SUSTAINABLE CROP MANAGEMENT

www.biobestgroup.com

Pest control and pollination services provided by the hoverflies *Eupeodes corollae* and *Sphaerophoria rueppellii*

Apostolos Pekas, PhD

Senior Scientist, R&D Department Biobest Group N.V.

ABIM
Annual Biocontrol Industry Meeting®
19 - 21 October 2020

Hoverflies or flower flies

Diptera: Syrphidae

Hoverflies: dual ecosystem service providers

but limited use in augmentative biological control (ABC)

1) Pollination: adults visit flowers for nectar (energy source) and pollen (egg maturation)

2) Pest control: ~7.000 hoverfly species -> ~1/3 aphidophagous; i.e. larvae prey upon aphids

- **Only 2 aphidophagous hoverfly species are commercially available -> vast potential for selecting promising species for use in ABC**

biobest SUSTAINABLE CROP MANAGEMENT

Eupeodes corollae:
Biobest´s selection of promising hoverfly species

- Most abundant hoverfly species on the aphid colonies in our field trials in Spain (Antonio Robledo – R&D Biobest Spain)
- Highly voracious larva: consumes 500-1000 aphids for development
- Generalist: preying upon > 60 aphid species
- Good performance at low temperatures
- Indigenous throughout Europe as well as further afield

biobest®
SUSTAINABLE CROP MANAGEMENT

Eupeodes corollae life cycle (25°C)

Adult (200 - 400 eggs)

+/- 7 days

Pupa

Egg to adult: 2 weeks

Egg

Larva

+/- 7 days

+/- 2 days

SUSTAINABLE CROP MANAGEMENT

Comparative efficacy of *Eupeodes corollae vs*. *Sphaerophoria rueppellii*

Sphaerophoria rueppelii

- 5-8 mm
- Yellow antennae
- Long and narrow abdomen
- Silky thorax with bright yellow edges
- Successfully employed in ABC programs in the Mediterranean and northern Europe

Eupeodes corollae

- 7-11 mm
- Brownish antennae
- Wide abdomen, yellow hairy scutellum
- Clear yellow spots or bands on abdomen

biobest® SUSTAINABLE CROP MANAGEMENT

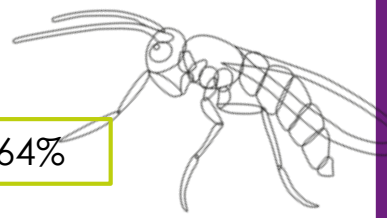
Study system:

