

Bio Control Pest Management in Tropical Fruit Crops

Shreya Maigur¹, Archana Anokhe² and Priyanshu Pawar³

¹Division of Plant Pathology, ICAR- Indian Agricultural Research Institute, New Delhi

²Scientist, Division of Entomology, ICAR- Indian Agricultural Research Institute, New Delhi

³Ph.D Scholar, Jawahar Lal Nehru Krishi Vishwavidyalaya Jabalpur, Madhya Pradesh

SUMMARY

India, with its diverse climatic conditions and geographical expanse, is a treasure trove of tropical fruit crops. These tropical fruits are crowning jewel in the realm of Fruit crops. Which are a vital component of agriculture, offering a wide variety of delicious and nutritious fruits. However, they are susceptible to various pests that can significantly impact both yield and quality. Hence, a sustainable and environmental friendly solution has emerged – Biocontrol of pest. Many examples of successful biological control of pests of Fruit crops, started with *Icerya purchasi* Biocontrolled by *Rodolia cardinalis* in California in 1888. Now Many Biocontrols are used to control the Pests of tropical fruit crops, These Biocontrols are categorized into predators, parasitoids and pathogens. The primary objective is to reduce pest numbers without harming the environment or human health.

INTRODUCTION

Tropical fruits form a diverse commodity group, ranging from perennial to herbaceous varieties. The herbaceous category includes important crops like bananas, pineapples, and papayas, while the woody or perennial group encompasses various tree species, shrubs, and vines. The phenology of tropical fruit trees, including leaf growth, flowering, fruiting, and leaf shedding, is more dramatic in tropical regions compared to higher latitudes, where growth and development are largely confined to one season each year due to winter. India is the world's second-largest fruit producer and is often referred to as the "fruit basket of the world." In 2022, India produced 107.24 million metric tonnes of fruits on 7.05 million hectares of land. India leads in the production of bananas (26.45%), mangoes (including mangosteens and guavas) (43.80%), and papayas (39.30%) among fruits. Additionally, India is the largest producer of tropical fruits globally, accounting for 28% of the production. Mangoes, bananas, pomegranates, and oranges are among the major fruits exported from the country.

Bio Control of pests: Biocontrol is a natural and environmentally friendly method of pest management that relies on the ecological balance within agricultural systems. These beneficial organisms can be predators, parasitoids, pathogens. The primary objective is to reduce pest numbers without harming the environment or human health.

1. Predators: These are free living organism throughout its life, which are usually larger than its host pest (prey) and requires more than one prey to complete its life cycle. In terms of diversity and significance of biological control - the coleopteran (lady bird beetle), Neuroptera (lacewing), Hymenoptera (ants), Diptera (flies) and Hemiptera (damselfly) are outstanding.

Fruit crop	Pest	Predator	Dose / Remarks	Reference
Citrus	Cottony Cushion Scale (<i>Icerya purchasi</i>)	<i>Rodolia cardinalis</i>	Reports First Biological Control	(Quezada and DeBach, 1973; DeBach et al., 1971)
		<i>Cryptochaetum icerya</i>		
	Citrus Mealy bug	Australian ladybird beetle, <i>Cryptolaemus montrouzieri</i>	10/tree	Chacko et al., 1978, van Whervin, 1968
	Citrus Black Fly	Brumus sp, Scymnus sp.		
	Citrus scale	<i>Chilocorus nigritus</i> is released	15 adults/tree.	
Citrus psyllid	<i>Coccinella</i>			(Sadana, 1991).

		<i>septumpunctata</i> , <i>rependa</i> , <i>sexmaculata</i> , <i>nigritus</i> .		
	Citrus whitefly	<i>Cryptognatha flavescens</i> , <i>Verania cardoni</i> .		
	Citrus aphid	<i>Menochilus sexmaculatus</i>	@ 50 per tree.	
Mango	Mango mealy bug	<i>Cryptolaemus montrouzieri</i>	@ 25 beetles per plant	
	Mango jassids	<i>Isyndus heros</i>		
	Mango leaf webber	Carabid beetle <i>Parena lacticincta</i> , reduvid, <i>Oecama</i> sps		
	Mango Aphid	Coccinellidae		
	Mango Hopper	<i>Mallada boninensis</i> , <i>Chrysopa lacciperda</i> .		
Guava	Guava spiralling whitefly	Release <i>Chrysoperla carnea</i> predators	at 10000/ha	
	Guava scale	<i>Microterys kotinskyi</i> <i>Azya luteipes</i> , <i>Cryptolaemus montrouzieri</i>		Bennett and Hughes, 1959
Banana	Banana Weevil	Myrmicine ant (<i>Tetramorium guinense</i> and <i>Pheidole megacephala</i>) Histerid beetle <i>Plaesius jauanus</i> (introduced into Fiji in 1913-1914) <i>Trichopoda pennipes</i>		Castineiras and Ponce, 1991 Davis and Krauss
Papaya	Papaya mealy bug	<i>Chrysopa</i> sp. and <i>Chilocorus cacti</i>		González et al.,1999

Parasitoids

These are the organism often of same size as its host pest, kills its host. It requires only one host for development into a free-living adult. And parasitic in immature stages but adult is free-living. Hymenoptera And Diptera are most important Orders Consisting of Parasitoids.

