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CORE organic II Softpest Multitrap

Softpest Multitrap - Mass trapping *Anthonomus rubi* and *Lygus rugulipennis* in strawberries

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Introduction

The strawberry blossom weevil, *Anthonomus rubi,* and the European tarnished plant bug, *Lygus rugulipennis*, can cause substantial damage in organic strawberries in Northern and Central Europe (10 - >80% losses). In conventional production it is also desirable to find alternatives to current pesticide use, which harm beneficial insects and also create a risk of build-up of pesticide resistance.

Anthonomus rubi lays an egg in a developing flower bud and then partially bites off the flower stem, resulting in a loss of yield. *Lygus rugulipennis* nymphs and adults feed on flowers and developing fruitlets, causing a fruit distortion which makes the damaged fruit unmarketable.

We studied how pheromone and plant volatiles can be combined to improve trapping of the two pests in strawberry. The project also included raspberry, and combination of volatiles attracting *A. rubi* and *Byturus tomentosus* (not reported here).

This study is one of the first approaches to pest management of non-lepidopteran insect pests of horticultural crops using semiochemicals in the EU, and probably the first to target multiple species from different insect orders.

Before the project, the pheromones of *A. rubi* and *L. rugulipennis* were characterized in England by NRI/EMR. The aggregation pheromone of *A. rubi* has been available for several years. However, it has shown low attractancy. Plant volatiles were collected by SPME. These volatiles were chemically identified using GC-MS. For the attraction of *A. rubi* the importance of combining the pheromones with the host plant volatiles has been documented (Wibe et al. 2014).

Here we present investigations of the phenology of *A. rubi* and *L. rugulipennis*, and test of lure combinations to trap *A. rubi* with data from Danish and Norwegian strawberry fields.

Figure 1. Trap in strawberry crop.

Using semiochemical traps to study the occurrence of *A. rubi* and *L. rugulipennis*

The strawberry blossom weevil is univoltine, overwintering as an adult and therefore, lends itself to mass trapping for control in spring. *L. rugulipennis* also overwinter as an adult.
We studied the phenology of *A. rubi* and *L. rugulipennis* catches in different habitats and crops, here reported for strawberry and surrounding habitats.

Figure 2. Setting up traps in the field

Trap design was selected based on tests of different alternative traps. In strawberry we used green unitraps equipped with green cross-vanes (Figure 1). Each trap had a lure with an odor blend known to attract both sexes of *A. rubi* in strawberry, consisting of aggregation pheromone and a plant volatile (Wibe et al. 2014).

Traps were deployed 50 m into the crop, in the field margin, and 50 m into the forest. An identical approach was used to study the occurrence of European tarnished plant bug (*Lygus rugulipennis*) in strawberry (traps baited with commercially available sex pheromones).

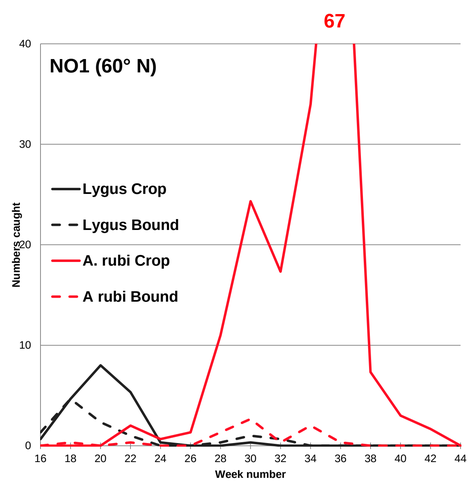
Trapping was carried out from April to October 2012 in three sites per country, captures being checked every fortnight and lures changed every 4-6 weeks.

Three farms were studied in both Norway and Denmark. Sites where there was known presence of pests were selected, so only one organic farm (DK) was included. In strawberry, catches were larger in the crop than in the two non-crop habitats and especially in the summer when the new generation of adult weevils emerged from the buds.

The summer peak period lasted through July and August in strawberry. Judging from the catches in this study, strawberry blossom weevil is was more numerous in Norway than in Denmark.

Comparing the *A. rubi* catches with those of *L. rugulipennis*, we found the relative abundances and phenology to vary considerably, reflecting regional differences in true abundances, voltinism and maybe also trap efficacy.

