Thrips control in onions.
New strategies for tackling a problem pest

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What makes thrips tricky?

- Many species; potential risk of misidentification
- Severe damage, both direct and indirect as virus vectors
- Thrips can counterattack (prey upon) predators
- Pesticide options are more and more restricted
- Thrips are known to develop pesticide resistance
- Invasive thrips spp. are often free of adapted enemies

Examples of invasive thrips species:

- *Thrips setosus*
- *Thrips parvispinus*
- *Thrips tabaci*
- *Echinothrips americanus*
- *Scirtothrips dorsalis*

Not All Thrips Are Bad Thrips !

AgriEco Insight

Feeding on Thrips

Franklinothrips vespiformis

Aeolothrips albicinctus

Aeolothrips intermedius

Aeolothrips ericae

Feeding on Spore of Fungi

Megathrips lativentris

Phlaeothrips annulipes

Feeding on Mites (All stages)

Scolothrips uzeli

Scolothrips longicornis

Onion Thrips (*Thrips tabaci*)

Can biocontrol provide the answer?

Types of biological pest control

- Classical Biocontrol

Introduction of exotic organisms to control invasive pests

- Augmentative Biocontrol

Mass release of (commercially produced) organisms to control pests

- Conservation Biocontrol

Targeted practices to support populations and/or efficacy of biocontrol organisms.

Trends in augmentative biocontrol

- Specialists
- Synchronisation with pest development cycle

- Generalist predators
  - act against several pests/pest stages
  - less/no need for synchronisation
  - easier to rear on factitious prey/alternative diets
  - can be established on alternative food
  - possibility of inducing plant resistance, when plant feeding
  - possible to use preventatively (standing army)

BUT

- Risk of intraguild interactions
- Risk of plant damage

Thrips control

Possible NEW predators

New Predatory mites (plus Nutrimite)

Chrysopa

Orius spp

Predatory Thrips

Predatory Flies

New strategies

Smart tools to make biocontrol agents perform better

This man is fast...

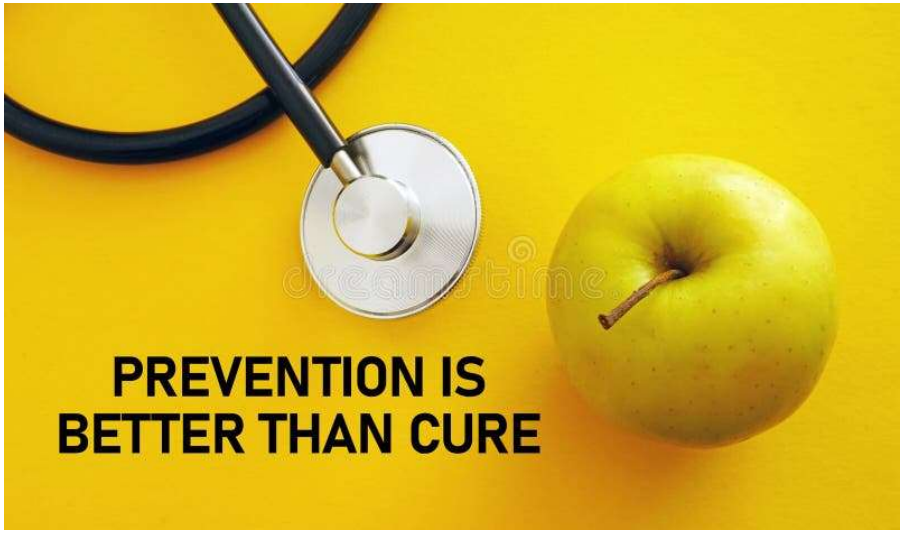
This man is faster

biobest
SUSTAINABLE CROP MANAGEMENT

New strategies in augmentative/conservation biocontrol

frontiers in Sustainable Food Systems

REVIEW
published: 23 December 2020
doi: 10.3389/fsufs.2020.595630



Predators and Parasitoids-in-First: From Inundative Releases to Preventative Biological Control in Greenhouse Crops

Juliette Pijnakker, Dominiek Vangansbeke, Marcus Duarte, Rob Moerkens and Felix L. Wäckers*

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Predator/parasitoid in first:

Advantages of predator/parasitoid in first:

- Builds up biocontrol populations before pest arrives
- Reduces number of required releases
- When pests arrive, they face a “Standing Army” of natural enemies
- Less damage
- Monitoring becomes less crucial
- More reliable and robust biocontrol

Preventive establishment?

Predators and Parasitoids are Omnivores

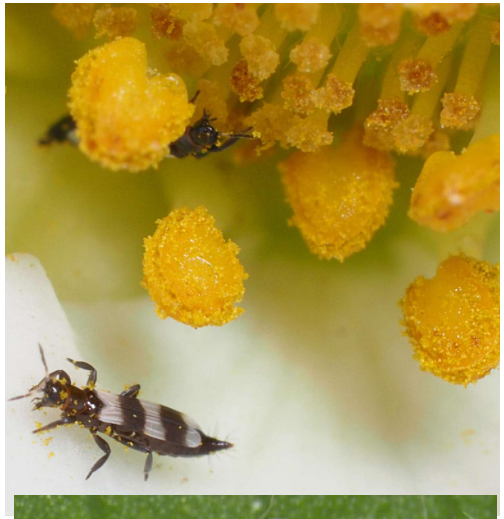
Preventive establishment?

