FLiPPER

Introduction and Product Profile

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Bayer and AlphaBio Control partner for the future of agriculture

Our collaboration

To bring more sustainable solutions to growers

Deliver world-class ***innovation in Seeds & Crop Protection***

Pioneer ***sustainable crop protection solutions***

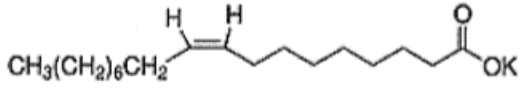
Meet ***requirements of evolving food production***

Unsaturated Carboxylic Acids

(C14 – C20)

Extra virgin olive oil production process by-product:
Olive Acid Oils

FLiPPER Active ingredient processes through 7 stages of purification: separation, distillation, fractionation in a Government Authorized Factory, ISO certified



- ✓ Evaluated by EU as Food Grade Material
- ✓ MRL Testing Exempted
- ✓ Low Risk Substance (EU)

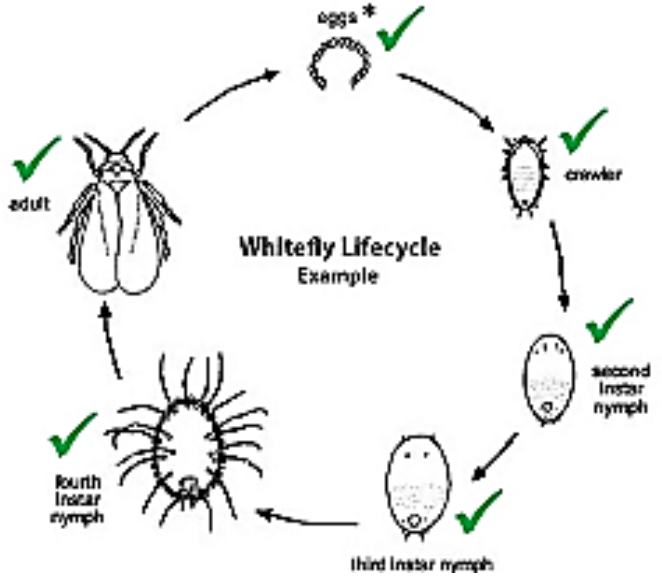
Carboxylic Acids Family

Carboxylic acids with different hydrocarbon chains of 4 – 36 C-atoms, offer different characteristics and uses:

1. **Short Chain Carboxylic Acids:** (Fewer than 6 C-atoms in the chain):
   - // e.g. C4 (Butyric Acid) – pathogenic bacteria control in animal feed.
2. **Medium Chain Carboxylic Acids:** (6 – 12 C-atoms)
   - // e.g. C9 (Pelargonic Acid) used as a herbicide.
3. **Long Chain Carboxylic Acids:** (13 – 21 C-atoms)
   - // Includes control of certain insects and fungal pathogens.
   - // Activity depends on specific carbon chain lengths…
   - // … and number and position of unsaturated carbon bonds
4. **Very Long Chain Carboxylic Acids: (**22 – 36 C-atoms)
   - // e.g. Present in human cell tissue.

FLiPPER controls a broad range of pests and is active at different stages of the pest lifecycle

Pest spectrum



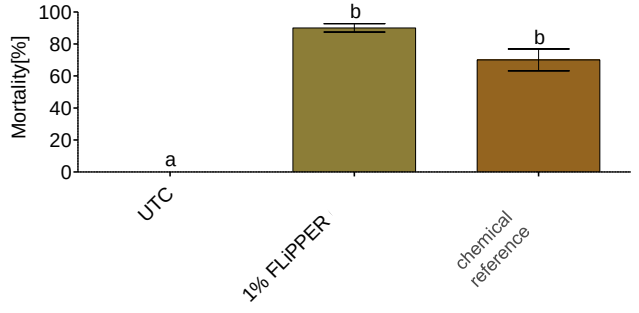
FLiPPER is active following contact with the pest body.

It is active against all stages of insect and mite life-cycles, such as eggs, juveniles, and adults.

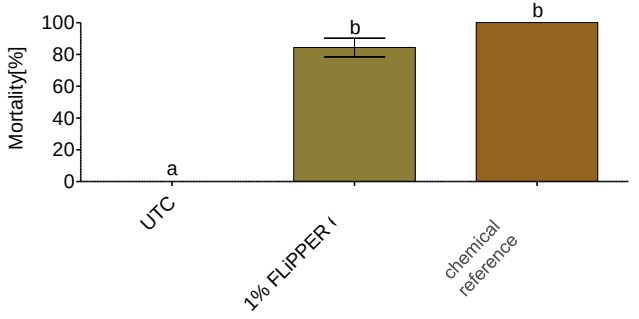
Consistent broad spectrum activity across multiple species

FLiPPER laboratory spectrum comparisons

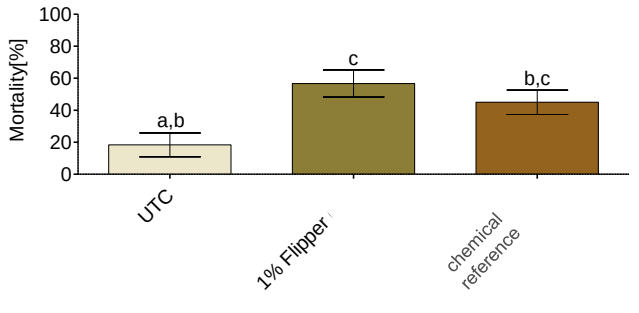
Aphis gossypii *(cotton-melon aphid)*



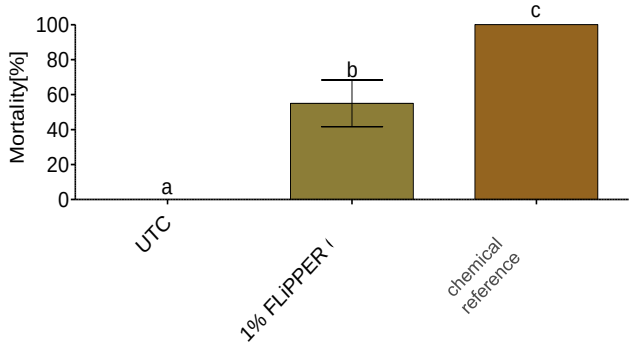
Myzus persicae *(green peach aphid)*



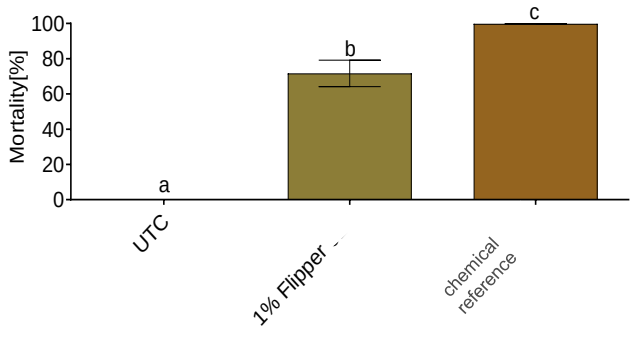
Nezara viridula[1] *(stinkbug)*



Nilaparvata lugens[1] *(brown plant hopper)*



Planococcus citri *(mealybug)*

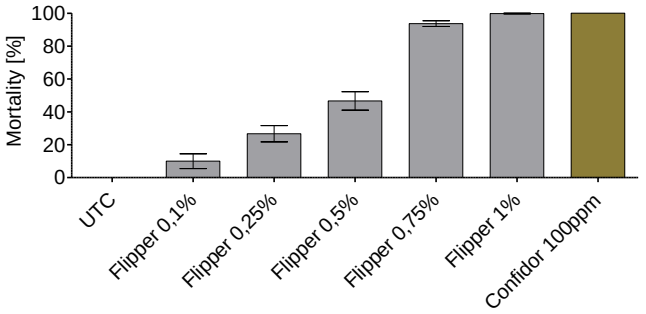


1 not included in the label

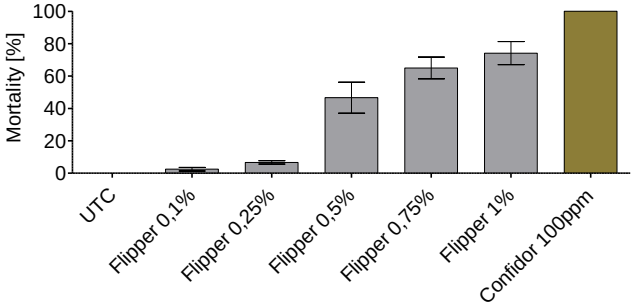
How it works – FLiPPER on different host plants