In Danish strawberry, *L. rugulipennis* was more numerous in the traps than *A. rubi*, especially during the summer. In Norwegian strawberry, *L. rugulipennis* captures exceeded those of *A. rubi* in the spring but after June very few plant bugs were found in the traps, and *A. rubi* greatly outnumbered them in total.



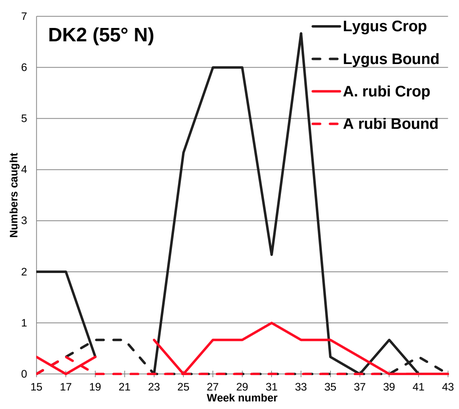


Figure 3 Seasonal occurrence of *L. rugulipennis* and *A. rubi* strawberry fields in Denmark and Norway 2012

Figure 3 shows that while *L. rugulipennis* had only one annual generation in Norway, it had two in Denmark. Higher abundance of *A. rubi* in Norway than in Denmark is something we found every year of the study. Cropping practices or regional differences may explain this.

Raspberry blossom weevil (*Anthonomus rubi*)	European tarnished plant bug (*Lygus rugulipennis*)	Raspberry beetle (*Byturus tomentosus*)
		
		
	Pest that traps are developed against: *Left:* *Anthonomus rubi*, a small weevil which damages the buds of strawberry and raspberry, *Centre:* *Lygus rugulipennis*,a mirid bug whose feeding cases the so-called cat-faced strawberries. *Right:* *Byturus tomentosus*, a beetle with larvae feeding in raspberries. (Photos: N. Trandem)	

Test of lure combinations to trap *A. rubi*

We earlier found improved trapping of *A. rubi* by adding plant volatile (Wibe et al. 2014), now the standard

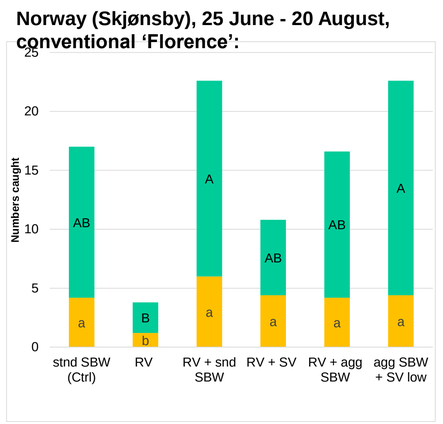


Figure 4 Total capture of strawberry blosson weevil males (green) and females (yellow) in the field using randomized block trials in Norway (top) and Denmark (below) 2013.

(Strd = standard (Pheromone + PV2 volatile), RV =raspberry volatile), PV2low = low concentration PV2, phero = pheromone)

To further optimize trapping we tested new lure combinations of pheromone and plant volatiles in the field. The same unitraps (Figure 1) were used.

Our results show remarkably similar patterns for captures in Norway and in Denmark (Figure 4). Captures due to the trapping period are (mainly) the new generation of strawberry blossom weevil. We have found that PV2 strawberry volatile concentration can be reduced to 1/5 without reduction in catch, and it is clear that RV (raspberry volatile) does not improve capture. Captures of males are higher than of females. Improved female capture is desirable, as females are causing the damage.

Next steps

In 2014 we assessed a multi-trap for both species, a study not yet completed.

Lure duration is one of the bottlenecks in designing commercially viable insect traps for monitoring or mass trapping. Our results emphasize that traps intended for more than one species and region either need long-lasting lures to cover all possibilities, or detailed knowledge about local conditions (e.g. prevalence of pest and surrounding host plant species etc.) to apply lures at the right time.

Further information

This project is funded via the ERA-net CORE Organic II by national funds to each partner. CORE Organic II is a collaboration between 21 countries on initiating transnational research projects in the area of organic food and farming. In 2011, CORE Organic II selected this project and 10 more for funding.
Read more about the project at the CORE Organic II website: www.coreorganic2.org/Softpest multitrap and in Organic Eprints: http://orgprints.org/view/projects/

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Reference

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