Use of natural enemies to support chemical control of aphids and virus yellows

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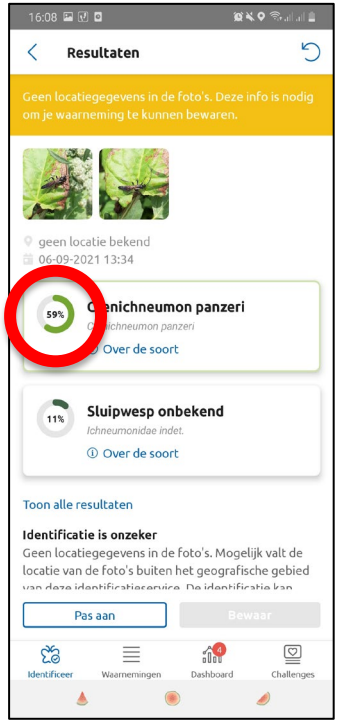
Introduction

ObsIdentify app



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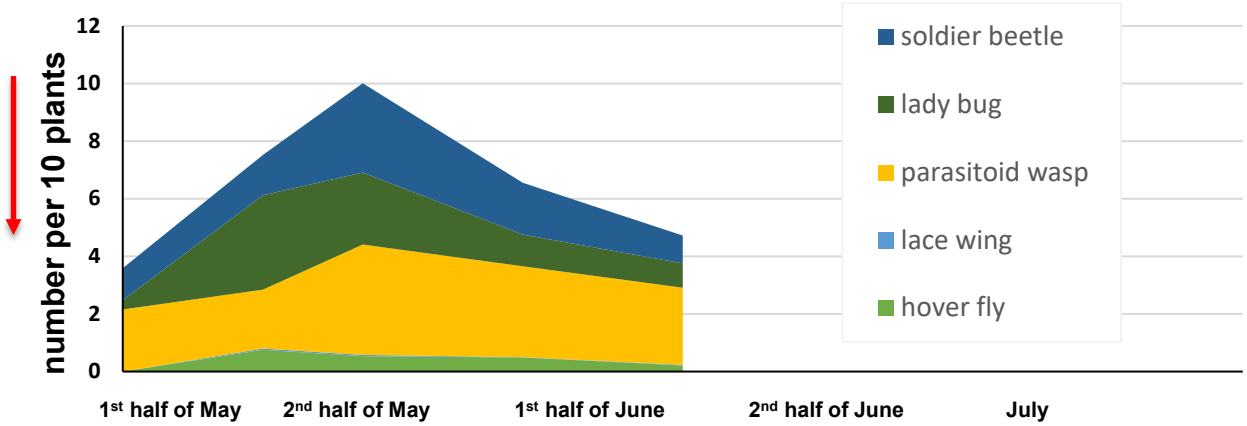
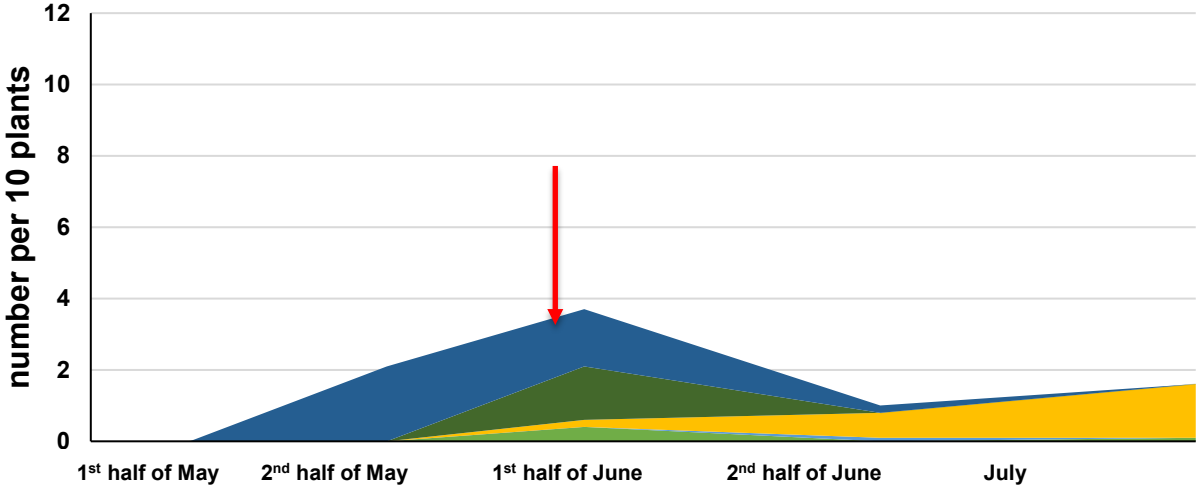
Country | 2021 | Number of species | Beetles (Coleoptera) | Europe | Load