Sweet pepper – *Myzus persicae* – semi-field

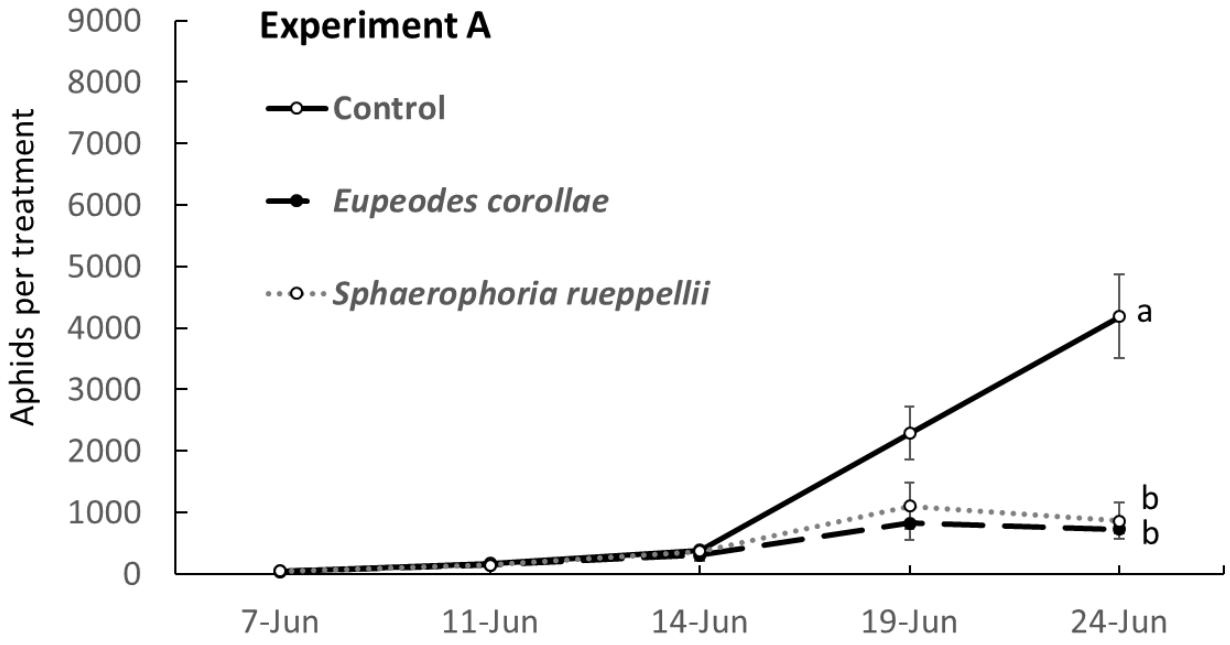
SUSTAINABLE CROP MANAGEMENT

Comparative efficacy of *Eupeodes corollae vs. Sphaerophoria rueppellii*

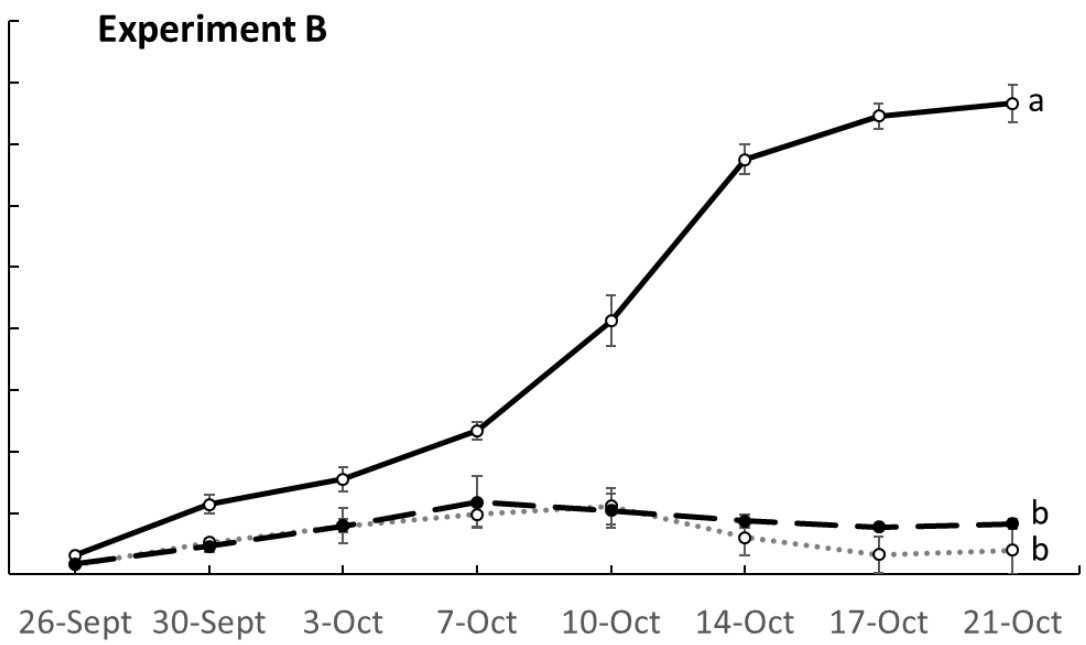
Against ***Myzus persicae*** in **sweet pepper**



