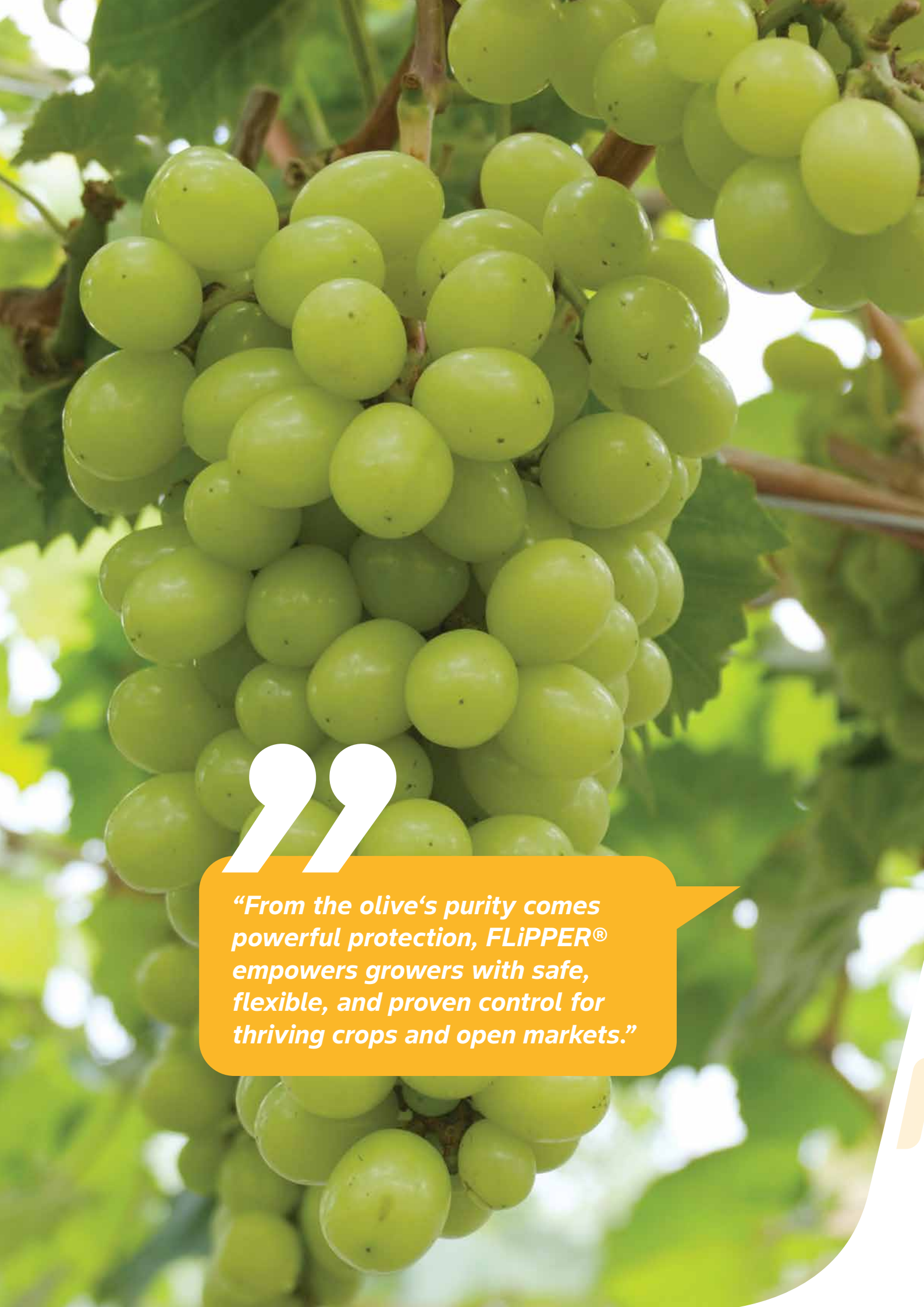
FLiPPER®

Technical Guide

BIOLOGICALS by Bayer

FLiPPER®

BAYER



“From the olive‘s purity comes powerful protection, FLiPPER® empowers growers with safe, flexible, and proven control for thriving crops and open markets.”

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FLiPPER®
BENEFITS – OVERVIEW

FLiPPER® is an innovative bioinsecticide derived from the natural by-product of extra virgin olive oil, which controls a broad spectrum of insects. It offers growers a wide range of benefits when producing their crops:

No residue concerns
/// Biological solution with no residue worries – whenever you apply.
/// Exempt from EU MRL testing, supporting export compliance.

Zero pre-harvest interval
/// No PHI – spray close to harvest with total flexibility.
/// Simplifies harvest planning with no waiting period.

Strong fit for resistance management
/// No known resistance or cross-resistance.
/// A reliable partner in resistance management programmes.

Low-risk profile
/// Safe for people, crops, and the environment.
/// Gentle on beneficials and pollinators.
/// Ideal for IPM programmes.

INTRODUCTION

FLiPPER® is the result of two decades of research. It is an innovative bioinsecticide formulation based on an active substance entirely obtained from olive oil; a specific and unique range of unsaturated carboxylic acids (C14–C20). The product is registered as a Plant Protection Product in many EU & non-EU countries. It is safe for users, selective for crops, pollinators and beneficial arthropods and is exempt from EU Maximum Residue Limit, as well as USA & Canada import tolerance.

Nature offers many opportunities to provide low impact crop protection solutions. But delivering dependable, sustainable solutions that come entirely from the natural world and which can be used reliably in commercial agriculture is not easy to achieve.