Cater to Resource Requirements

Nectar

Pollen

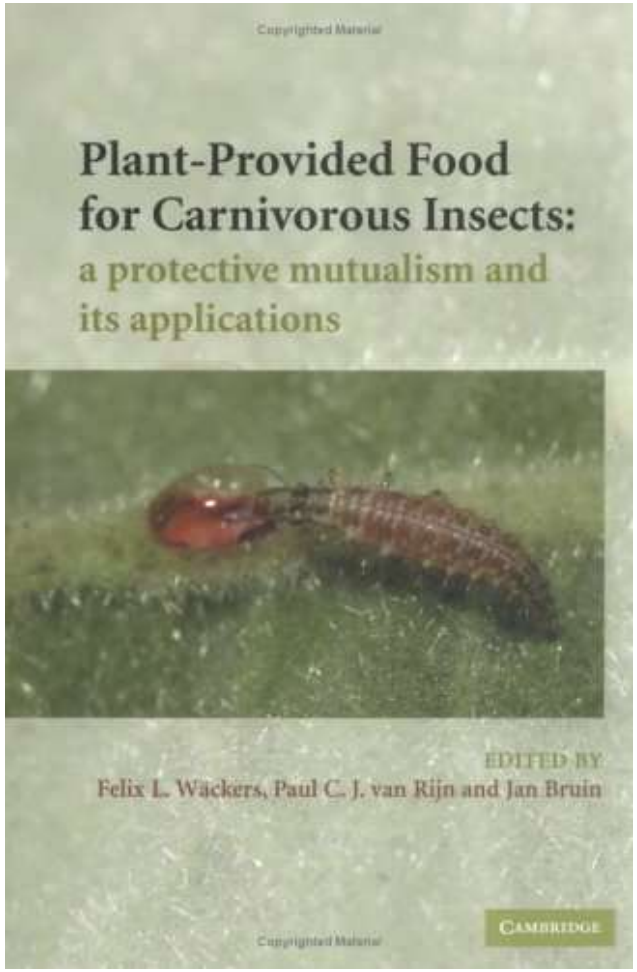
Alternative Prey



Phloemsap

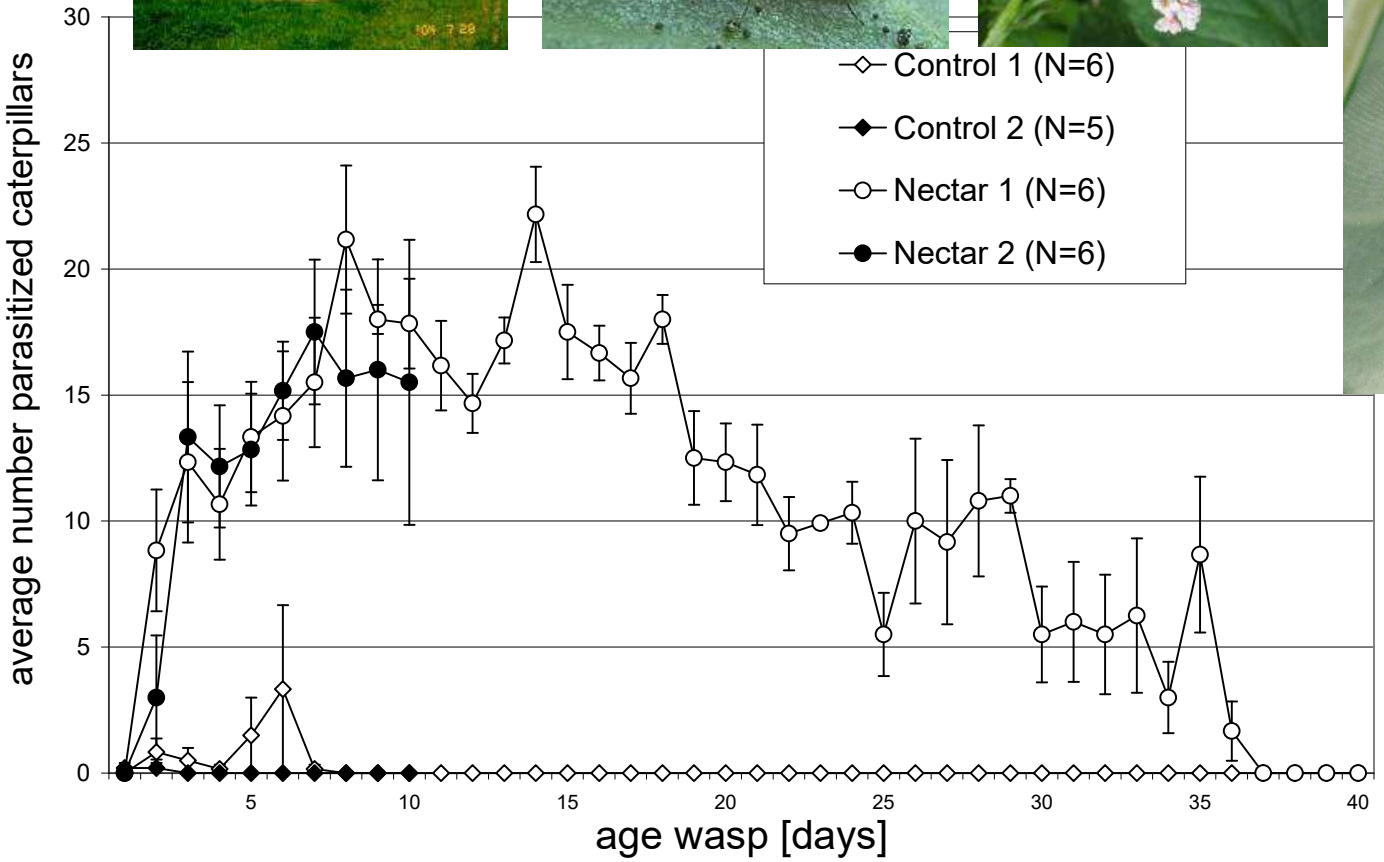
Shelter

Flower feeding by different groups of biocontrol organisms



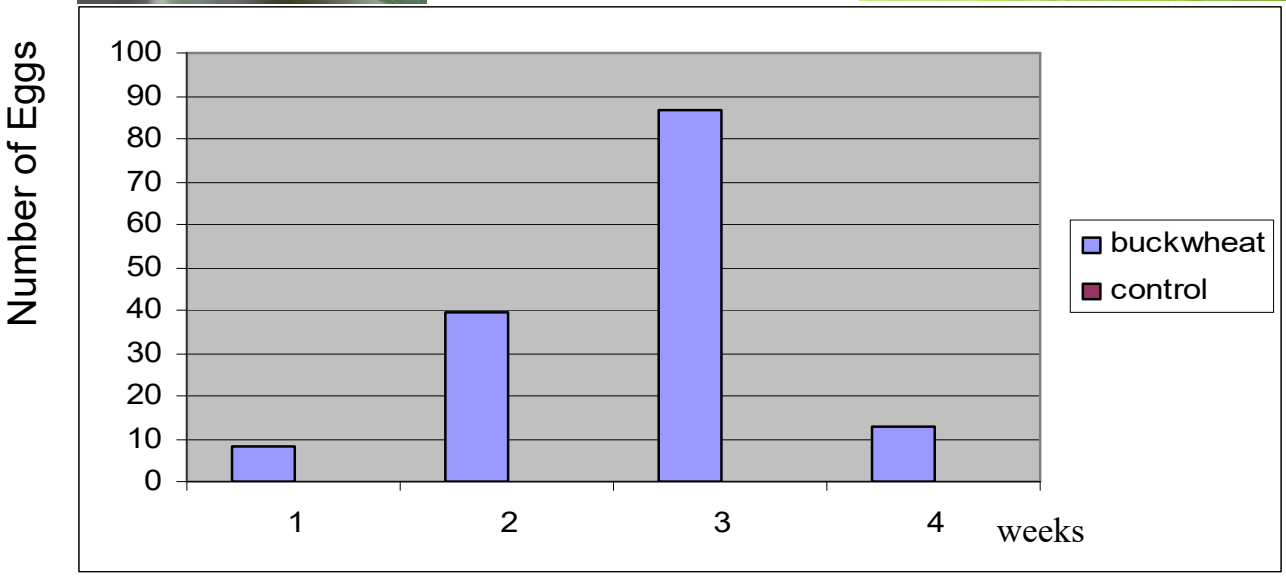
Type	Plant-feeding stage	Arthropod examples can be found within:		Type of plant food utilised
Life-history omnivory	adult	Neuroptera: Diptera: Hymenoptera: Coleoptera:	Chrysopidae (green lacewings) Syrphidae (hoverflies) Cecidomyiidae (gall midges) Tachinidea (parasitoid flies) Ichneumonidae, Braconidae, a.o. (parasitoid wasps) Vespidae (social wasps) Formicidae (ants) Meloidae (blister beetles)	nectar, pollen nectar, pollen nectar nectar nectar nectar nectar, fruit nectar nectar, pollen
	juvenile	Heteroptera:	Pentatomidae (stink bugs)	plant-juice
Temporal omnivory	adult	Hymenoptera: Coleoptera:	Ichneumonidae, Braconidae, a.o. (host feeding parasitoids) Cicindelidae (tiger beetles)	nectar seeds
	juvenile	Araneae:	Araneidae (orb web spiders)	pollen
Permanent omnivory	adult & juvenile	Acari:Mesostigmat Heteroptera: Neuroptera: Thysanoptera: Coleoptera:	Phytoseiidae (predatory mites) Pentatomidae (stink bugs) Miridae (mirid bugs) Geocorinae (big-eyed bugs) Anthocoridae (flower bugs) *Chrysopa,* Hemerobiidae (brown lacewings) Aeolothripidae, Phlaeothripidae Coccinellidae (ladybirds) Carabidae (ground beetles)	nectar pollen plant juice plant juice plant juice pollen nectar, pollen leaves, pollen nectar pollen seeds