Avg. temperature: 24°C; RH: 69%



Avg. temperature: 20°C; RH: 64%

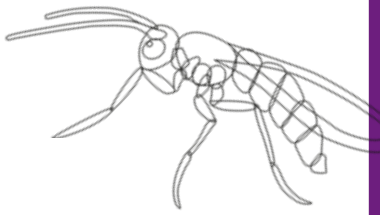


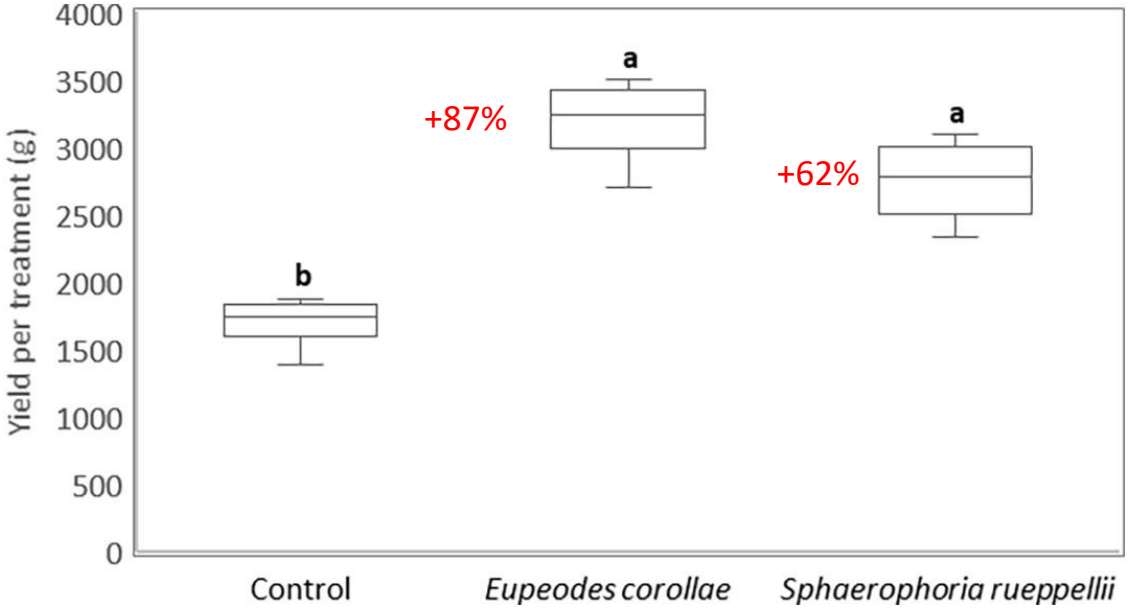
Both hoverfly species reduced significantly the *Myzus persicae* infestation

