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Biological Control of *Pulvinaria vitis* in Viticulture: Sustainable Strategies for an Emerging Threat

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Introduction

In recent years, *Pulvinaria vitis* has gained attention as a damaging pest of grapevines. The rise of this grapevine pest is tied to climate change and limitations of chemicals. Its impact includes direct damage through phloem feeding and indirect effects via virus transmission and sooty mold formation. As environmental policy and consumer preferences shift toward sustainable farming, the use of biological control agents becomes a better solution in integrated pest management (IPM).

Figure 1. *Pulvinaria vitis* (L2) nymphs on grapevine leaf (a); Pulvinaria vitis infestation on grapevine (b)

The life cycle of *P. vitis* (Figure 2) is temperature-dependent. Warmer conditions may induce partial bivoltinism, leading to higher densities and extended feeding. Overwintering females mature earlier, disrupting synchronization with natural enemies. (Robinet & Roques, 2010).

The crawler stage (0.5 mm, pale yellow) is the most vulnerable to biocontrol interventions. Higher temperatures may enhance nymphal survival and shorten development time, potentially reducing the effectiveness of parasitoids if not properly synchronized. IPM should incorporate habitat management (e.g., floral plantings to sustain parasitoid populations) (Camacho & Chong, 2015).

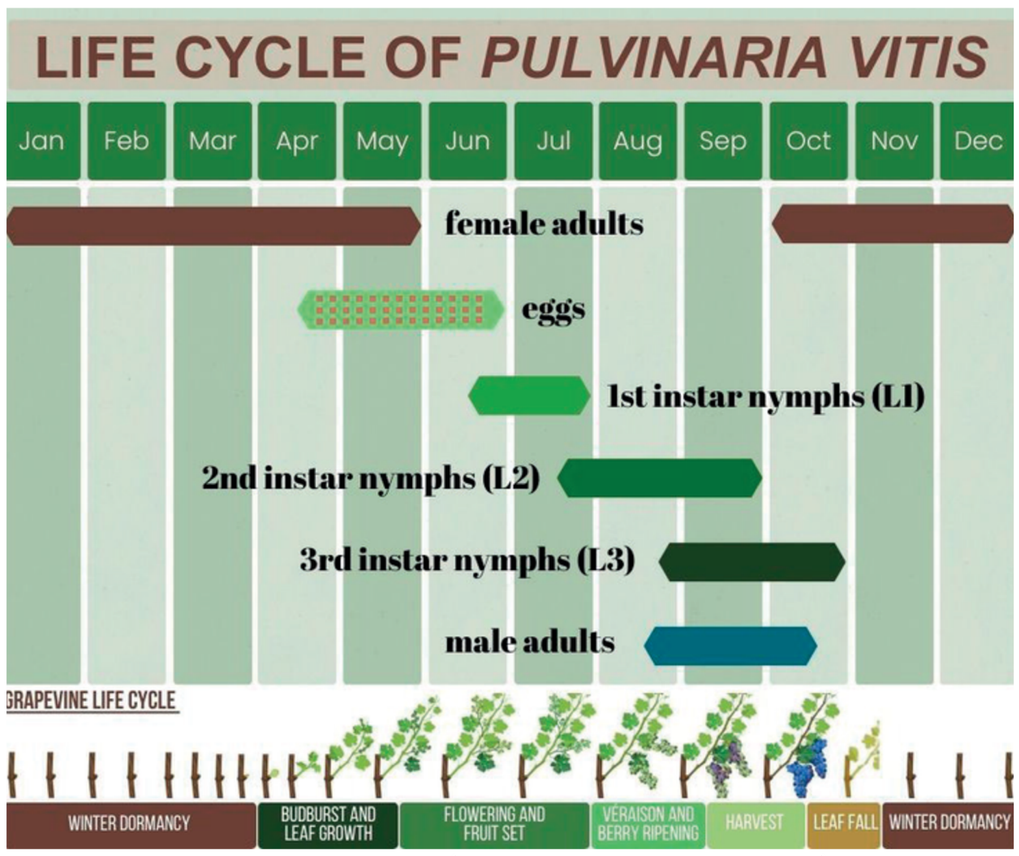

Figure 2. *Pulvinaria vitis* life cycle (adapted after Jansen, 2000) in correlation with the grapevine annual life cycle (described by Venios et al., 2020)

Biological Control Agents

- Parasitoid Wasps

Metaphycus annasor (Encyrtidae) and *Cocophagus sp. (Aphelinidae)* are known parasitoids of *P. vitis*, (Zhang & Wu, 2007).

- Predatory Beetles

Coccinellidae (*Exochomus quadripustulatus, Chilocorus bipustulatus*) prey on *P. vitis* nymphs but require ant exclusion for optimal effectiveness (Masten Milek et al., 2009).

- Entomopathogenic Nematodes

Steinernema carpocapsae causes >90% mortality in scale pests (lab conditions), offering potential for vineyard application (Paraschiv, 2023).

Figure 7. Ladybug feeding on *Pulvinaria vitis* nymphs

Integration into IPM and Future Directions

- Regular monitoring to identify crawler stages for targeted interventions.
- Habitat enhancement via cover crops and floral strips to support predator and parasitoid diversity.
- Selective pesticide use to minimize harm to beneficial organisms and avoid resistance buildup (Pertot et al., 2017).

Conclusions

- Further research is needed to evaluate field efficacy, optimal release timing, and synergistic combinations of natural enemies.
- Biocontrol strategies using parasitoids, predators, and entomopathogens offer sustainable options to manage Pulvinaria vitis, but require ecological consideration and integration into IPM systems.

Selective Bibliograpy

1.Hommay, G., Alliaume, A., Reinbold, C., & Herrbach, E. (2021). Transmission of Grapevine leafroll-associated virus-1 (Ampelovirus) and Grapevine virus A (Vitivirus) by the cottony grape scale, Pulvinaria vitis (Hemiptera: Coccidae). Viruses, 13(10), 2081. https://doi.org/10.3390/v13102081
2.Zhang, Y.-Z., & Wu, S. (2007). Metaphycus annasor (Hymenoptera: Encyrtidae), an important parasitoid of Pulvinaria vitis. Entomotaxonomia, 29(4), 318–320.
3.Masten Milek, T., Ivezić, M., & Šimala, M. (2009). The genus Pulvinaria Targioni Tozzetti, 1866 (Hemiptera: Coccidae) with special regard to Pulvinaria hydrangeae Steinweden, 1946 as a newly recorded species in the fauna of Croatia. Entomologia Croatica, 18, 267–278.