Composition of natural enemies in the field





2020 Field trial South-west NL (Westmaas)

2021 Field trial South-west NL (Westmaas)

Diet of natural enemies

natural enemies	life stage	amount of aphids/day
ladybug	larvae	100
	adult	50-100
gall midge	larvae	5-80
hoverfly	larvae	31
soldier beetle	adult	8
green lacewing	larvae	7
ground beetle	adult	3-6
spider	adult	3
parasitic wasp	adult	1

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Effects on non-target organisms

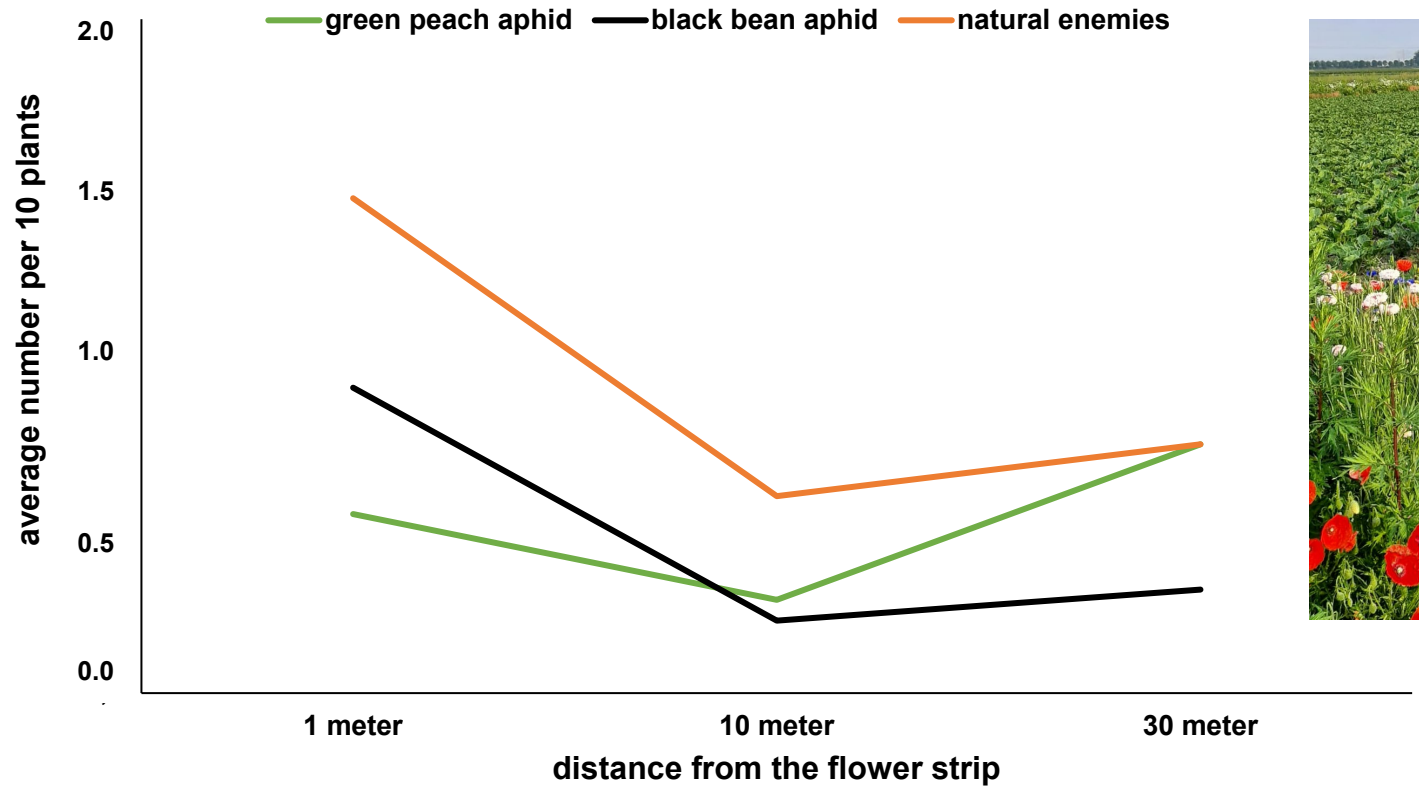
Latin family or genus name	Common name	stage	deltamethrin	acetamiprid	pirimicarb	flonicamid	sulfoxaflor	spirotetramat
Anthocoridae	Flower bugs	Adult	4	4	1	1	3	2
Chrysoperla	Green lacewings	Adult	4	?	2	1	2	1
Chrysoperla	Green lacewings	Larvae	4	3	1	1	1	1
Aphidoletes	Gall midge	Adult	4	3	4	1	?	?
Aphidoletes	Gall midge	Larvae	4	4	1	1	?	?
Feltiella	Gall midge	Adult	4	3	4	1	?	?
Feltiella	Gall midge	Larvae	4	4	1	1	?	?
Coleoptera	Beetle	Adult	1	4	4	1	?	?
Coleoptera	Beetle	Larvae	4	4	1	1	?	?
Staphylinidae	Rove beetle	Adult	4	?	?	2	1	?
Coccinellidae	Ladybug	Adult	4	4	?	1	2	1
Coccinellidae	Ladybug	Larvae	4	4	?	?	4	1
Amblyseiinae	Rove mite	Nimph/adult	3	?	1	1	3	3
Aphidius	Parasitoid wasp	Adult	4	3	1	1	4	?
Syrphidae	Hover fly	Adult	4	?	?	2	?	1