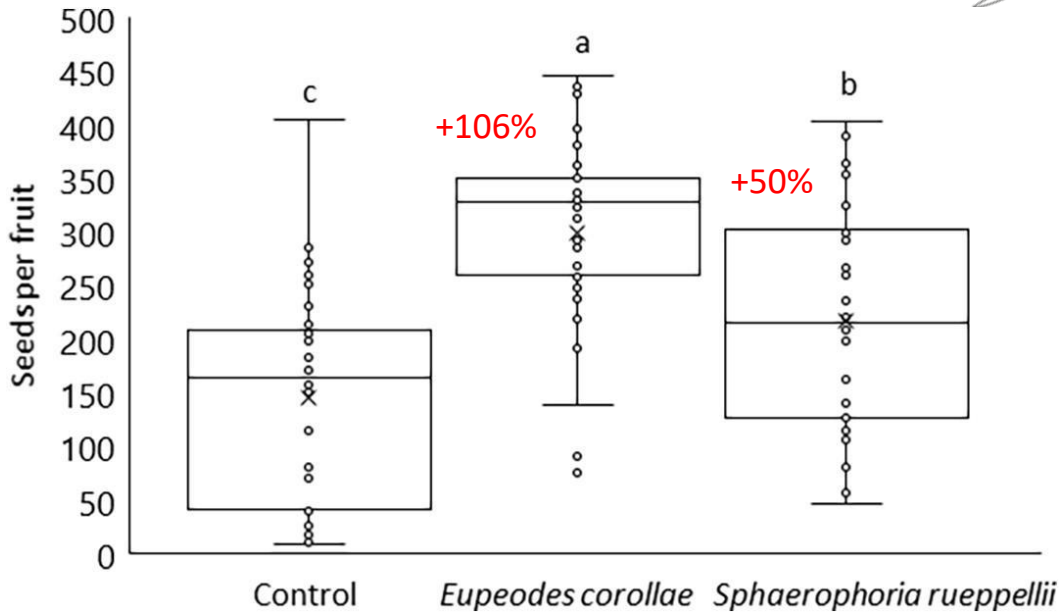
biobest SUSTAINABLE CROP MANAGEMENT

Comparative efficacy of *Eupeodes corollae vs. Sphaerophoria rueppellii*

Against ***Myzus persicae*** in **sweet pepper**







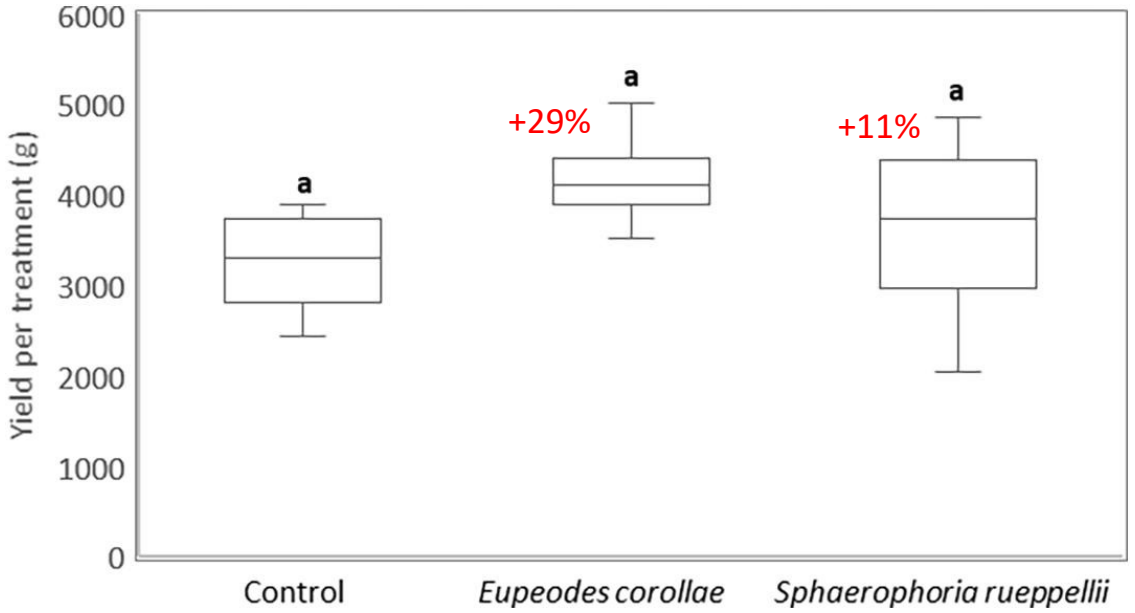
Hoverflies increased yield and seed set

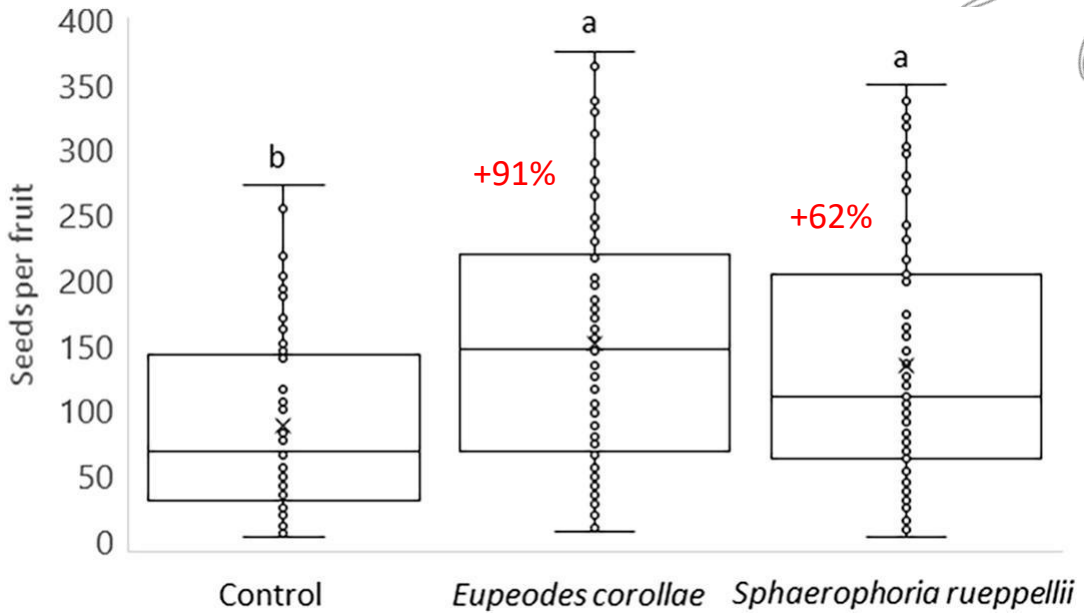
Mainly due to aphid control *and* pollination ?