The impact of flowers on biocontrol efficacy



Winkler et al., (2006)

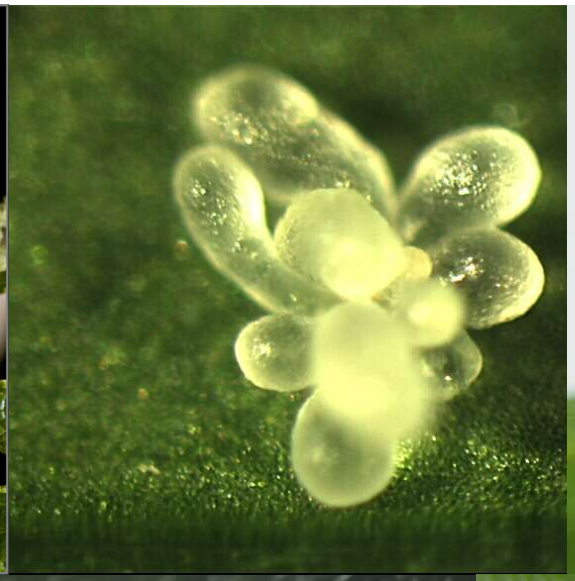
Hoverflies (*Episyrphus balteatus*)

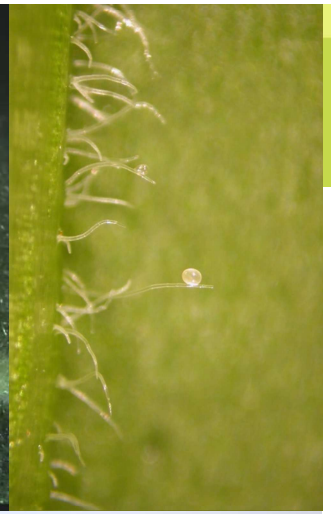


Chifflet and Wäckers, 2005

Inspired by nature:

Plants recruiting predators as bodyguards





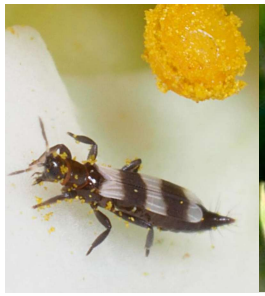
Strategies for providing supplementary resources

- Providing resources through the crop
- Providing resources through landscape management
- Providing resources through supplementation

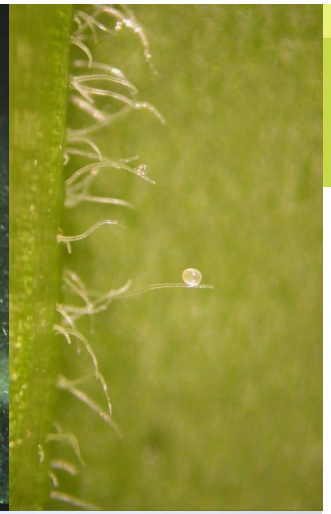
The onion crop

Nectar	-
Pollen	-
Alternative Prey	-/x
Phloemsap	x

Predators in onion




The onion crop					
Nectar	-	X	X	X	X
Pollen	-	X	X	X	X
Alternative Prey	-/x	X	X	X	X
Phloemsap	x	X			



Strategies for providing supplementary resources

- Providing resources through the crop
- Providing resources by managing the landscape
- Providing resources through supplementation

Additional Food Sources

Flower Margins	
Nectar	X
Pollen	X
Alternative Prey	X
Phloemsap	X

How to make biodiversity work for farmers
Examples from European flower margin projects

Felix Wäckers

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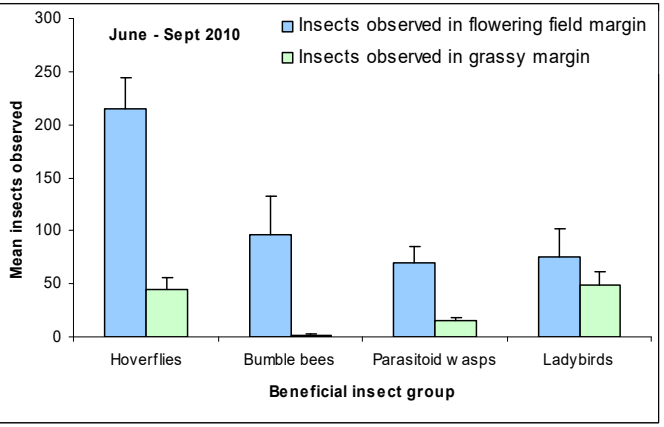
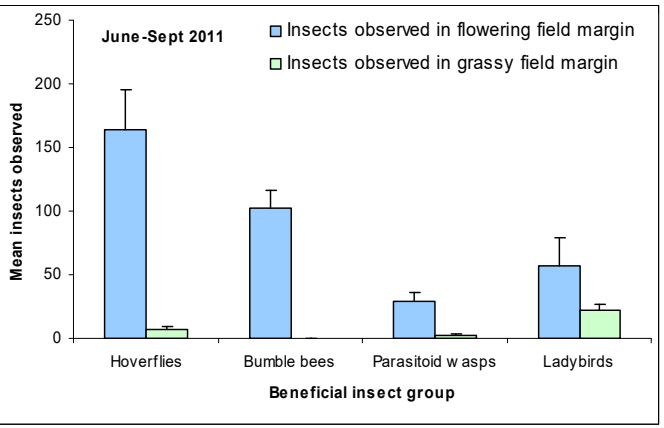
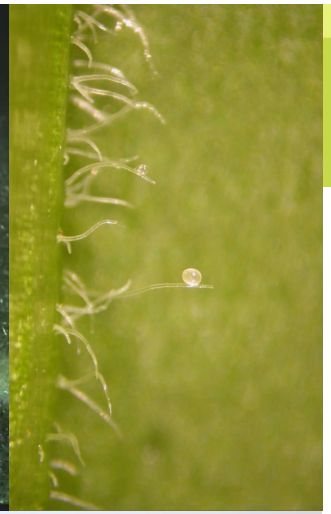
Build up of thrips predators in flower margins