*Consistent activity on **aphids** across multiple host plants*

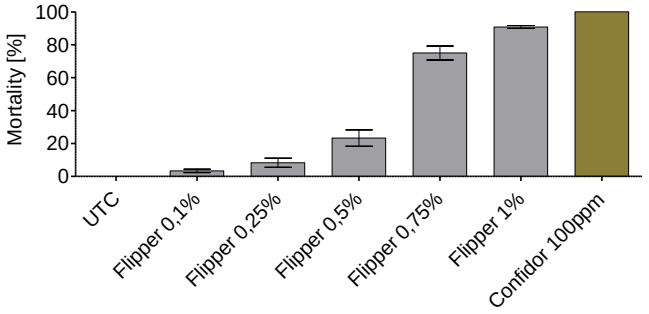
Pepper



Chinese cabbage[1]

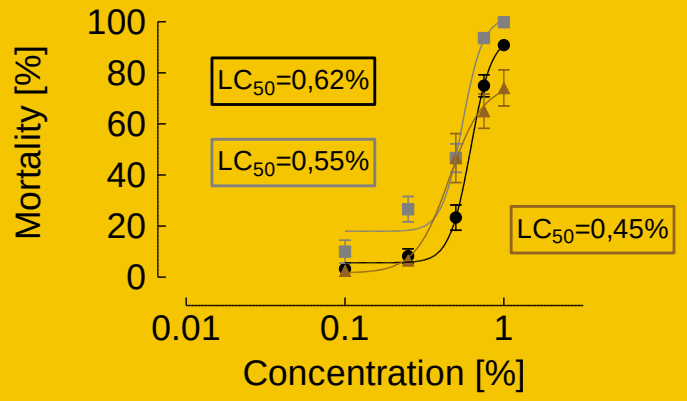


Savoy cabbage[1]



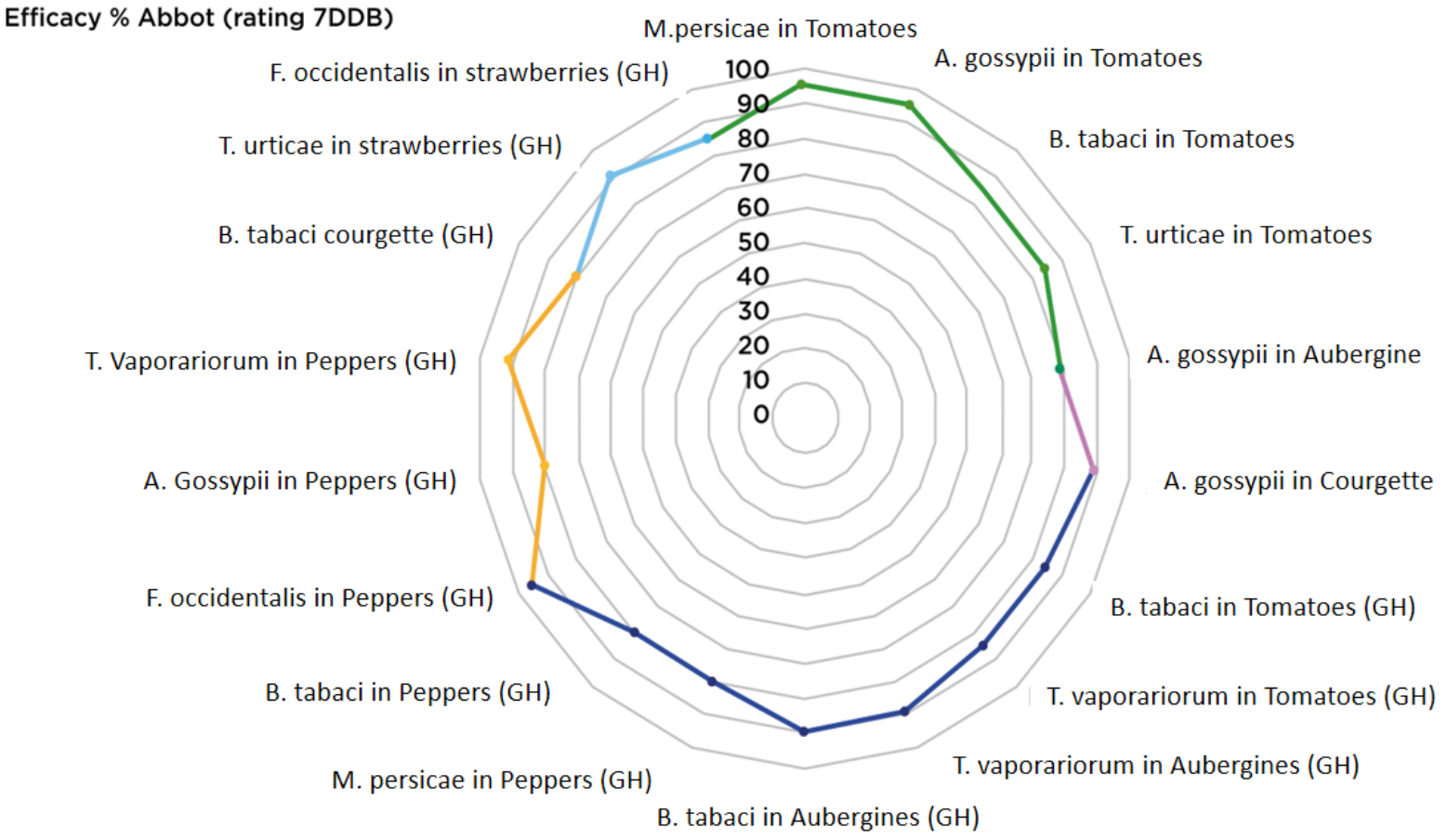
1 ongoing registration under label expansion process

LC_{50} comparison between each host plant



FLiPPER shows consistently high efficacy levels against different species on multiple crops