IOBC toxicity class

1 = harmless, 2 = slightly harmful, 3 = moderately harmful, 4 = harmful

Modified from Biobest and *Agriculture and Horticulture Development Board (AHDB)*

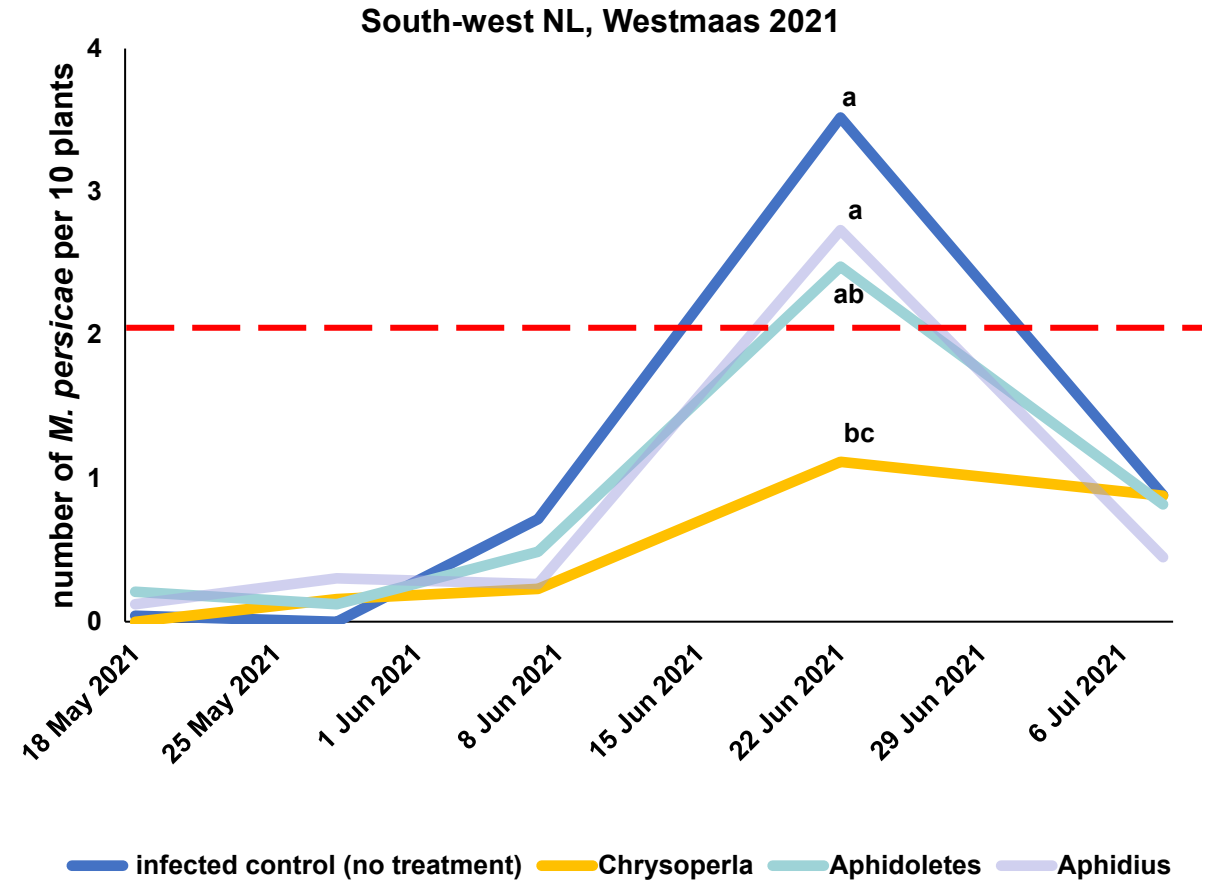
Migration into the field



IRS field trial 2021

Chrysoperla kept *M. persicae* under threshold

Results



Plants Helping Plants: Companion Plants For Aphid Control

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Introduction

Virus yellows is a complex of three viruses, mainly transmitted by aphids, which can cause up to 50% reduction in sugar yield[1,2]. It is known from other crops that plants are less attacked by aphids when grown between other plants. Probably aphids have difficulties in finding the host plant, are more vulnerable to predators or lose viruses when companion plants or intercropping is used.

Materials & methods

Alternative approaches to control aphids as virus vectors were tested. Field trials were set up in Belgium, Denmark, Germany and the Netherlands in 2021 with barley sown shortly before sugar beet. The barley plants emerged earlier and were aimed to expel or distract aphids coming in. In addition, one other alternative control method was examined at each location (other companion plants, straw mulch).

Fig. 1 Barley as companion plant in sugar beet.

Fig. 2 Number of black bean aphids per plant.

Fig. 4 Number of ladybugs per plant.

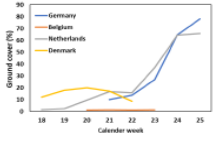

Fig. 6 Percentage of ground cover of barley at different locations.

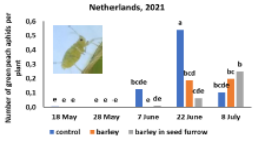

Fig. 3 Number of green peach aphids per plant.

Fig. 5 High incidence of ladybugs when barley was used as companion plant.

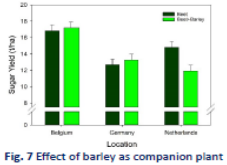