Shortage of food resources in the onion crop remains





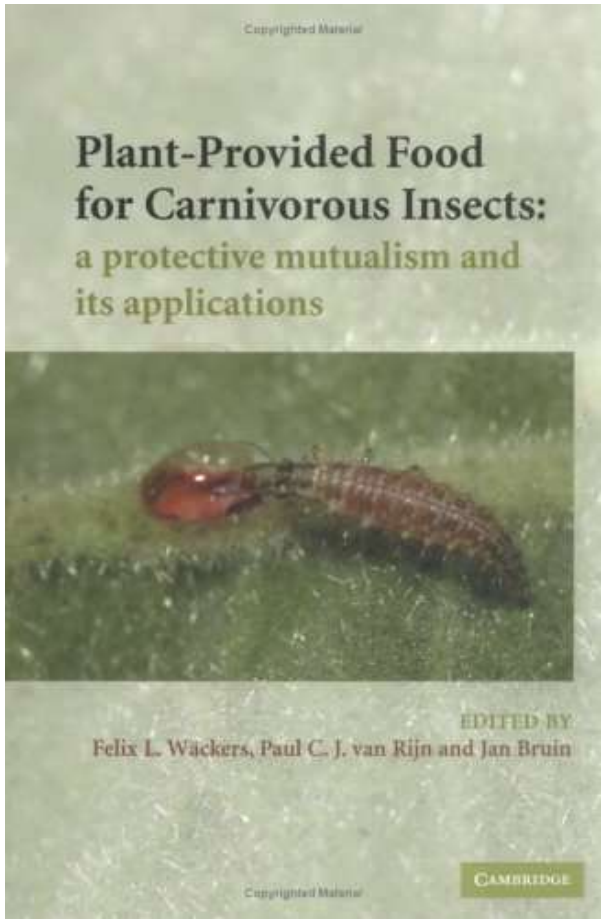


Strategies for providing supplementary resources

- Providing resources through the crop
- Providing resources by managing the landscape
- Providing resources through supplementation

Food supplementation in the crop

- Pollen
- Sugars
- Factitious Prey
  - Ephestia kuehniella
  - Artemia spp
  - Prey mites
- Artificial diets



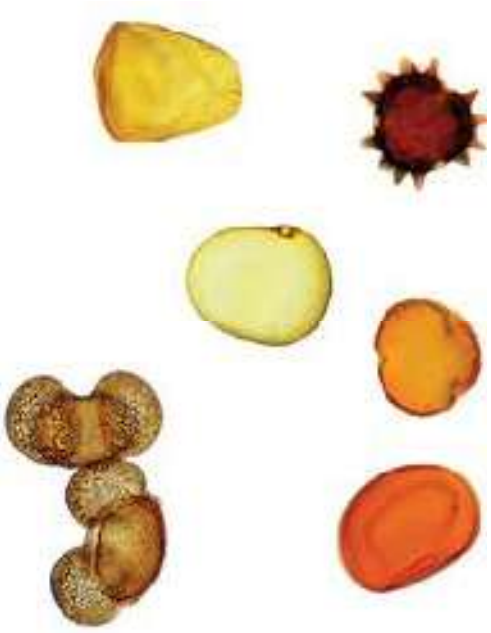
Many pest natural enemies are pollen feeders

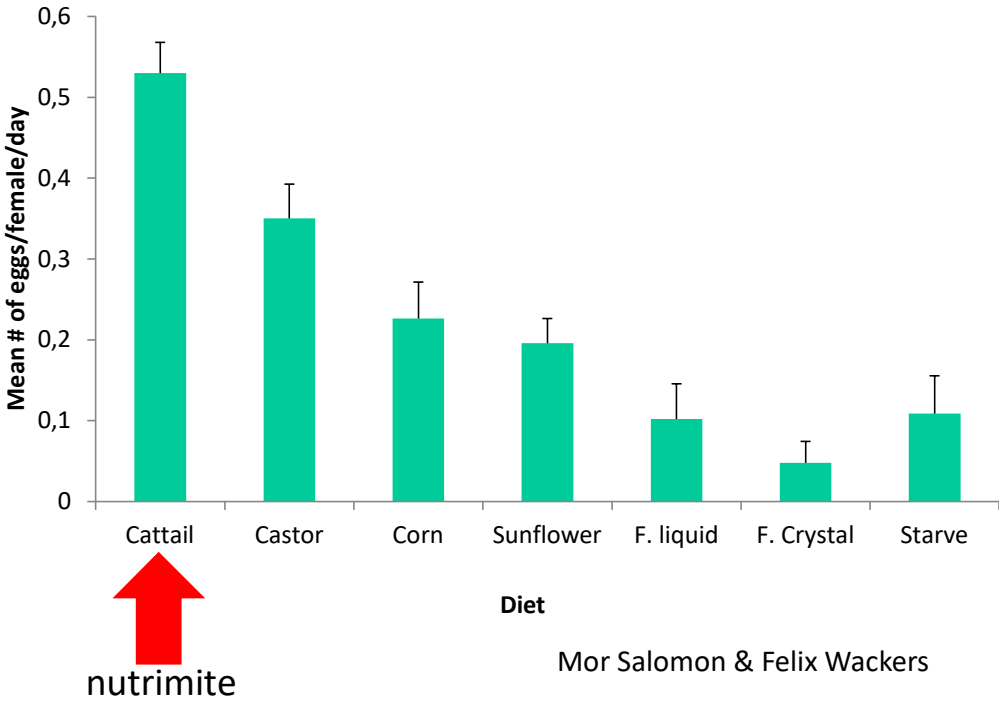
Type	Plant-feeding stage	Arthropod examples can be found within:		Type of plant food utilised
Life-history omnivory	adult	Neuroptera:	Chrysopidae (green lacewings)	nectar, pollen
		Diptera:	Syrphidae (hoverflies)	nectar, pollen
		Hymenoptera:	Cecidomyiidae (gall midges)	nectar
			Tachinidea (parasitoid flies)	nectar
			Ichneumonidae, Braconidae, a.o. (parasitoid wasps)	nectar
			Vespidae (social wasps)	nectar, fruit
			Formicidae (ants)	nectar
		Coleoptera:	Meloidae (blister beetles)	nectar, pollen
	juvenile	Heteroptera:	Pentatomidae (stink bugs)	plant-juice
Temporal omnivory	adult	Hymenoptera:	Ichneumonidae, Braconidae, a.o. (host feeding parasitoids)	nectar
		Coleoptera:	Cicindelidae (tiger beetles)	seeds
	juvenile	Araneae:	Araneidae (orb web spiders)	pollen
Permanent omnivory	adult & juvenile	Acari:Mesostigmat	Phytoseiidae (predatory mites)	nectar, pollen
		Heteroptera:	Pentatomidae (stink bugs)	plant juice
			Miridae (mirid bugs)	plant juice
			Geocorinae (big-eyed bugs)	plant juice
			Anthocoridae (flower bugs)	pollen
		Neuroptera:	*Chrysopa,* Hemerobiidae (brown lacewings)	nectar, pollen
		Thysanoptera:	Aeolothripidae, Phlaeothripidae	leaves, pollen
			Coccinellidae (ladybirds)	nectar
		Coleoptera:	Carabidae (ground beetles)	pollen, seeds