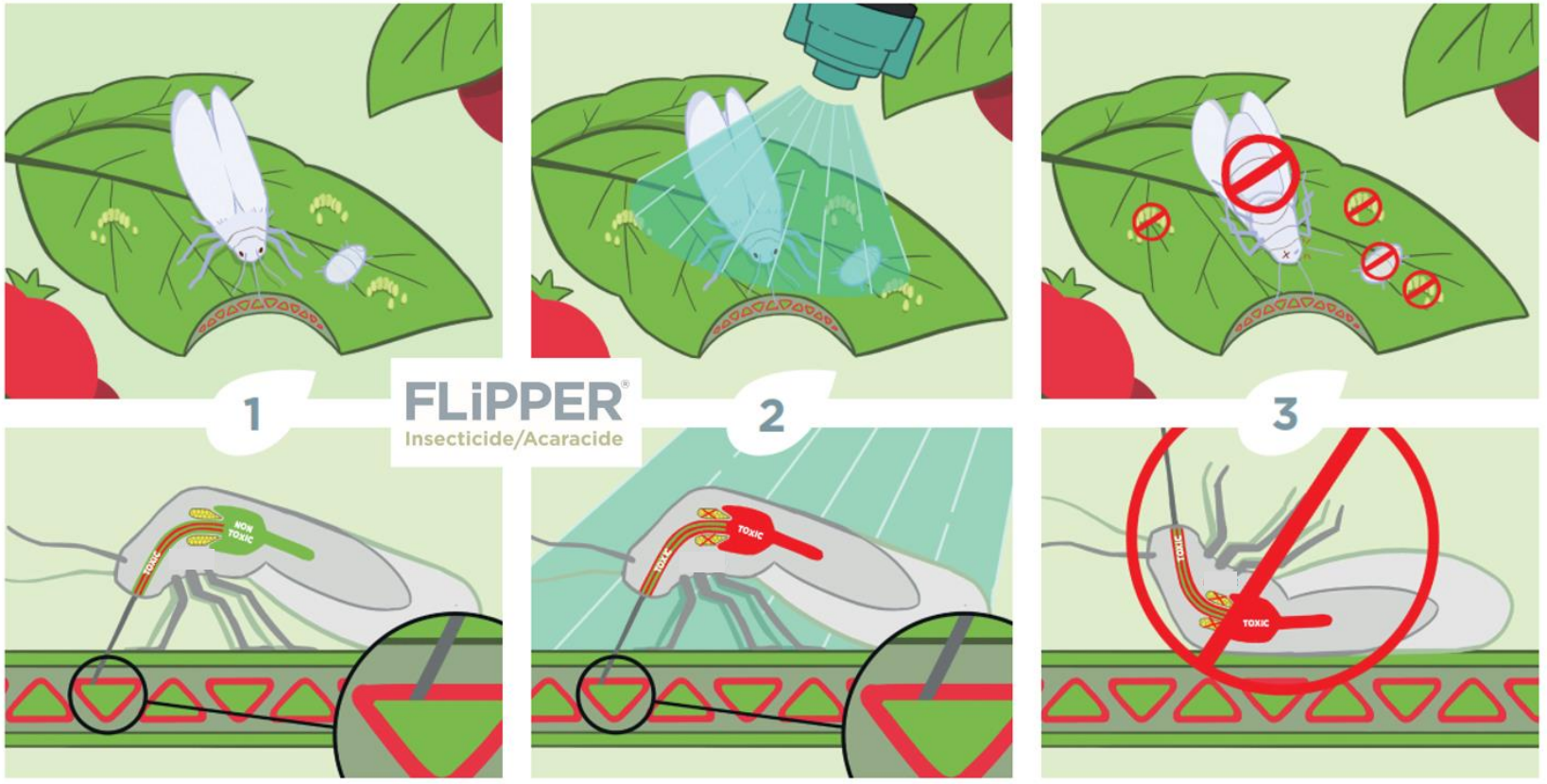
Broad spectrum efficacy



- ***2 applications***
- ***Rates 10 l/ha***
- ***Interval of 7 days***
- ***Combined with beneficials where suitable***

Source: alphabiocontrol

Unique and multi-site mode of action

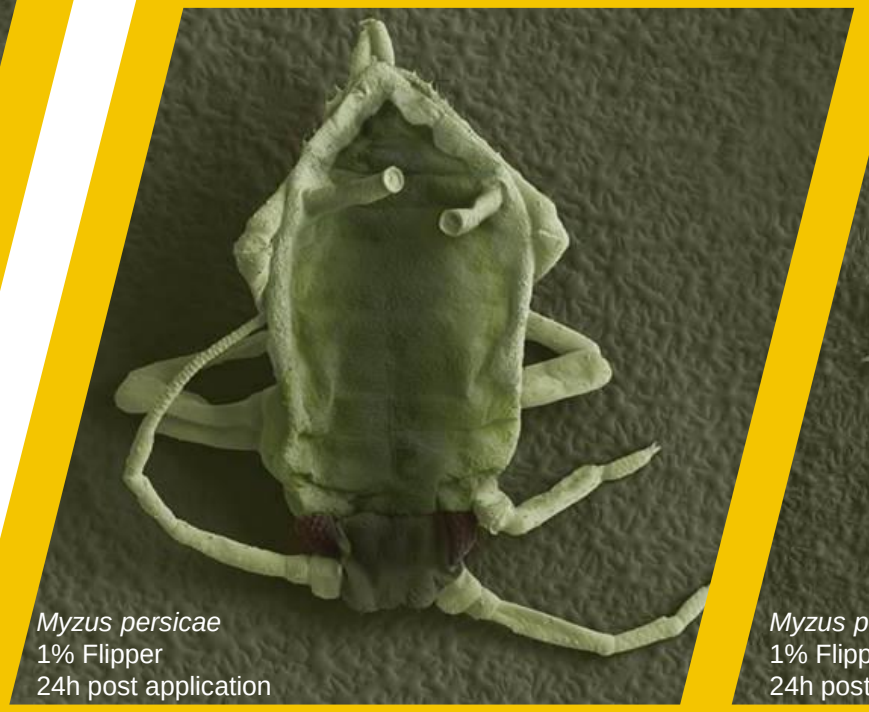


The effectiveness of FLiPPER's active ingredient – Unsaturated Carboxylic Acids (carbon chain lengths C14 – C20) is achieved by the lipophilic carbon chains penetrating the external layers of the target pest. The unsaturated part of the carbon chains interacts with multiple vital metabolic processes. This interferes with feeding activity, resulting in mortality.

How it works – FLiPPER effect on aphids

Visualisation of Mode of action

Myzus persicae
UTC control
24h post water treatment



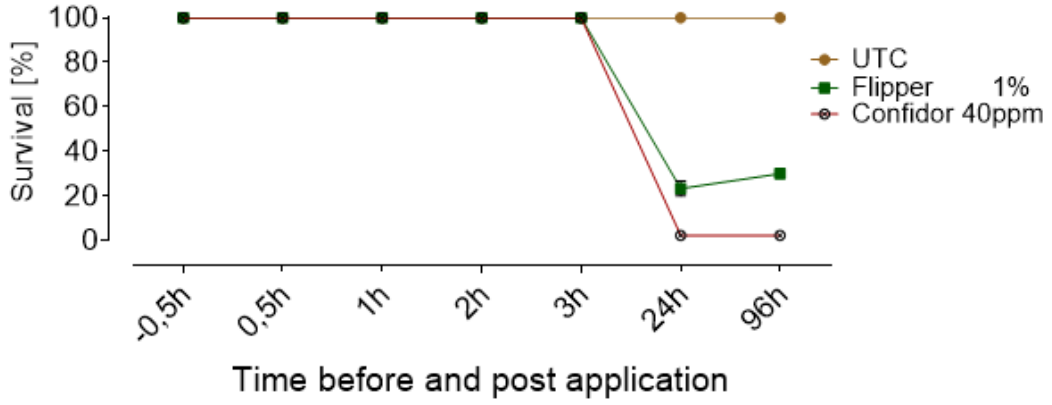
Myzus persicae
1% Flipper
24h post application

