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Biological Control of Temperate Fruit Crops Pest

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SUMMARY

Temperate fruit crops have a high potential for foreign exchange and provide higher employment opportunities. Insect pests like San Jose scale, Wolly aphid, Apple stem borer, Tent caterpillar, and European red mites cause considerable damage to temperate fruit crops and make them unmarketable. These pests can be managed by cultural, mechanical, physical, biological, and chemical methods. Chemical control measures are most commonly used but due to the continuous increased use of chemicals, different problems arise such as pest resurgence, pesticide resistance, and pesticide residue in food. Biological control is one of the alternative and sustainable methods for the control of insect pests. Natural enemies of insect pests like predators, parasitoids, and pathogens are used as biological control agents.

INTRODUCTION

Horticulture fruit crops are classified based on climate requirements into temperate fruit, subtropical fruit, and tropical fruit crops. They can tolerate both diurnal and seasonal wide fluctuations of temperature and are grown only in places where winter is distinctly cold. Temperate fruit crops are important because they produce higher biomass than the field crops per unit area resulting in efficient utilization of resources, also have a high potential for foreign exchange, provide higher employment opportunities, and have the potential for the development of westlands through planned strategies. The maximum area under temperate fruit crops is in Jammu & and Kashmir followed by Himachal Pradesh and Uttarakhand.

Table 1: Area and production of temperate fruit crops (2018-19)

Fruit crop	Area (Ha)	Production (MT)
Apple	3,01,000	23,27,000
Pear	44,000	3,18,000
Peach	19,000	1,14,000
Plum	23,000	89,000
Almond	11,000	14,000
Strawberry	1,000	5,000

(ICAR-Central Institute of Temperate Horticulture, Srinagar)

Important Pests of Temperate Fruit Crops And Their Biological Control

Biological Control of San Jose Scale, *Quadraspidiotus Perniciosus* (Hemiptera: Diaspididae) **:**

The population of *Encarsia perniciosi* established by augmentative and inoculative gave promising results for the suppression of the San Jose scale on apples (M. A. Masoodi et al. 1989). The Chinese and American strains of *E. perniciosi* proved better in Uttar Pradesh and the Russian strain was found to be effective in Himachal Pradesh. The parasitoid, *Encarsia perniciosi* (Tower) may be released to check the overwintering population on wild host plants growing around so that primary infestation in the next season gets reduced. Other natural enemies found associated with the Sanjose scale on apples included 3 parasites (*Marietta carnesi*, *Azotus kashmirensis*, *Aphyatis paramaculicornis*) and 5 predators four of which coccinellids and the remaining one. Predator *Coccinella infernalis* Mulsant was also actively found in Kasmir orchards (Muneer Ahmed 2020). Entomopathogenic fungi *Beauveria bassiana* @10^5 conidia /ml followed by *lecanicillium lecanii at* the same formulation found to be effective.

Biological Control Woolly Apple Aphid, *Eriosoma Lanigerum* (Hausmann)(Hemiptera: Aphididae) **:**

Many predators feed on woolly apple aphids, such as carabids, spiders, syrphids, coccinellids, chrysopids, carabids, and earwigs. One of the most important natural enemies is the parasitoid *Aphelinus mali* (Haldeman 1851) of *E. lanigerum*. This host-specific endoparasitoid parasitizes all parthenogenetic stages of woolly apple aphids with a preference for third-stage nymphs and older hosts. *A. mali* hibernates as a full-grown larva or pupa inside a dead hardened (mummified) body of a woolly apple aphid, and new adult parasitoid wasps emerge in spring (Eva Bangles, Ammer Alhmedi, et al. 2021). Ladybird beetles@30-50 adults /infested tree or chrysopa @ 10-20 1st instar larvae/tree also found effective.

Biological Control Tent Caterpillar, *Malacosoma Indicum* Walker (Lepidoptera: Lasiocampida)**:**

Larva can be controlled with a spray of *Bacillus thuringenesis kurstaki* on the leaves of the plant (James R. Meeker). NPVs are also potent biopesticides against this pest. The isolated viruses, *M. indicum multiple nucleopolyhedrovirus* (MainMNPV) were confirmed to be double-stranded DNA viruses belonging to the family Baculoviridae. Ecofriendly management of *M. indicum* is possible by the use of baculovirus-based biopesticides in various cropping systems of J & K (Mudasir Gani, R.K. Gupta, et al 2016).

Biological control Indian Gypsy Moth, *Lymantria Obfuscata* Walker (Lepidoptera: Lymantriidae) **:**

Pathogens especially *Entomophaga maimaiga* and the nucleopolyhedrovirus have been found to give promising results. The infections due to *Entomophaga maimaiga* and LdMNPV can occur in all larval stages but are usually most profound in late instars. In the Ladakh region, several predators and parasitoids have been observed to feed on this pest Egg Parasitoids -*Telenomus spp*, Larval parasitoids -*Cotesia melanoscela*, *Glyptapantelo sindienesis*, Pupal parasitoid -*Brachymeria intermedia, B. lasus* (Showket Adar, Owasis Mir et al. 2020).

Biological control Western flower thrips *Frankliniella occidentalis* :

The Western flower thrips' natural enemies include pirate bugs of the genus *Orius, Amblyseius swirskii*, and *Neoseiulus cucumeris*, a predatory mite species that is the most commonly used biological control agent against western flower thrips(Raymond A . Cloyd 2019). Other than the above agent's entomopathogenic fungi *Metarhizium robertsii* (syn. *M. anisopliae*) *Beauvthaneria bassiana* and the mirid *Dicyphus hesperus* also show good results. Sustainable fungus treatment was developed to preserve fungal inoculum in soil and reduce thrips population.