Pollen as food supplement

Pollen

Comparison of Pollen types for predatory mites (*A swirskii*)





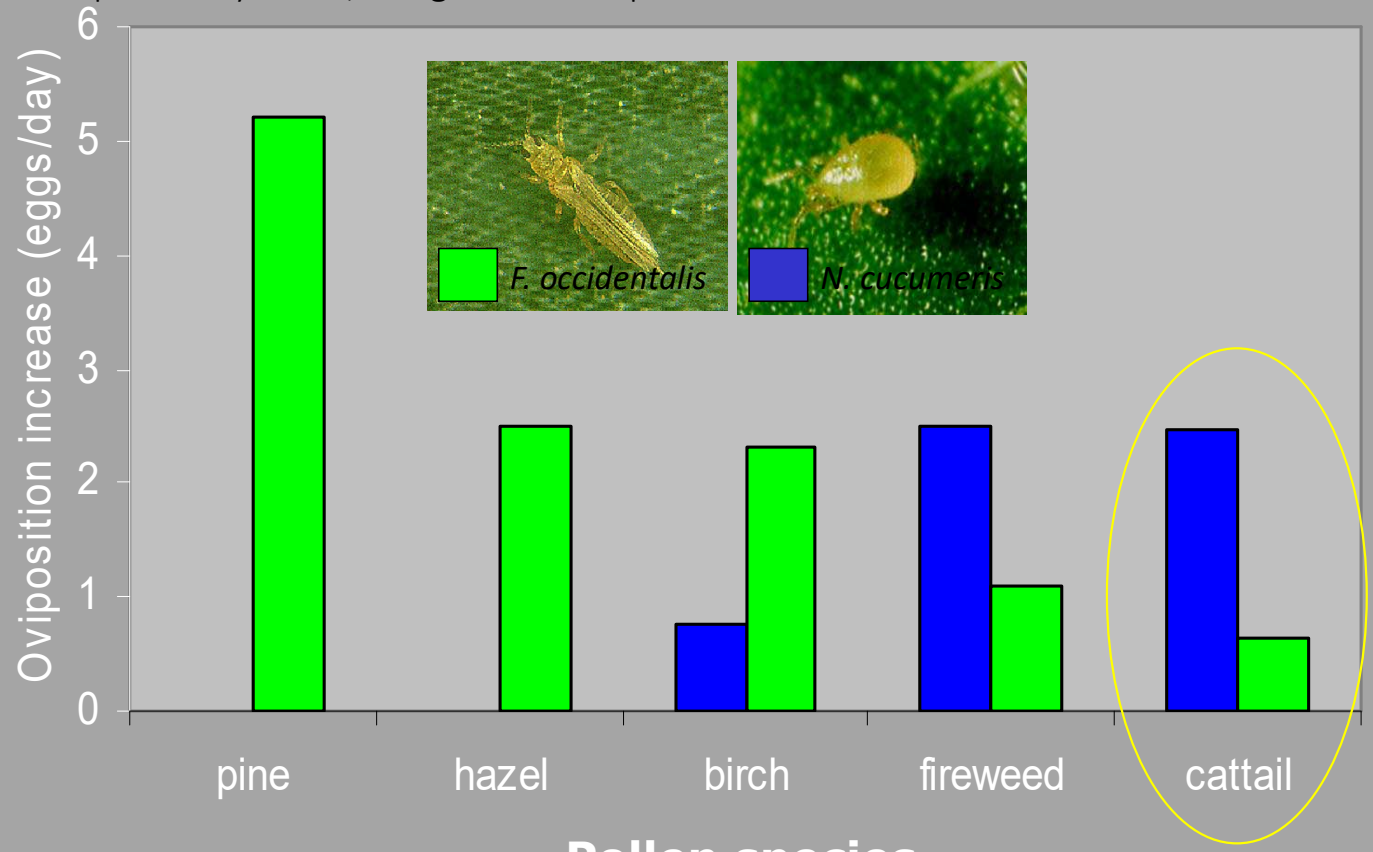
Mor Salomon & Felix Wackers

What about pest thrips?

Some (not all) pest thrips are pollen feeders

Thrips?

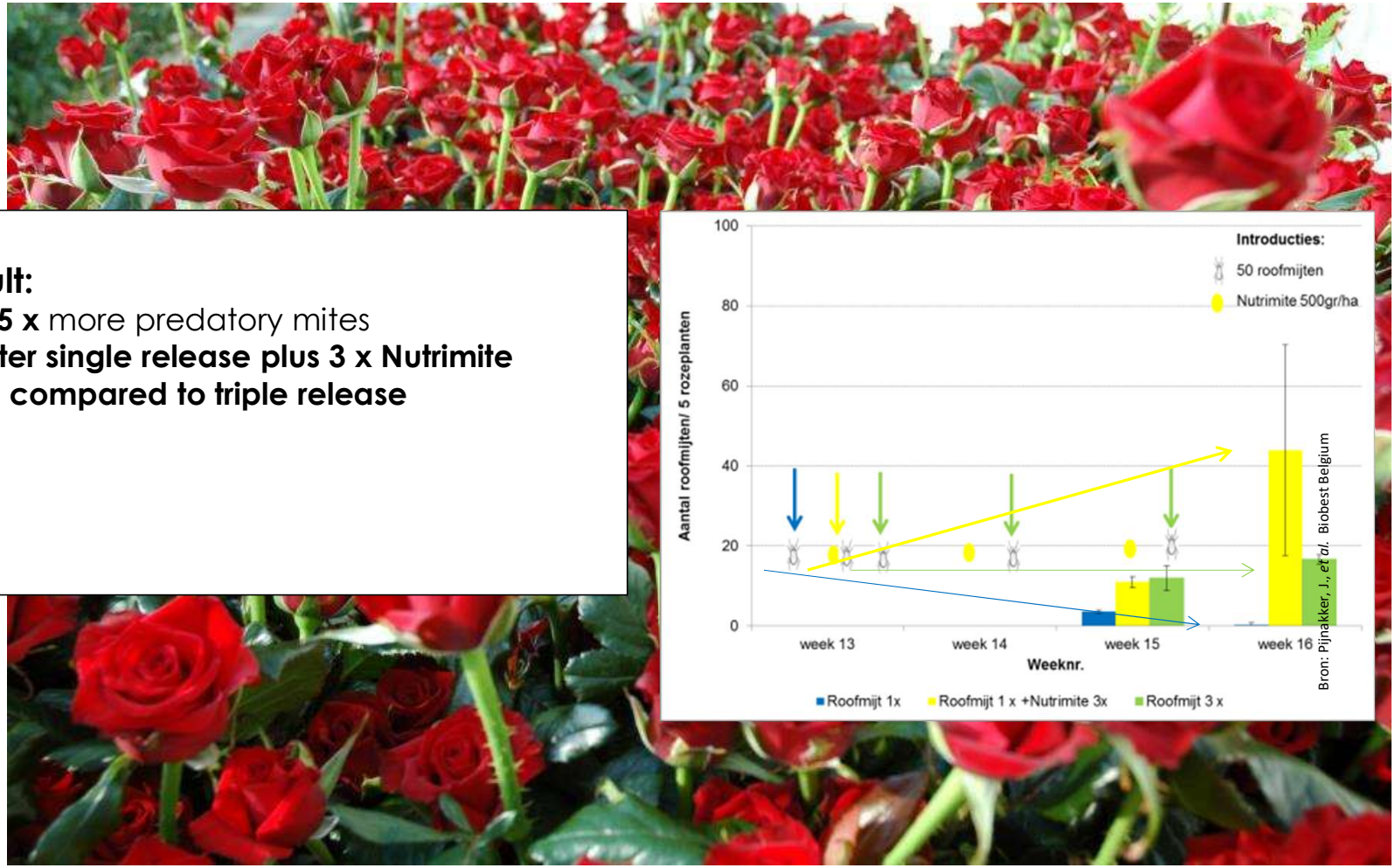
Nutrimite is good for predatory mites; not good for thrips



