 ml per hectare, Spiromesiten 22.9% SC at 400 ml per hectare, dicofol at 1.5 ml per liter, or wettable sulfur at 2 grams per liter.[9]

Conclusion

The adoption of Integrated Pest Management (IPM) practices in tapioca cultivation emerges as an imperative step towards ensuring sustainable and resilient agricultural systems. Through the principles of prevention, monitoring, and integrated control, IPM equips tapioca farmers with effective tools to mitigate the damage inflicted by insect pests and diseases while safeguarding the environment and human health. By minimising the reliance on chemical pesticides, IPM not only reduces production costs but also diminishes the ecological footprint associated with agriculture.

References

1. Chennakrishnan, P., & Thenmozhi, D. (2020, March 1). A Study on Cassava Production Technologies in Tamil Nadu. *Shanlax International Journal of Economics*, *8*(2), 29–32. https://doi.org/10.34293/economics.v8i2.1611
2. Ragavi, G., Sanjay Kumar, and Rai, A.K. (2019) An Economic Analysis of Production of Tapioca in Namakkal District of Tamilnadu. *International Journal of Innovative Science and Research Technology*, vol. 4, no. 5.
3. Laasya Shekhar, A., (2023, July 5). *High capital investment and poor access to subsidies, a drawback for biogas in sago industry*. Mongabay-India. https://india.mongabay.com/2023/07/lack-of-subsidies-a-major-drawback-for-biogas-in-sago-industry/
4. Manihot esculenta (cassava). (2022, January 7). *PlantwisePlus Knowledge Bank, Species Pages*. https://doi.org/10.1079/pwkb.species.32401
5. Guerreiro, J. C., Azevedo, A. P., Prado, E. P., Pietrowski, V., Ringenberg, R., Moritz, C. M. F., Ghiotto, T. C., Pascutti, T. M., & Ferreira-Filho, P. J. (2022, July 5). CASSAVA ROOTS DAMAGED BY MIGDOLUS FRYANUS PRODUCE POOR QUALITY STARCH. *REVISTA DE AGRICULTURA NEOTROPICAL*, *9*(2), e6884. https://doi.org/10.32404/rean.v9i2.6884
6. Parsa, S., Kondo, T., & Winotai, A. (2012, October 15). The Cassava Mealybug (Phenacoccus manihoti) in Asia: First Records, Potential Distribution, and an

Identification Key. *PLoS ONE*, *7*(10), e47675. https://doi.org/10.1371/journal.pone.0047675

7. Nasruddin, A., Menzler-Hokkanen, I., & Hokkanen, H. M. (2020). Beneficial fungi for promoting plant health in cassava: ecostacking prospects for the management of invasive pests. *Integrative Biological Control: Ecostacking for Enhanced Ecosystem Services*, 217-229. https://doi.org/10.1006/jipa.1996.4638

8. Ballal, C. R. (2022, April 30). Success stories in biological control: Lessons learnt. *Vantage: Journal of Thematic Analysis*, 7–20. https://doi.org/10.52253/vjta.2022.v03i01.02

9. Muthukrishnan, N., Ganapathy, N., Raguraman, S. and Nalini, R., (2023). *Text Book on Horticultural Entomology* (1st ed.), Coimbatore, Tamil Nadu Agricultural University Offset Press. ISBN. 978-81-962451-0-8