Fig. 7 Effect of barley as companion plant on sugar beet yield. Barley was destroyed late in Germany and the Netherlands.

Results and Conclusions

First results of companion plants with barley between sugar beet show that:

- Establishment of barley did succeed in 2 out of 4 trials;
- Late destruction of barley can lead to high yield reduction in sugar beet;
- Incidence of insect pests was low in 2021 and therefore we must be careful with the first conclusions. Sugar beet mixed with barley:
  - might result in less green peach aphids (*Myzus persicae*) and black bean aphids (*Aphis fabae*). However, more other aphids, like grain aphids (*Sitobion avenae*) were found;
  - might have a positive effect on some of the natural enemies;
  - might have a variable effect on other pests: in some fields, thrips population was lower, while flea beetle populations were higher.

Trials are repeated in 2022.

References

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2. **Smith, H.G. & Hallsworth, P.B. (1990).** The effects of yellowing viruses on yield of sugar beet in field trials, 1985 and 1987. Annals of Applied Biology, 116, 503– 511.
3. **Dupuis, B., Cadby, J., Goy, G., Tallant, M., Derron, J., Schwaerzel, R., & Steinger, T. (2017).** Control of potato virus Y (PVY) in seed potatoes by oil spraying, straw mulching and intercropping. Plant Pathology, 66(6), 960–969. https://doi.org/10.1111/ppa.12698
4. **Lacomme, C., Glais, L., Bellstedt, D. U., Dupuis, B., Karasev, A. V, & Jacquot, E. (2017).** Potato virus Y: epidemiology and pathogenicity, biodiversity, management.

Summary

- **To support chemical control with natural enemies we need:**

Crop monitoring

AI apps

Selective insecticides

Innovations in Cropping systems

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