(Hulshof et al., EEA 2003)

(Van Rijn & Tanigoshi, EAA 1999b)

More with Less
Example Roses

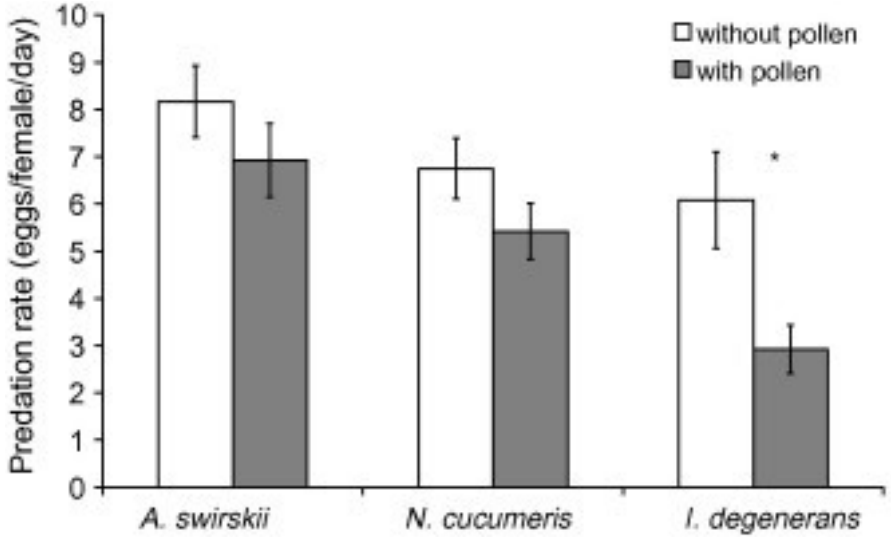


Result:

- **2,5 x** more predatory mites
  After single release plus 3 x Nutrimite as compared to triple release

Additional advantage of Typha pollen

Pollen can reduce or prevent “intra-guild predation”
(Example predatory mites & Aphidoletis eggs)

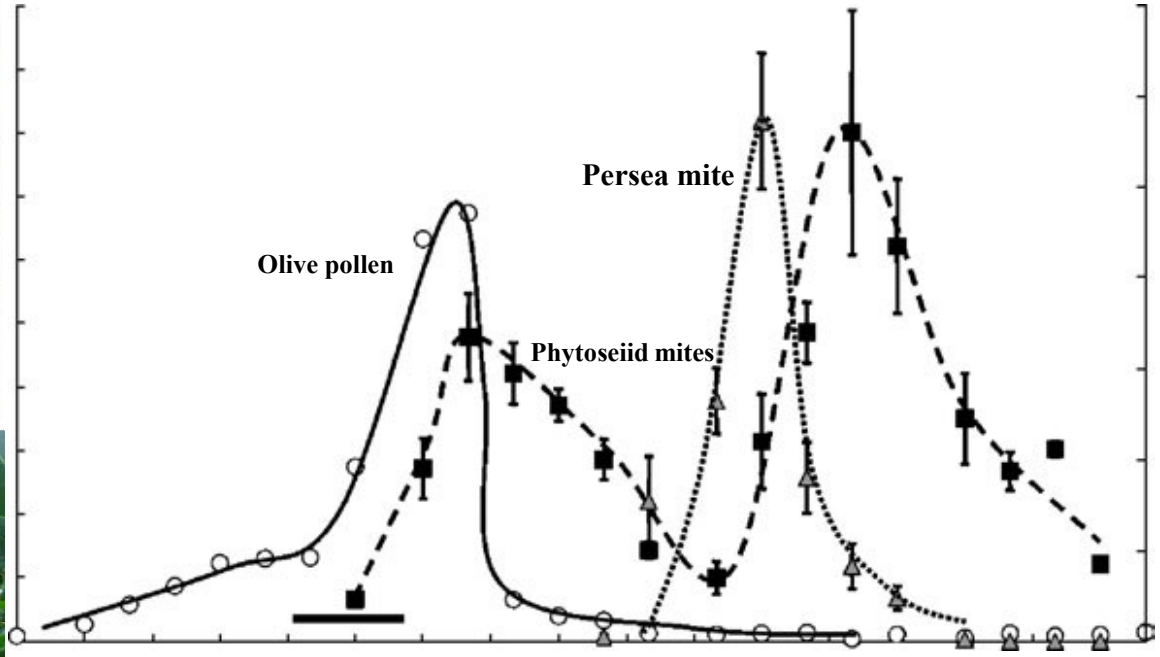


Messelink et al., 2011

Natural aerial pollen levels and predator-pest dynamics

Natural aerial pollen levels and predator-pest dynamics

Example: Olive pollen impact on predatory mite & Persea mite (pest) in Avocado



Alternative food improves the combined effect of an omnivore and apredator on biological pest control. A case study in avocado orchards
J.J. GonzálezFernández et al., (2009) Bulletin of Entomological Research 99 :433 444

Pollen as food supplement in onion crops

Conventional
4 insecticide treatments

Food supplements to support natural pest control?
Example Onions

No insecticides
2 pollen applications

Onion Thrips
(*Thrips tabaci*)