Myzus persicae
1% Flipper
24h post application

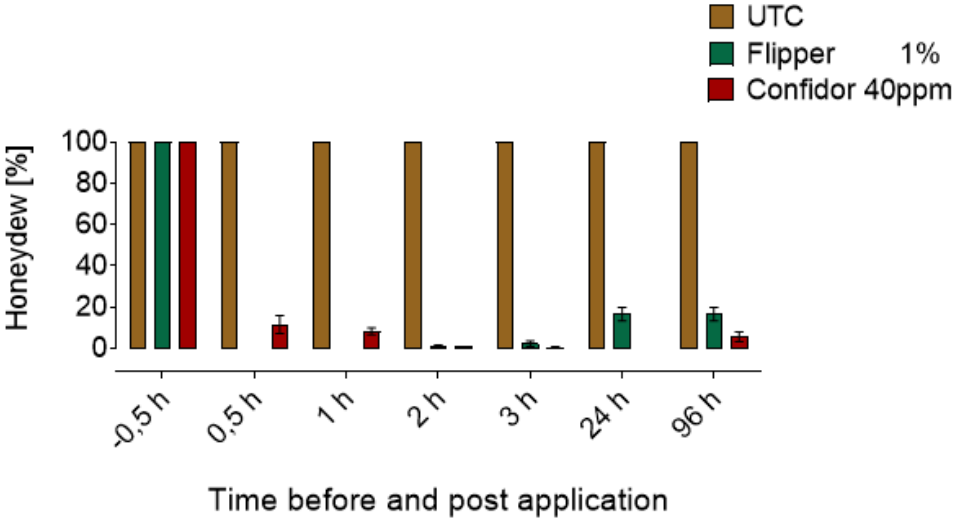
How it works – FLiPPER speed of action comparison

Mortality after 24hs, Fast feeding stop (30 mins)

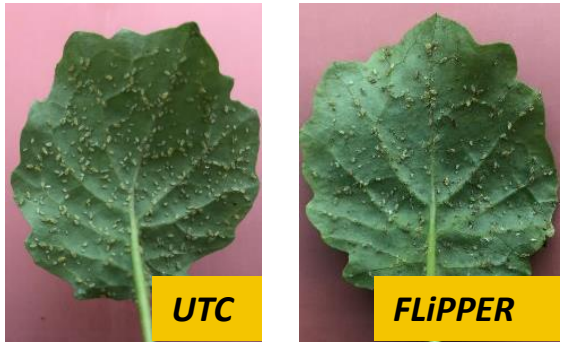
Time until mortality of aphids (Myzus persicae)



Feeding stop of aphids (Myzus persicae)



24 h post application

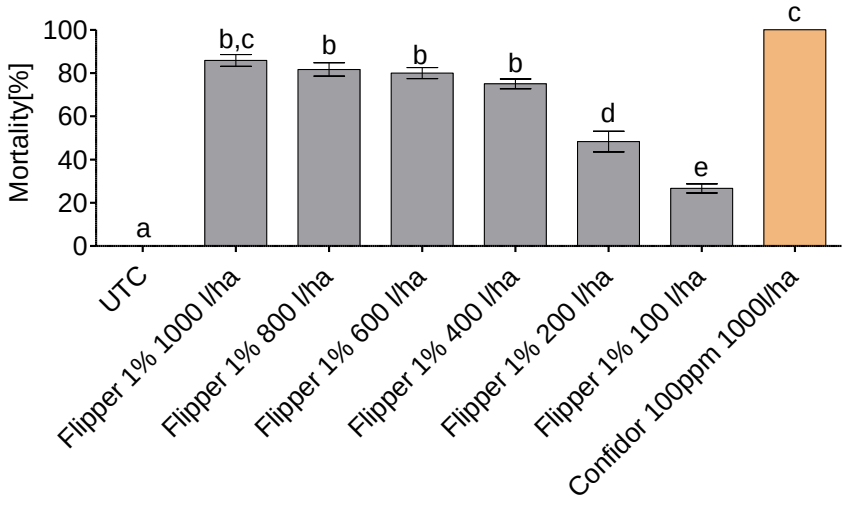


Measurement of honey dew excretion indicates
that feeding stops ~30 mins after FLiPPER treatment

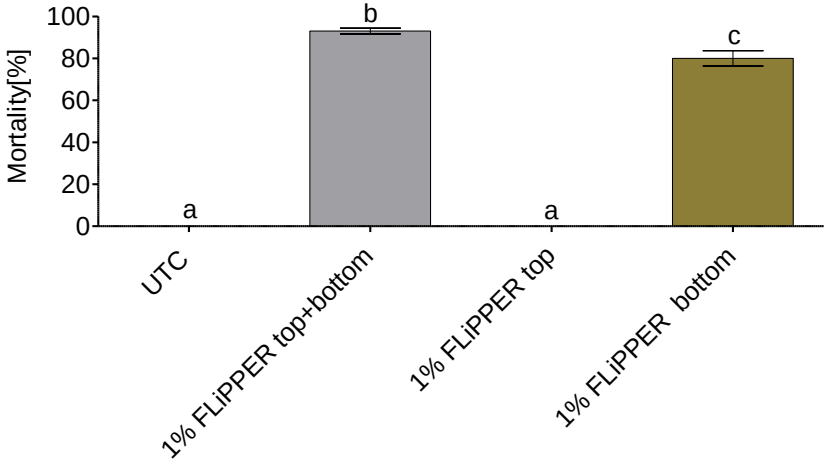
How to use it – FLiPPER application

Contact is important / Spray volume

Aphid mortality at different water volumes



Aphid mortality at different types of spray patterns



FLiPPER is a contact insecticide. Therefore, it is important that the product comes in direct contact with the pest for best results. Use of adequate water volume is important for pest contact/coverage.

FLiPPER needs to reach the plant parts where the pest is actually located. Regarding aphids on the bottom of the leaves, there will be no efficacy, if the product is only sprayed on top of the plant. But good results can be obtained, when the bottom or top+ bottom are sprayed.

It is important to follow some tips for application

How to use it - FLiPPER application

Spray contact with the pest is important

Recommended rate 1L FLiPPER per 100L water = 1% v/v

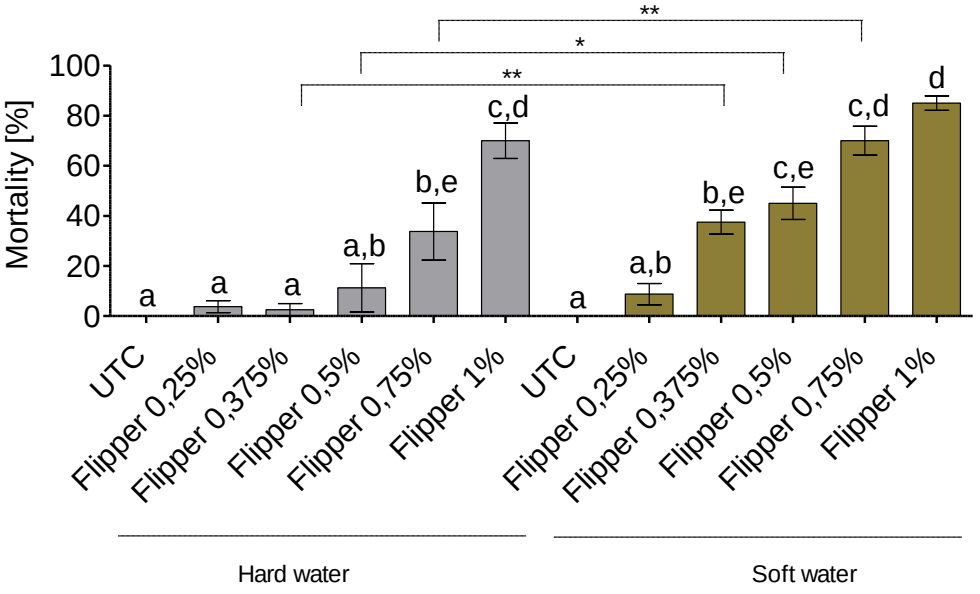
- Apply at the first signs of infestation build-up or founding colonies of aphids.
- Complete wetting of the pest and vegetation, including the rear side of the leaves, avoiding runoff.
- Assess performance 3 days after application, repeat applications, at 7 days after previous application, if required depending on pest pressure.
- Avoid using hard water with a Total Dissolved Solids of >300ppm, where TDS exceeds 300ppm thoroughly soften all spray water prior to the introduction of FLiPPER to the spray solution.