Fruit crop	Pest	Parasitoid	Dose/Remarks	Reference
Mango	Fruit fly	Wasps like <i>Encarsia formosa</i> and <i>Diachasmimorpha longicaudata</i>		
		<i>Opius oophilus</i>		van den Bosch and Haramoto, 1953
		<i>Biosteres longicaudatus</i> (Ashmead), <i>Dhirinus giffardii</i> Silvestri and <i>Spalangia grotiusi</i> Girault		Syed et al.(1970)
	Fruit-piercing moths	<i>Telenomus</i> spp.	Egg Parasitoid	
	leaf webber	<i>Hormiusa</i> sps		

Citrus	Shoot psyllid	<i>Tetrastichus radiates</i>		
	Citrus butterfly	<i>Trichogramma evanescence,</i> <i>Telenomus</i> sp.	Egg parasitoid	
		<i>Dostatrix papilionis,</i> <i>Brachymeria</i> sp.	Larval parasitoid	
		<i>Pterolus</i> sp	Pupal parasitoid	
		<i>Coccidoxenoides peregrinus</i>		Mani, 1994a
	Citrus Black fly	<i>Eretmocerus serius</i>		Krishnamoorthy and Singh, 1987
		<i>Encarsia opulenta</i>		Bedford and Thomas, 1965
Papaya	Papaya mealy bug	<i>Acerophagus papayae,</i> <i>Anagyrus loecki</i> sp.		Browning et al., 1995
Pomegranate	Pomegranate fruit borer	<i>Trichogramma chilonis</i>	Egg parasitoid at 1 lakh/ha	
		<i>Brachymeria euploae</i>	Larval parasitoid	
Banana	Banana weevil	Trichogramma wasps	Egg parasitoid	
Guava	Guava Tea mosquito bug	mermithid, <i>Agamerimis paradecaudata.</i>	Nymph Parasitoid	

3. Pathogens

Microorganisms like fungi, bacteria and Viruses that infect and kill pests.

Category	Fruit crop	Pest	Pathogen	Dose/ Remarks	Reference
Fungi	Mango	Fruit fly	<i>Beauveria bassiana</i> and <i>Metarhizium anisopliae</i>		
		Mango Hopper	<i>Lecanicillium lecanii</i>		
		Mango leaf webber	<i>Paecilomyces farinosus</i>		
		Mango giant scale	<i>Beauveria bassiana</i>		
	Guava	Fruit fly	<i>Beauveria bassiana</i>	1x10 ⁹ spores/ml	
	Papaya	Mealy bug	<i>Lecanicillium lecanii</i>		
Bacteria	Papaya	fruit borer	<i>Bacillus thuringiensis</i>		
Nematode		Fruitfly	<i>Steinernema feltiae</i> and <i>Heterorhabditis bacteriophora</i>		
	Banana	Banana weevil	Steinernema and Heterorhabditis		Schmitt, 1993

CONCLUSION:

Pest Management by Biocontrols in Tropical fruit crops is a promising and sustainable approach that aligns with the principles of eco-friendly agriculture. As research and technology continue to advance, biocontrol is poised to play an even more significant role in ensuring the future of tropical fruit crop cultivation. Embracing biocontrol is not just a choice; it's a step toward a more sustainable and resilient agricultural future. Currently, very few people in tropical countries are researching these areas, and very few specialists receive adequate financial

support. While major emphasis has been given to staple crops (i.e. rice and cassava), with the exception of banana, little or no emphasis has been given to fruit crops.

REFERENCES

Horticultural statistics at a glance 2018

<https://nhb.gov.in/statistics/Publication/Horticulture%20Statistics%20at%20a%20Glance-2018.pdf>

<https://nhb.gov.in/Statistics.aspx?enc=WkegdyuHokljEtehnJoq0KWLU79sOQCy+W4MfOk01GFOWQSEvtp9tNHHoiv3p49g> - Area production Statistics <https://agricoop.gov.in/en/PublicationReports> - (DAC & FW)