Potential of the predatory bugs *Nabis americoferus* and *Orius insidiosus* as biological control agents of *Lygus lineolaris* in organic strawberry field.

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Introduction

The tarnished plant bug (TPB), *Lygus lineolaris* (Palisot de Beauvois) (Hemiptera: Miridae) is a polyphagous pest that causes important economic damages in several crops including strawberry. This phytophagous insect feeds on more than 350 hosts, of which about 120 are economically relevant (Young 1986). Organic strawberry growers have few tools to fight the TPB, and so up to 100% of their yield can be lost due to this pest. The TPB is the main barrier that prevents transitioning from conventional management to organic strawberry farming. The TPB has several predators that can reduce its density in agroecosystems (e.g. predatory bugs, ladybeetles, spiders) (Arnoldi et al. 1991). However, these predators are not used in classical or inundative biological control because their potential is not yet determined. The role of predators as biological control agents of TPB has been overlooked for a couple reasons. First of all, the high reproduction rate of the TPB and secondly, the relatively low economic threshold may prevent a sole predator to effectively protect crops. In a recent study on the effect of trap crops on TPB in strawberry fields, we observed that both the damsel bug *Nabis americoferus* (Carayon) (Hemiptera: Nabidae) and the minute pirate bug *Orius insidiosus* (Say) (Hemiptera: Anthocoridae) naturally colonize plots exploited by the TPB and are suspected to be the main contributors to the TPB's mortality (about 50% from large nymphs to adults). The damsel bug feeds on every TPB's developmental stages and has a life cycle that matches the TPB (besides having high fertility). The smaller but very voracious pirate bug feeds on younger TPB stages and could be an adequate complement to the damsel bug (Isenhour and Yeargan 1982; Pumarino et al. 2011). Both species are omnivorous and feed on several crop pests and pollen. Hence, these predators have interesting potential as biological control agents of the TPB. Moreover, both species oviposit on several plant hosts and could be relevant contributors to TPB mortality in various cropsand non crop hosts, including trap crops.

Project's overview

Predation & Reproduction

- Level of predation
- Prey preferences
- Intraguild predation
- Susceptibility to entomopathogenic fungi
- Reproduction rate

Artificial selection

- Nabis' aggressiveness (see below)

Field tests

- Intervention threshold
- Predator release rate
- Trials at organic farms

Nabis americoferus

- Life cycle similar to the TPB: hibernate as adult, active soon and late in the season (synchronized on TPB cycle), 2 to 3 generations a year.
- Feed on all TPB mobile stages (even smaller Nabis can feed on TPB.
- Feed on various prey including aphids, leafhoppers and other bugs
- Female lay an average of 160 eggs during their adult life

Artificial selection

Aim : increase Nabis and Orius additive impact on Lygus through decreased level of aggressiveness in Nabis.