How to use it - FLiPPER application

Product handling – it is important to use non-hard water

Fig. 1 - Flipper diluted with hard (25 °dH) vs soft (0 °dH) water

Efficacy comparison of Hard vs Soft water on aphids



Hard water contains ions of calcium, magnesium and iron. When FLiPPER is mixed with hard water, these ions and FLiPPER together form largely insoluble salts. The resulting solution may be milky and a scum may form. In severely hard waters a heavy precipitate will occur.

These insoluble salts are not available to act as an insecticide and as a result less active ingredient is available in solution.

FLiPPER is soft on Pollinators and Beneficials

Beneficial profile

Honey bees

Bumble bees

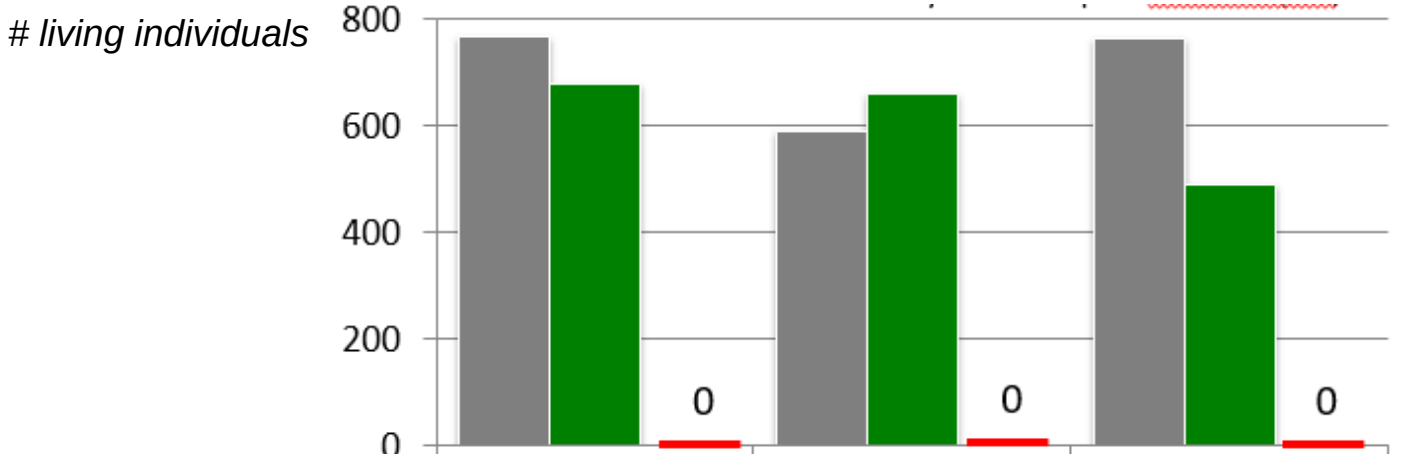
Beneficial insects

Beneficial mites

Low impact on pollinators

Study at IPM Impact Nederhespen, Belgium 2014

Bumble bee (B. terrestris) workers



	Direct Contact	Sugar water ingestion	Pollen ingestion
Untreated	766	590	764
Flipper 1%	679	661	489
Neo nicotinoide	0	0	0

Source:

FLiPPER selectivity on Beneficial Arthopods

Study at IPM Impact Nederhespen, Belgium 2014

PEST GROUP	PEST SPECIES	IOBC rating
Predatory mites	*Amblyseius swirskii*	1
	Amblyseius cucumeris	1
	Macrolophus caliginosus	2
	Encarsia formosa (hatched pupae) – untreated	1
	Encarsia formosa (hatched pupae) – treated	2
	Phytoseilus persimilis	2
Predatory bugs	*Orius levigatus*	1
	Therodiplosis persicae	1
	Cryptolaemus montrouzieri	2
	Delphastus catalinae	2
	Diglyphus isaea	1
Parasitic wasps	*Amblyseius californicus* – eggs	2
	Amblyseius californicus – nymphs	1
	Amblyseius californicus – adults	1
	Aphidius colemani – mummies	2
	Aphidius colemani – hatched mummies	1

IOBC Rating
1 = Harmless or only slightly harmful <25% mortality

2 = Moderately harmful 25-50% mortlity

FLiPPER is a low risk food grade material

Sustainable Profile

- Naturally occurring compound
- Submitted as low risk PPP (according to EU Art. 47 1107/2009)
- Full sourcing and production chain for FLiPPER's active ingredient has been formally evaluated by EU regulatory processes
- Conclusion of this evaluation that the active ingredient in FLiPPER is of Food Grade Material
- FLiPPER is therefore exempt from EU MRL testing requirements.

A fully sustainable product from sourcing and production to application and food chain

2015 trial in NLD for thrips in leeks

Photo 8. Plot 4, untreated with thrips damage, 5 October 2015.