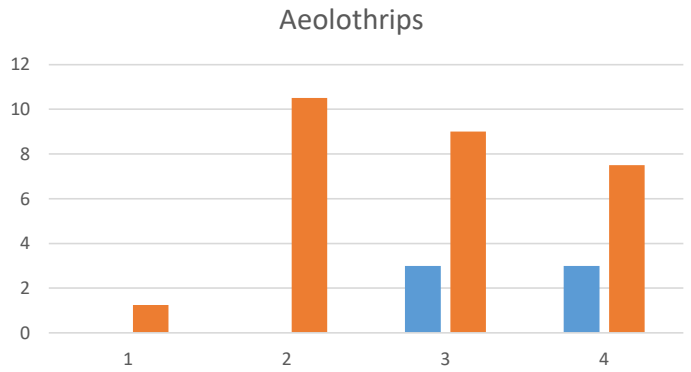
Scouting:
Pest + Natural Enemies

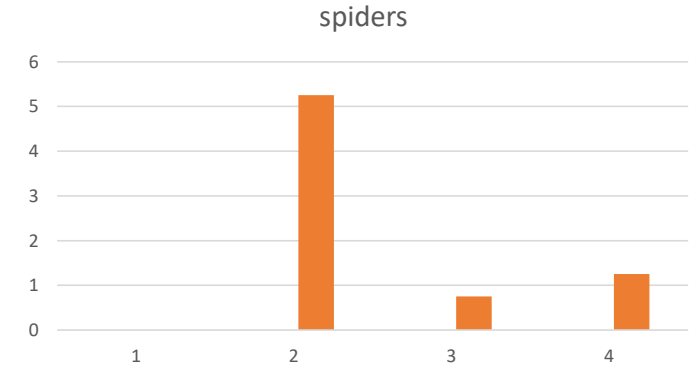
Aeolothrips intermedius

Counts per 10 onion plants

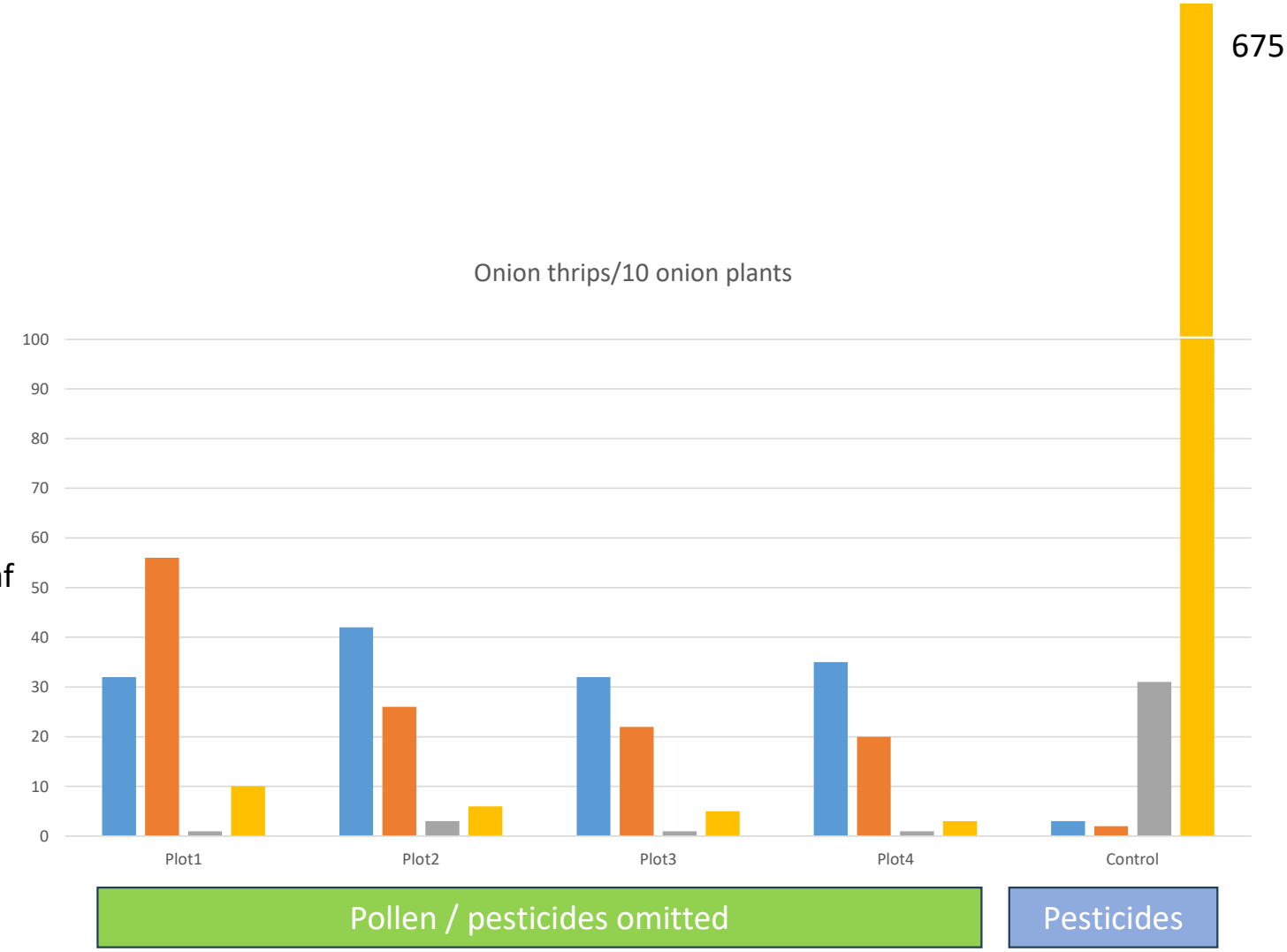
Insecticides (4x)