biobest SUSTAINABLE CROP MANAGEMENT

Comparative efficacy of *Eupeodes corollae vs. Sphaerophoria rueppellii*

Experiment C: sweet pepper NO aphids; only pollination





Hoverflies increased seed set independently of the presence of aphids

In addition to controlling aphids *E. corollae* and *S. rueppellii* also contribute to pollination

biobest SUSTAINABLE CROP MANAGEMENT

Biological Control 149 (2020) 104328

Contents lists available at ScienceDirect

Biological Control

journal homepage: www.elsevier.com/locate/ybcon

One stone; two birds: concurrent pest control and pollination services provided by aphidophagous hoverflies

Apostolos Pekas*, Ines De Craecker, Sten Boonen, Felix L. Wäckers, Rob Moerkens

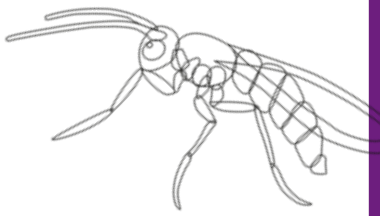
Biobest Group N.V., R&D Department, Ilse Velden 18, 2260 Westerlo, Belgium

https://www.sciencedirect.com/science/article/abs/pii/S1049964420303364

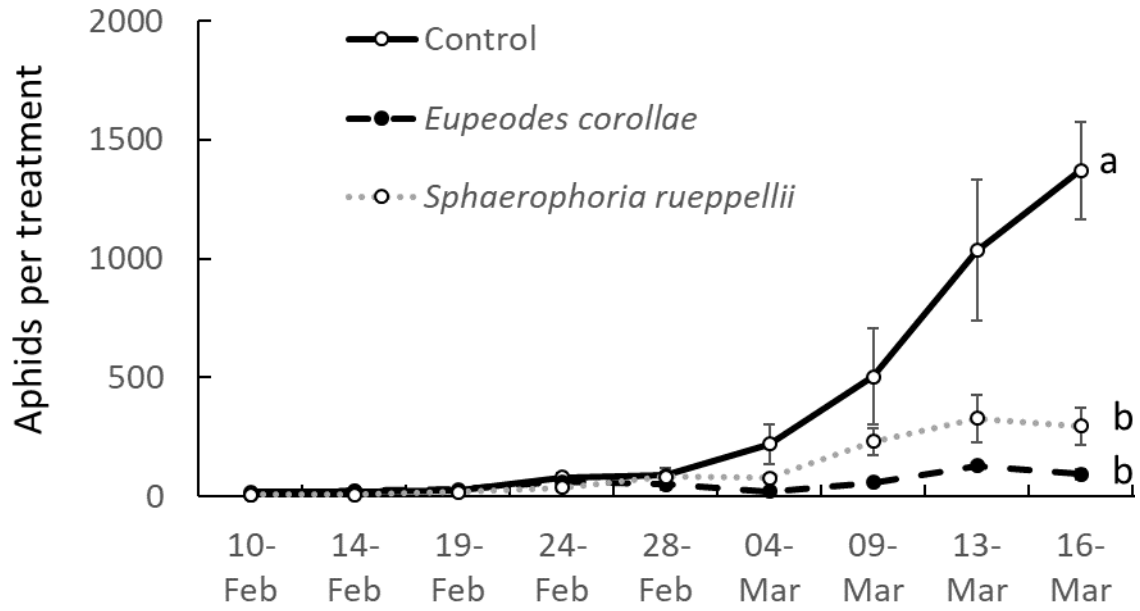
Comparative efficacy of *Eupeodes corollae vs. Sphaerophoria rueppellii* against *Aulacorthum solani* (foxglove aphid)