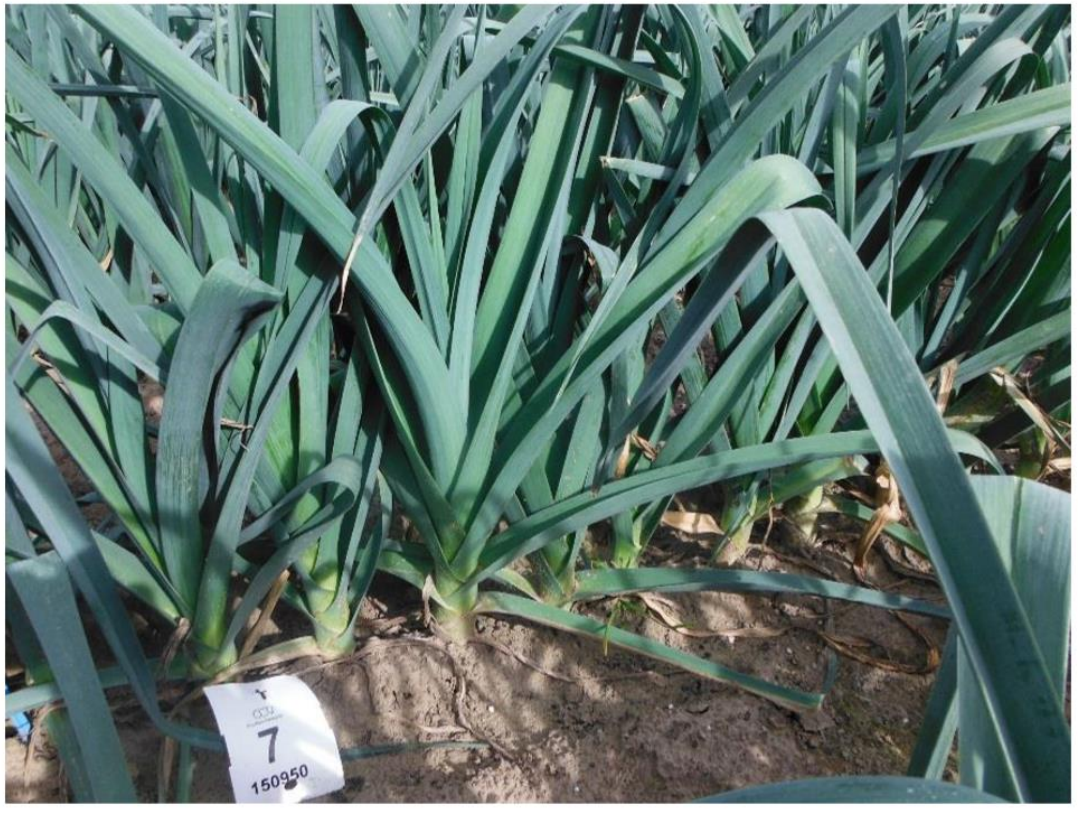


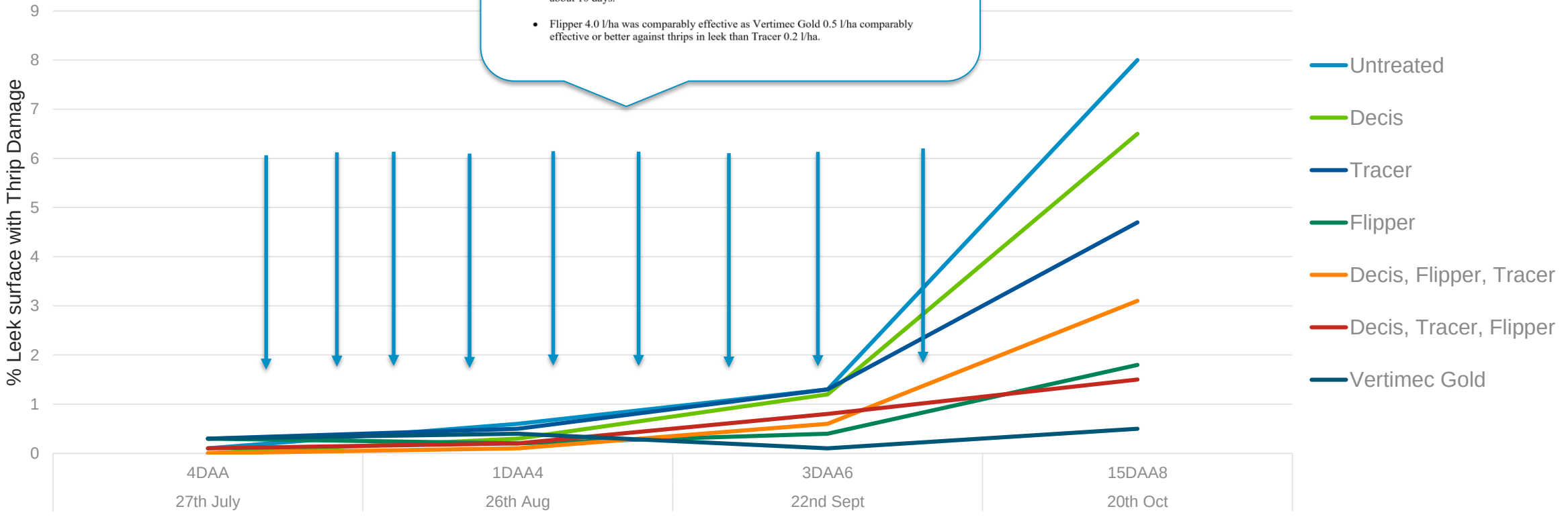
Photo 9. Plot 7, Flipper with no visible thrips damage, 5 October 2015.

Results - Flipper @1% equivalent to tracer

4. CONCLUSIONS

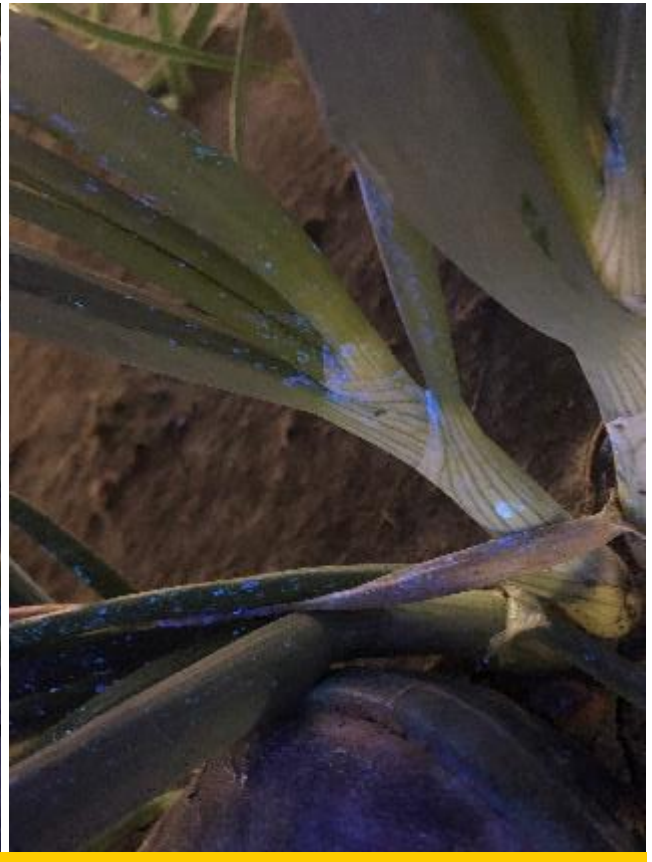
Based on the results of trial 150950 against thrips in leek in the Netherlands in 2015 the following valid conclusions can be drawn:

- Flipper 4.0 l/ha and Vertimec Gold 0.5 l/ha controlled trips damage in leek significantly in comparison with untreated and Decis EC at an application interval of about 10 days.
- Flipper 4.0 l/ha was comparably effective as Vertimec Gold 0.5 l/ha comparably effective or better against thrips in leek than Tracer 0.2 l/ha.