Pollen only





Damage threshold:
1 onion thrips per leaf




biobest
SUSTAINABLE CROP MANAGEMENT

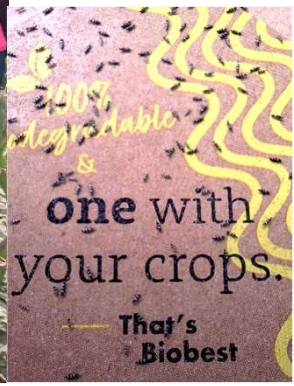
<u>Yield:</u>

Diameter + 8%

Weight +15%

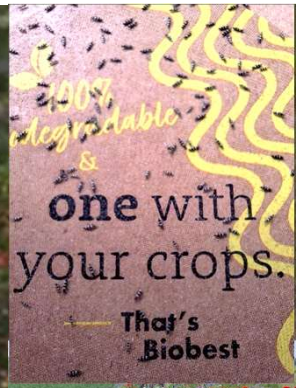
Field trials 2025

Kieldrecht

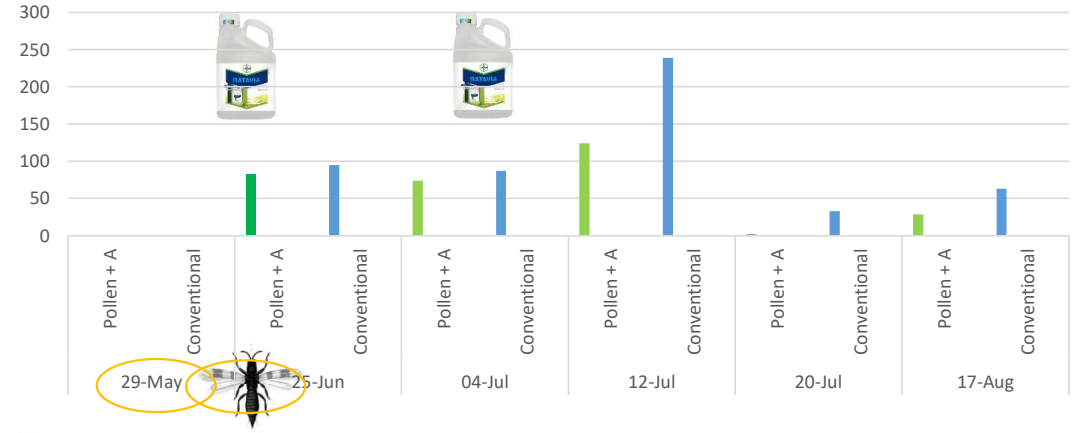


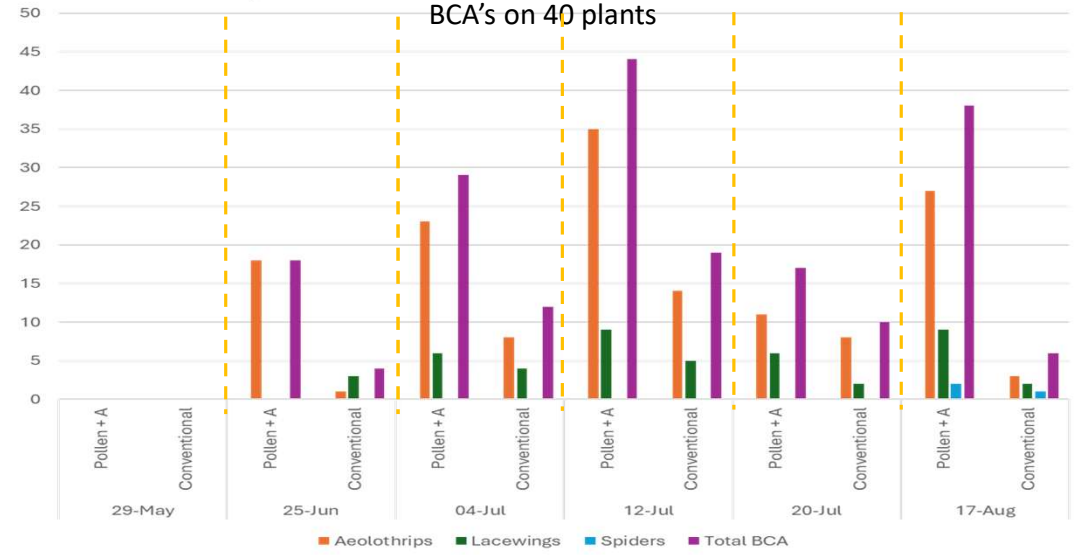
Onion field Kieldrecht, Belgium

12 hectares total
3 hectares pollen
9 hectares conventional (Movento 2x)



Kieldrecht (Anné) 2025



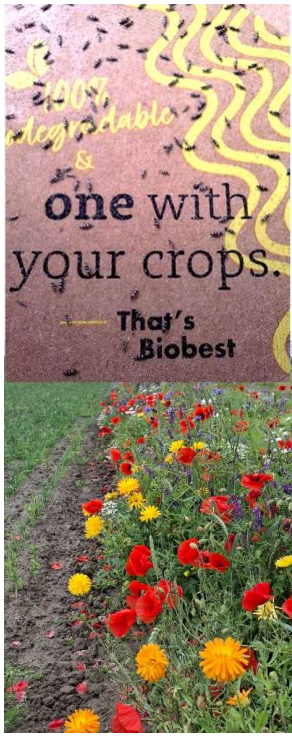


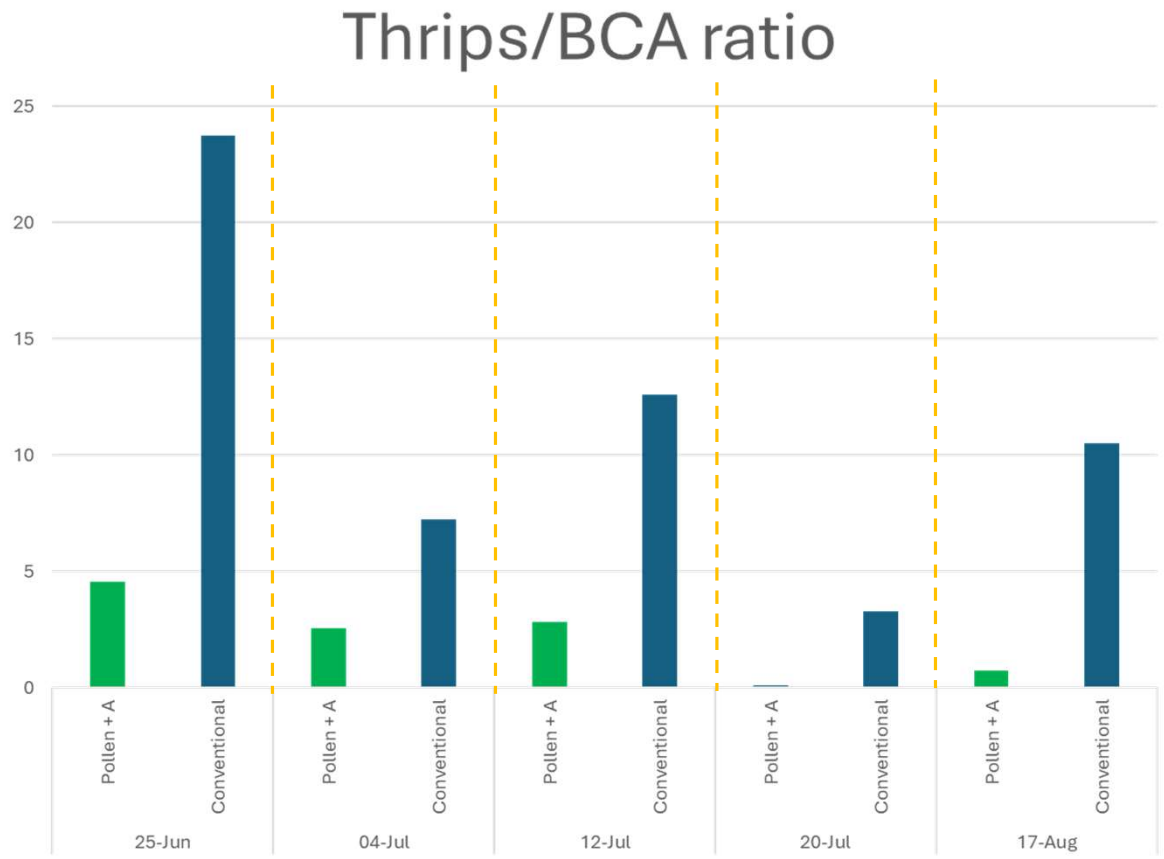
Irrigation

Movento (conventional)

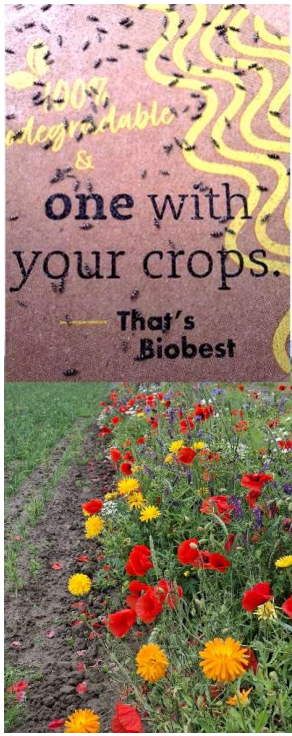
Pollen

Aeolothrips




Thrips/BCA ratio
25
20
15
10
5
0
Pollen + A
Conventional
25-Jun
04-Jul
12-Jul
20-Jul
17-Aug


biobest
Nutrimite 500g
Typha spp.


100%
&
one with
your crops.
That's
Biobest

4 PILLARS (IBC)

Thank You

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OPEN FIELD POLLEN APPLICATION