Decreasing cannibalism in mass rearings

Decreasing intraguild predation by Nabis on Orius

Lower Aggressiveness

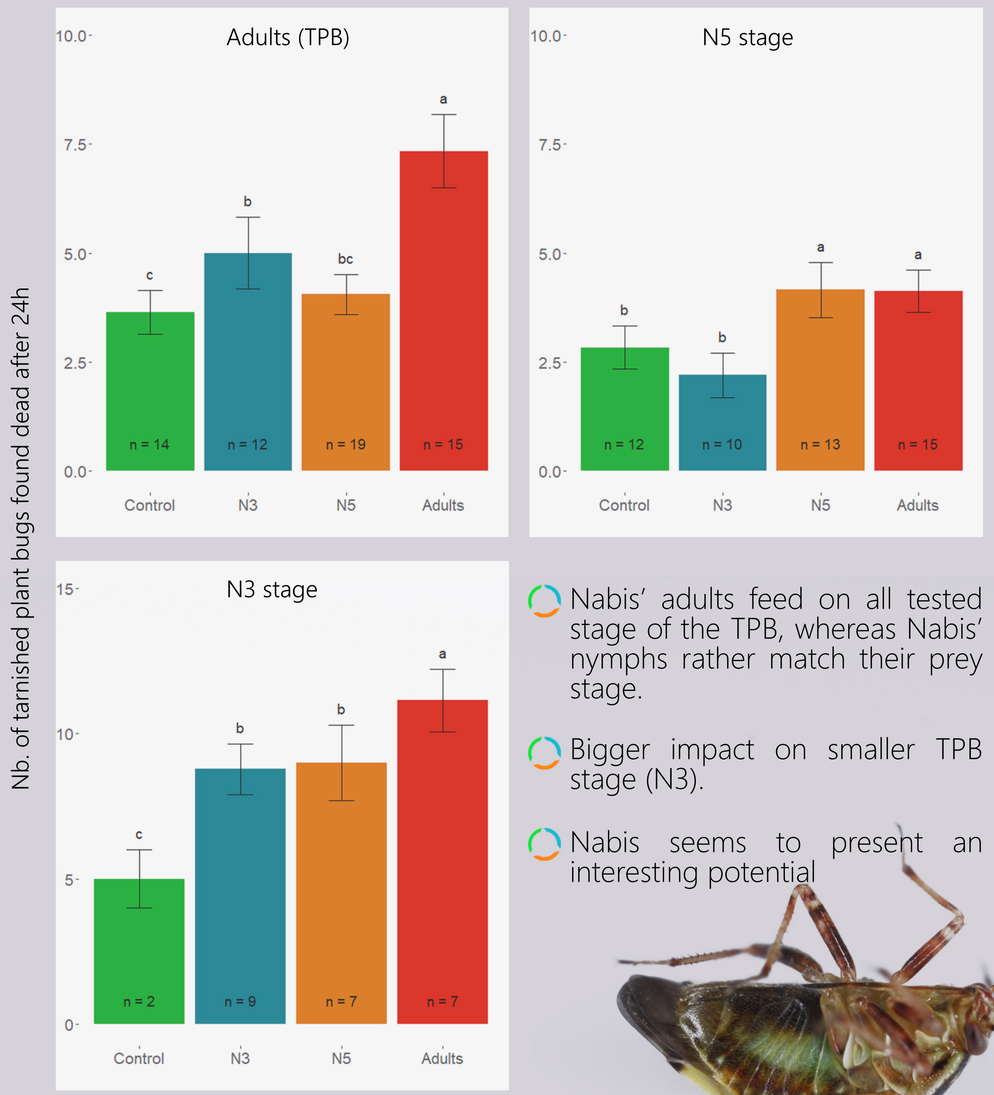
May decrease the level of voracity on Lygus

Chapter 1: Level of predation

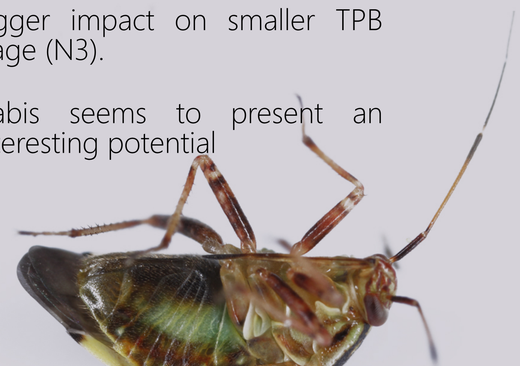
Methodology

Nabis adults and nymphs (N3 and N5) were matched with different TPB developmental stages (N3, N5 and adults). In each test, a single predator was allowed 24 hours to feed on 15 available prey. After the allocated time, the predator was removed and the number of prey killed was counted. Prior to the test, the predator was kept on an empty stomach for 24 hours. Control treatments consisted of TPB (all three development stages tested separately) held 24 hours without any predator.

Preliminary results



- Nabis' adults feed on all tested stage of the TPB, whereas Nabis' nymphs rather match their prey stage.
- Bigger impact on smaller TPB stage (N3).
- Nabis seems to present an interesting potential



Nabis americoferus' developmental stage

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