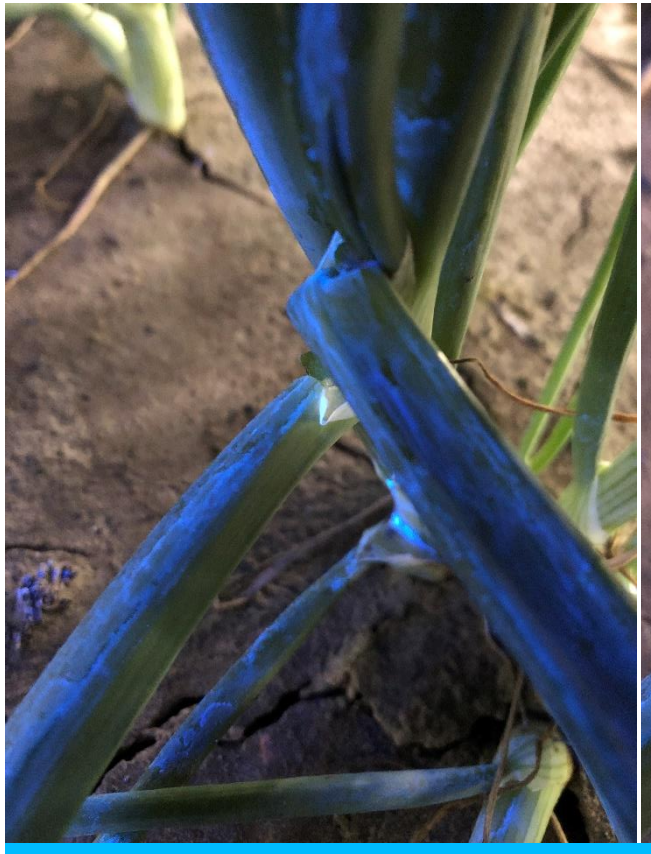


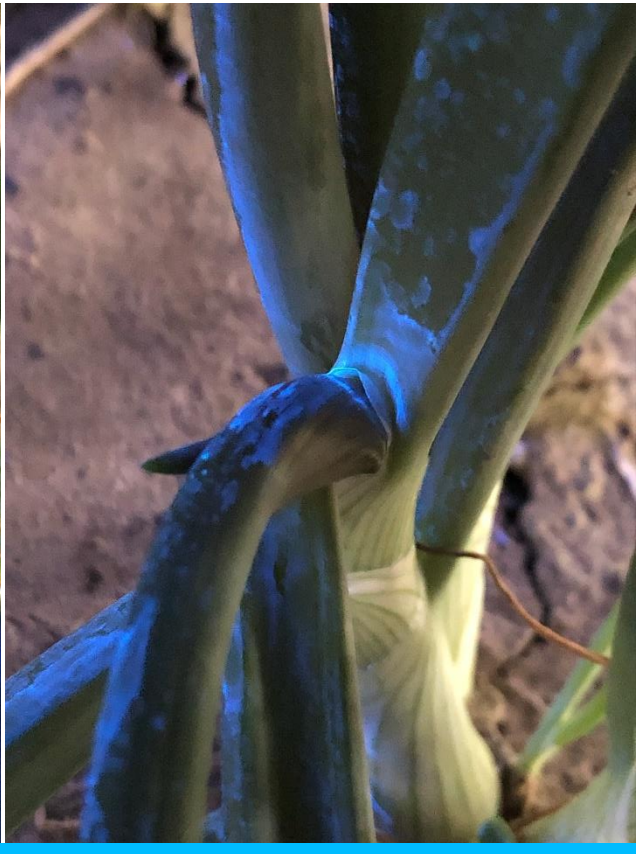
NLD Application studies

Application technology: biologicals often require more attention due to only contact activity



150 L/ha



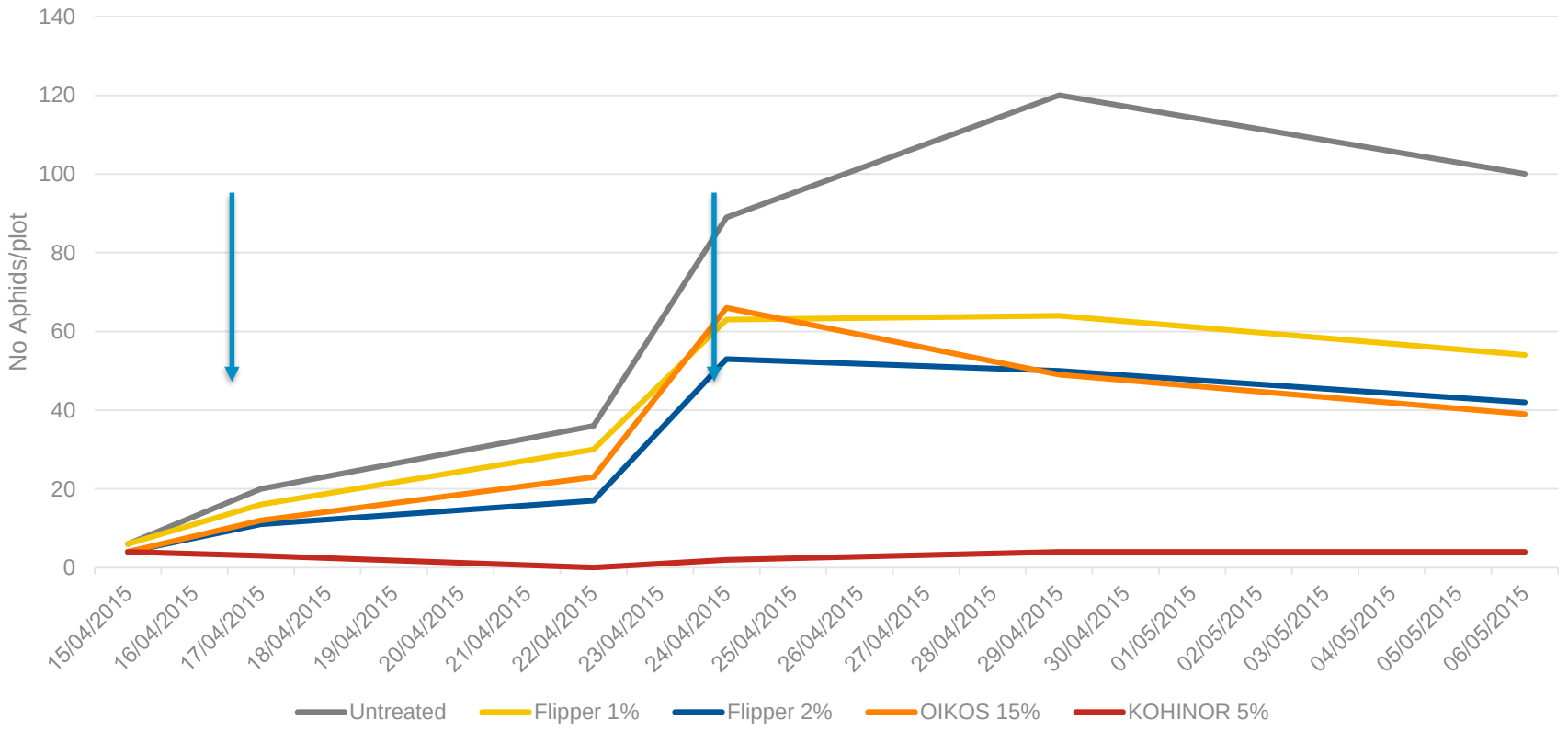


600 L/ha

Fruiting Vegetables Control of Aphids Trials Summary

Pest	Crop	No of Trials	No of applications	Dose Rate	Efficacy Range	Other comments
Myzus persicae	Tomato Outdoor	4	2	1%	65%-85%	
Myzus persicae	Solanaceae Protected	3	2	1%	60%-80%	early application, low volume in trials
Myzus persicae	Cucumber Protected	1	2	1%	60%-80%	too late application trial
Aphis gossypii	Solanaceae Outdoor	3	2	1%	65%-85%	
Aphis gossypii	Cucumber Protected	4	2	1%	60%-80%	
Aphis gossypii	Melon Outdoor	5	2	1%	65%-85%	
Aphis gossypii	Zucchini Outdoor	4	2	1%	65%-85%	

Aphids in Lettuce, Italy. Trial 1



Products were applied twice on 15th and 22nd April 2015 and the water volume applied was 750 l/ha. Trial conducted by Agroblu in 2015.
Sp. Nasonovia ribisnigri *AB15003IT01. Assessed 15/04/2015 17/04/2015 22/04/2015 24/04/2015 29/04/2015*