Biological control European red mite *Panonychus ulmi*:

Natural enemies of mites include predatory mites such as *Ambleseius fallacis Paraphytoseius multidatus, Agistemus terminalis, Euseius parsadi, Neoseiulus longispinosus., Agistemus gambeli and Typhlodromus himalayensis*. Other potential predators of mites in apple orchards of Himachal Pradesh include coccinellids (*Stethorus* punctillum (LeConte), anthocorid bugs (*Orius insidiosus and Anthocorus sp.),* predatory thrips (*Leptothrips sp*.), green lacewings (*Chrysoperla carnea*) and some dipterans flies (cecidomyiid fly). They mainly prey on the eggs and young ones of spider mites and do not harm trees.

Biological control of Codling moth: *Cydia (Carpocapsa) pomonella:* Codling moth is a quarantine pest of apples in Ladakh, India. EPN *Steinernema feltida* and *S. carpocapsa* have good potential for controlling overwintering cocooned larvae when temperatures above 10 and 15 ^{0}C respectively and adequate moisture is maintained in the orchards for several hours after EPN application. Release egg parasitoids, *Trichogramma embryophagum* at 2000/tree at a time when it synchronizes with egg laying of pest. This has been found useful in eliminating pest infestation in the early stage of development of codling moth. It was infected by *Cydia pomonella granulovirus* (CpGV) in India.

Biological control of Grapes Mealy bug *Ferrisia virgate*:

The Coccinellid beetles such as *Cheilomenes sexamaculata, Rodolia fumida, Scymnus coccivora,* and *Nephus regularis* are important predators of mealybug nymphs. Biological control by the release of natural enemies has proved very successful. Among the biological control agent introduction of *Cryptolaemus montrouzieri (*Australian Ladybird*), Anagyrus pseudococci, Leptomastix dactylopii, Hypoaspis sp* are effective in managing the infestation. *Hypoaspis* is a predatory mite that feeds on crawlers. *Cryptolaemus montrouzieri* commonly called the red-headed ladybird beetle or the mealybug destroyer, is a black lady beetle. It can eat 3,000–5,000 mealybugs in various life stages. For biological control of mealy bugs in grapes one to three releases of *C. montrouzieri* at 10 per tree or @ 5,000 beetles/ha, two times in a season, especially during August– September and December–January. It is useful to release a mixed population of adults and grubs rather than only adults. Foliar spray of *Verticillium lecanii or Beauveria bassiana* (2×10^8 cfu/ml) @ 5 g/ml per litre of water is effective during highly humid months in reducing the population of mealybugs. (R.K. Tanwar, P. Jeyakumar and D. Monga 2007).

Biological control of *Grapes* Leaf-eating caterpillar *Spodoptera litura:*

Spodoptera litura is effectively managed by using different bioagents like **Parasitoids: Egg:** *Trichogramma chilonis, Telenomus spp.;* **Larval:** *Campoletis chloridae, Peribea orbata, Glipapanteles africanus, Carcelia sp, Cotesia ruficrus, Chelonus carbonator;*

Pupal: *Blepherella setigera, Sarcophaga dux, Sarcophaga albiceps, Lasiochalcidia erythropoda*

Predators: *Chrysoperla zastrowi sillemi, C. crassinervis*, King crow, braconid wasps, dragon flies, spiders, praying mantids,

Biological control of Mites *Colomerus vitis (*Trombidiformis: Tetranchidae)*:* Predatory mites, predatory beetles such as ladybird beetle, lacewing, predatory thrips, anthocorid bug (*Orius spp*.); Entomopathogenic fungi *Lacanicillium (Verticillium) lecanii, Beauveria spp*. Used.

Biological control of Thrips., *Riphiphorothips cruentatus*:

The green lacewing *Chrysoperla carnea* is commonly associated predators with insect pests in the vineyards. Spraying of fungal pathogens namely *Verticillium lecanii* or *Beauveria bassiana* @ 5 mL or 5 g/L helps in reducing thrips population in cold and humid climates especially when the temperatures are between 20-25°C and humidity of above 80% (Dr. N.S. Kulkarni et al. 2007).

CONCLUSION

Temperate fruit crops are important as they provide different health benefits and employment opportunities. Biological control is one of the eco-friendly and sustainable methods as each pest species has tens to hundreds of associated natural enemy species (parasitoids, predators, and pathogens), and thus thousands of natural enemies still await discovery. During the past 40 years, the identification and pre-release evaluation of natural enemies has improved greatly with more than 150 species of natural enemies now commercially available for augmentative biological control (van Lenteren 2003).

REFERENCES

R.K. Tanwar, P. Jeyakumar and D. Monga (2007) Mealybugs and their management Technical Bulletin 19, September 2007 National Centre for Integrated Pest Management LBS Building, Pusa Campus, New Delhi 110 012.

Bale JS, van Lenteren JC, Bigler F. Biological control and sustainable food production. Philos Trans R Soc Lond B Biol Sci. 2008 Feb 27;363(1492):761-76. doi: 10.1098/rstb.2007.2182. PMID: 17827110; PMCID: PMC2610108.