Comparative efficacy of *Eupeodes corollae vs. Sphaerophoria rueppellii*

Experiment D: against ***Aulacorthum solani*** in **sweet pepper**



Avg. temperature: 20°C; RH: 64%

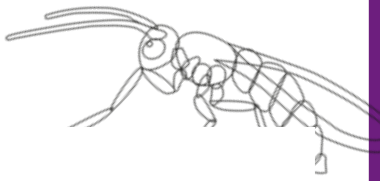


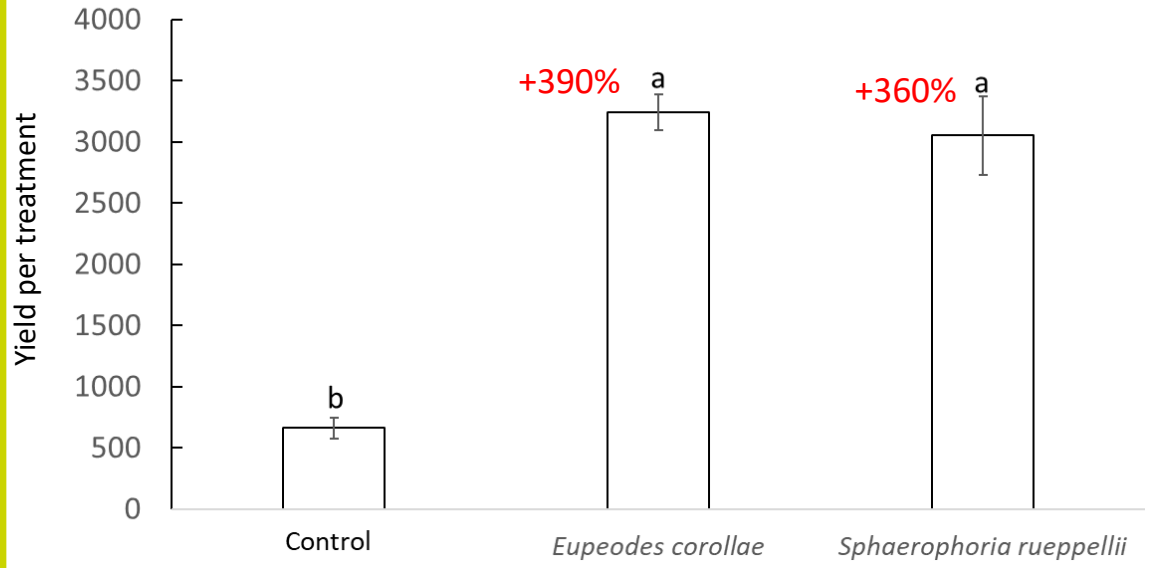
Both hoverfly species reduced significantly the *Aulacorthum solani* infestation