Trials for the control of whitefly

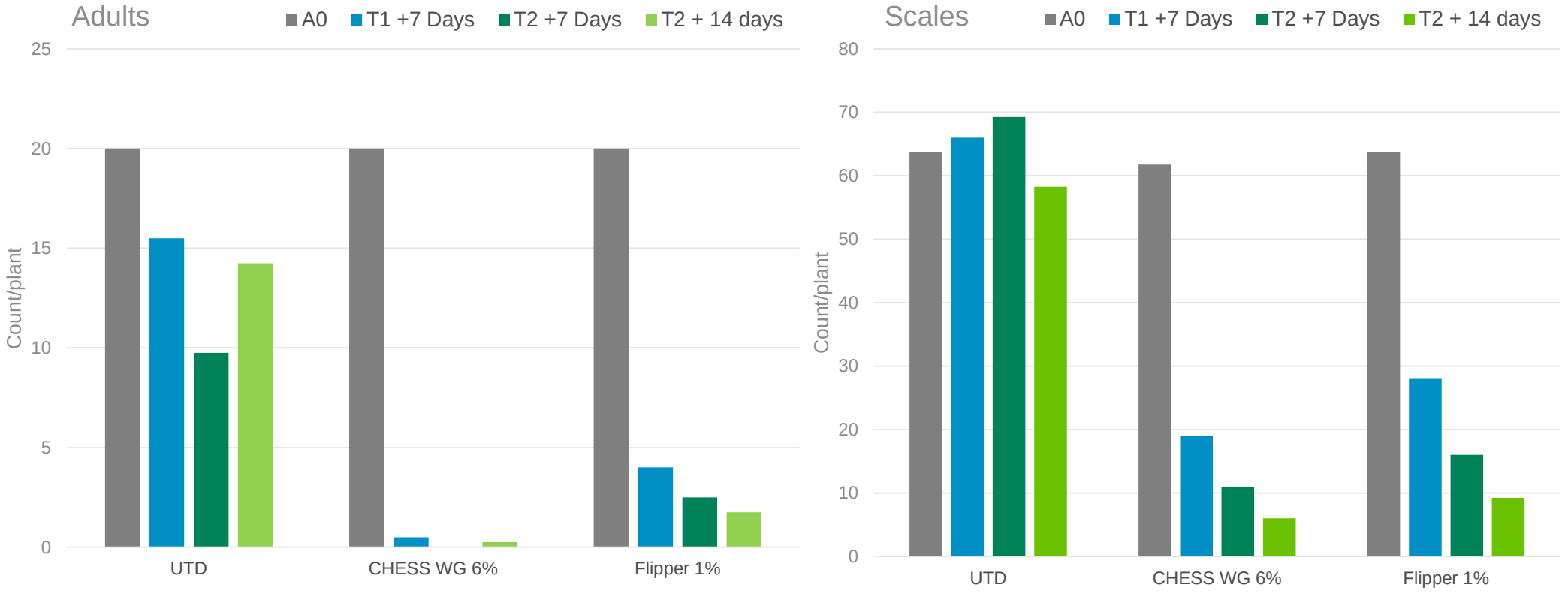
Effect of Flipper on whitefly

YEAR	SOURCE	COUNTRY	LOCATION	FIELD	CROP	PEST	ASSESS	STAGE	% CONTROL
2010	**Dow**	**ITALY**	**SICILIA Santa Croce Camerina (RG)**	**GREENHOUSE**	**EGGPLANT**	**TRIAVA**	**T2+7**	**Nymph**	**90,7**
2010	**Dow**	**ITALY**	**EMILIA-ROMAGNA Vaccolino FE**	**OPEN FIELD**	**EGGPLANT**	**TRIAVA**	**T2+7**	**Nymph**	**67,6**
2011	**Dow**	**ITALY**	**LAZIO Sabaudia LT**	**GREENHOUSE**	**CUCUMBER**	**TRIAVA**	**T2+6**	**Motile**	**89,3**
2011	**Dow**	**ITALY**	**CAMPANIA Parete CE**	**GREENHOUSE**	**EGGPLANT**	**BEMITA**	**T2+7**	**Nymph**	**64,0**
2011	**Dow**	**ITALY**	**PUGLIA Zapponeta FG**	**GREENHOUSE**	**EGGPLANT**	**BEMITA**	**T2+7**	**Motile**	**92,6**
2011	**Dow**	**ITALY**	**LAZIO Fondi LT**	**GREENHOUSE**	**TOMATO**	**BEMITA**	**T2+7**	**Motile**	**60,4**
2011	**Dow**	**ITALY**	**LAZIO Fondi LT**	**GREENHOUSE**	**ZUCCHINI**	**BEMITA**	**T2+7**	**Nymph**	**69,4**
2011	**Dow**	**ITALY**	**PUGLIA Giovinazzo BA**	**GREENHOUSE**	**ZUCCHINI**	**TRIAVA**	**T2+7**	**Nymph**	**60,7**
2011	**Dow**	**ITALY**	**PUGLIA Mesagne BR**	**OPEN FIELD**	**TOMATO**	**BEMITA**	**T2+7**	**Motile**	**86,5**
2012	Others	GREECE	Dionisou (Chalkidiki), Central Macedonia	GREENHOUSE	TOMATO	BEMITA	T2+7	Nymph	87,0
2012	Others	ITALY	LAZIO Anzio (RM)	GREENHOUSE	TOMATO	BEMITA	T2+7	Nymph	69,0
2012	Others	FRANCE	Etoile sur Rhone (Drome)	GREENHOUSE	TOMATO	TRIAVA	T1+7	Motile	90,0
2012	Others	FRANCE	Mauguio (Hérault)	GREENHOUSE	TOMATO	TRIAVA	T3+4	Adults	66,0
2012	Others	ITALY	LAZIO Sperlonga (LT)	GREENHOUSE	TOMATO	TRIAVA	T2+14	Adults	70,0
2012	Others	ITALY	LAZIO Fondi LT	GREENHOUSE	TOMATO	TRIAVA	T3+7	Adults	68,9
2012	Others	SPAIN	Torellano (Alicante), Comunidad Valenciana	GREENHOUSE	TOMATO	TRIAVA	T2+7	Nymph	85,2
2012	Others	SPAIN	Elche (Alicante), Comunidad Valenciana	GREENHOUSE	TOMATO	TRIAVA	T2+7	Nymph	58,0
2015	Others	SPAIN	Finca La Rambla - Gualchos	GREENHOUSE	CUCUMBER	BEMITA	T3+7	Adults	64,7
2015	Others	SPAIN		GREENHOUSE	TOMATO	BEMITA	T2+7	Nymph	60,0
2016	Others	ITALY	SICILIA Scoglitti RG	GREENHOUSE	TOMATO	BEMITA	T2+7	Adults	68,3
2016	Others	ITALY	LAZIO Sperlonga (LT)	GREENHOUSE	TOMATO	TRIAVA	T2+7	Adults	78,6

OVER 70% EFFICACY WITH 2 APPLICATIONS AT 1%. ALL STAGES CONTROLLED SOLANACAE & CUCURBITACAE GH & OF.

STC TRIAL – WHITEFLY CONTROL Lab conditions

2 applications 8 days apart - 4th Oct and 12th Oct 2017.



FLiPPER Summary

Innovative

Range of crops

Safe to Pollinators & Beneficial arthropods

No MRL

No PHI

High level of Efficacy

Minor crops

Sole or in tank mix

No Resistance

No Re-Entry restrictions

Registered across EU

Use during Flowering

Approved for Organic farming

Plant based

No phytotoxicity

The Small Print

FLiPPER contains fatty acids C7-C20. Decis contains deltamethrin. Tracer contains spinosad. Chess contains pymetrozine. Confidor contains imidacloprid. Vertimec Gold contains abamectin. Confidor and Decis are Trade Marks of Bayer. FLiPPER is a registered Trade Mark of AlphaBioPesticides Limited. All brands listed may be Trade Marks of other manufacturers and proprietary rights may exist.

Use plant protection products safely. Always read the label and product information before use. Pay attention to the risk indications and follow the safety precautions on the label.

For further information, please visit www.cropscience.bayer.co.uk or call Bayer Assist on 0808 1969522

Thank You!