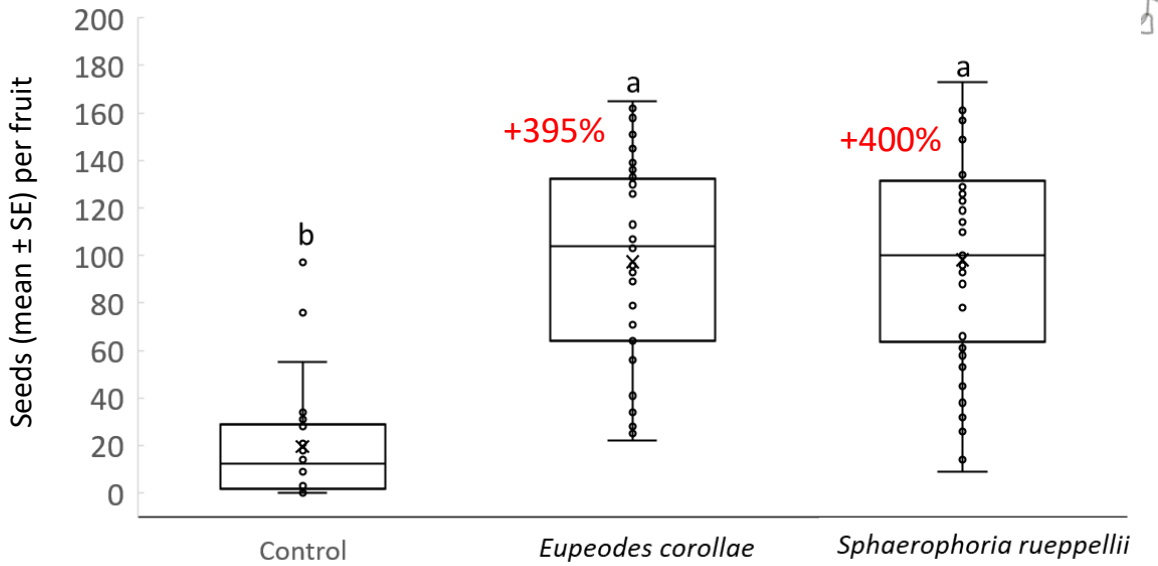
biobest SUSTAINABLE CROP MANAGEMENT

Comparative efficacy of *Eupeodes corollae vs. Sphaerophoria rueppellii*

Experiment D: against ***Aulacorthum solani*** in **sweet pepper**







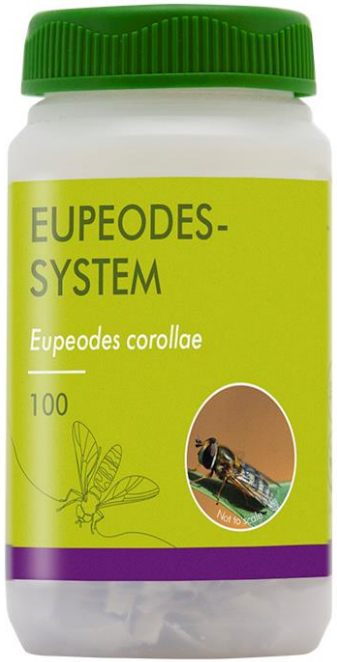
E. corollae and *S. rueppellii* controlled *Aulacorthum solani*

AND

contributed to pollination

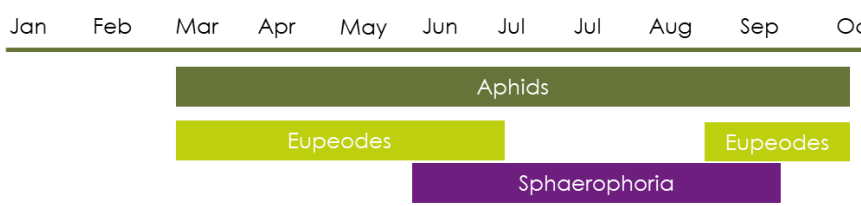
biobest SUSTAINABLE CROP MANAGEMENT

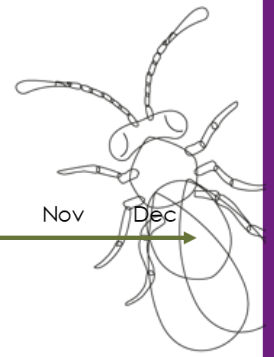
From R&D to commercial availability: Eupeodes-System & Sphaerophoria-System



- **Package size**: bottle of 100 ml
- **Package content**: **100 pupae on a mix of buckwheat husks and vermiculite**
- **Storage temperature**: 8-10°C (46-50°F)

Dosage	Area	Repeat
100 pupae/Ha	3-4 release points per bottle	6 times / Weekly
150-250 pupae/Ha	3-4 release points per bottle Hot spots and surroundings	4 times / Weekly





Instar	Active ingredient	Impact	IOBC classification	Mortality
Larvae	Pymetrozine	Harmless	1	<25%
Larvae	Spirotetramat	Harmless	1	<25%
Adult	Azadirachtin	Harmless	1	<25%
Larvae	Esfenvalerate	Slightly harmful	2	25-50%
Larvae	Flonicamid	Slightly harmful	2	25-50%
Larvae	Thiacloprid	Moderately harmful	3	51-75%
Larvae	Pirimicarb	Harmful	4	>75%
Larvae	Deltamethrin	Harmful	4	>75%
Larvae	Spinosad	Harmful	4	>75%

biobest SUSTAINABLE CROP MANAGEMENT

MOLECULAR ECOLOGY

Molecular Ecology (2013) 22, 5329–5339 doi: 10.1111/m

Migration and dispersal may drive to high genetic variation and significant genetic mixing: the case of two agriculturally important, continental hoverflies (*Episyrphus balteatus and Sphaerophoria scripta*)

LUCIE RAYMOND,*†‡ MANUEL PLANTEGENEST† and AUDE VIALATTE*‡

*UMR 1201 DYNAFOR, INRA, F-31320 Castanet Tolosan, France, †Agrocampus Ouest, UMR 1349 IGEPP, F-35042 Rennes, France, ‡UMR 1201 DYNAFOR, Université de Toulouse, INPT-ENSAT, F-31320 Castanet-Tolosan, France

Commercially available aphidophagous hoverflies:

- Migratory species
- Lack of genetic differentiation at the continental scale
- Populations are mixed beyond national borders

Report

Current Biology

Mass Seasonal Migrations of Hoverflies Provide Extensive Pollination and Crop Protection Services

Highlights

- Between 1 and 4 billion hoverflies migrate into and out of southern Britain each year
- These migrants provide important pest control by consuming 3–10 trillion aphids
- They also provide extensive pollination services and long-range pollen transfer

Authors

Karl R. Wotton, Boya Gao, Myles H.M. Menz, ..., Don R. Reynolds, Gao Hu, Jason W. Chapman

Correspondence

k.r.wotton@exeter.ac.uk (K.R.W.), hugao@njau.edu.cn (G.H.), j.chapman2@exeter.ac.uk (J.W.C.)

- Does it make sense to claim national strains for registration?
- Remember: for every day naturally occurring hoverflies are denied registration, quite possibly, harmful pesticides are used instead

biobest SUSTAINABLE CROP MANAGEMENT

Take home messages:

- *Eupeodes corollae*: a new arthropod natural enemy against aphids
- *Eupeodes corollae* & *Sphaerophoria rueppellii*: concurrent provisioning of pest control and pollination
- Combine aphidophagous hoverflies with other natural enemies, e.g., parasitoids, *Aphidoletes aphidimyza,* to optimize aphid control

Production: Laila Khouimi, Thierry Lefebvre, Karim Jerate, Mohamed Nachit, Asmaa Elamrani, Bart Peeters, Ann Bourbon

Product Management: Hanne Steel, Ines De Craecker

R&D: Felix Wäckers, Rob Moerkens, Antonio Robledo, Sten Boonen, Lien De Smedt, Peggy Bogaerts, Ilse Jacobs, Stijn Belinkx, Dominique Swietimang

QC: Lieve Vandendriessche, Cindy Gorrens, Said Id-Boubker

Legal and Regulatory affairs: Sandro Frati, Lotte Renders, Yves Arijs, Felipe Villarroel, Amélie Midthassel

IPM & Pollination Specialists: Neal Ward, Sam Gui, David Abeijón, Ivan Cano, Rocío López, Ward Stepman

Marketing: Lise Verachtert, Kathy Van de gaer

THANK YOU!

tolis.pekas@biobestgroup.com

biobest®
SUSTAINABLE CROP MANAGEMENT