Carboxylic acids are naturally occurring organic compounds that contain a carboxyl group (carbon, oxygen and hydrogen). They occur widely and can be derived from many different sources. They are properly defined by the number of carbon atoms they contain and are grouped as follows:

- Short chain carboxylic acids: (Fewer than 6 carbon atoms) e.g. Butyric Acid (C4), a biocide used to control pathogenic bacteria in animal feed.
- Medium chain carboxylic acids: (6–12 carbon atoms) e.g. Pelargonic Acid (C9), used as herbicide and plant desiccant.
- Long chain carboxylic acids: (14–20 carbon atoms) Various acids of insecticidal and fungicidal character. Activity depends on specific chain length and position of unsaturated bonds.
- Very long chain carboxylic acids: (21–36 carbons) Present in human cell tissue.

RENEWABLE & SUSTAINABLE CROP PROTECTION

We have taken a scientific approach towards the study and understanding of the molecular behaviour and activity of plant-derived carboxylic acids. The conclusion of this work is a detailed understanding of the functionality of each of the different carbon chain lengths and the optimum source and method of extraction. The source of **FLiPPER®**'s active ingredient is both sustainable and renewable.

FLiPPER® contains a specific group of unsaturated carboxylic acids within the C14–C20 range, whose selection has been optimised for insecticidal activity. De Sangosse S.A.S requires that each batch of **FLiPPER®**'s active ingredient meets the required specifications and thus the insecticidal activity is ensured.

MODE OF ACTION

FLIPPER® FOLIAR INSECTICIDE – MODE OF ACTION

As a biological, contact insecticide, **FLiPPER®** requires direct contact with the target insects to be effective.

The effectiveness of the active ingredient, its carboxylic acids (C14 – C20), is achieved by the lipophilic carbon chains penetrating the external layers of the target pest and gaining access to the cell membrane. Once inside the cell, the unsaturated part of the carbon chains enables binding with a number of vital cell components, affecting membrane fluidity. This disrupts essential cellular functionality, interferes with feeding activity in phytophagous insects and results in rapid mortality.

LABELLED ACTIVE INGREDIENT

FLiPPER® is authorised for use as a plant protection product insecticide. The active ingredient consists of a defined combination of unsaturated long-chain carboxylic acids (C14–C20), selected for insecticide activity. To ensure solubility in water, the unsaturated carboxylic acids are formulated with potassium hydroxide to form potassium salts.

CHEMICAL PROPERTIES	
Name of Active Substance	Unsaturated carboxylic acids (C14–C20) potassium salts
Chemical Group	Natural occurring carboxylic acids of vegetal origin
Active Substance Content (pure)	479.8 g/ℓ 47.8 % w/w
Chemical Formula (main carboxylic acid)	$C_{18}H_{33}O_2^-$

FORMULATION

NATURAL CHEMISTRY FROM A CERTIFIED PRODUCTION PROCESS

The extraction and production processes for **FLiPPER®**'s active ingredient are purely physical processes. No addition of chemicals is involved. The raw material is the by-product redundant from the production process for extra virgin olive oil.

Olives are obtained from within the Mediterranean region. Each batch must meet stringent quality standards and specifications to ensure conformity.

Both the extraction of the unsaturated carboxylic acids and the production of the formulated product are carried out at facilities certified by the authorities. Extraction is the result of an ISO Quality Controlled process of multi-stage distillation and fractionation. Formulation and packaging processes are also ISO Quality controlled.

NO IMPURITIES OR CROSS-CONTAMINATION

Each batch of active ingredient is analysed to ensure the component composition meets the defined specification and is fully compliant with regulatory approvals. The content of selected unsaturated carboxylic acids is not less than 90 % w/w. The balance is made up of non-active saturated carboxylic acids whose presence is approved (but which do not contribute to the insecticidal activity) and whose removal during the refinement process is not economically viable. No impurities are formed during the manufacturing process.

Each batch of formulated product is analysed to confirm that no cross-contamination has occurred during the production process.

FOOD GRADE MATERIAL

The technical active ingredient contains unsaturated carboxylic acids (C14–C20) of natural vegetal origin. These are essential dietary components for living organisms and play a fundamental role in human metabolism.

The complete sourcing supply chain and production processes for the active ingredient have been evaluated by EU Regulatory authorities whose formal conclusion was that the active ingredient in **FLiPPER®** is of Food Grade Material and is therefore exempt from EU MRL testing requirements.

LOW RISK SUBSTANCE

FLiPPER®'s active ingredient has been listed as a Low Risk Substance.

STORAGE STABILITY

The formulated product has a minimum shelf life of two years from the date of manufacture when stored under normal warehouse conditions; refrigeration is not necessary. Shelf-life stability studies have been completed in various environmental conditions, including those where temperatures and humidity are high and not controlled, as well as under freeze-thaw conditions.

PHYSICAL PROPERTIES	
Description at Standard Conditions	Liquid, colour clear light yellow / pale amber
Formulation Type	Emulsion, oil in water (EW)
Odour	Characteristic, slight and no unpleasant odour
Solubility in Water	1.46 mg/ℓ at 20 °C, pH 7 ** 13.3 mg/ℓ ***
Vapour Pressure	3.35 x 10^{-3} Pa at 20 °C ** 2.43 x 10^{-10} Pa at 25°C ***
Coefficient Partition Octanol / Water	$K^{o/w}$: Log Pow at pH 7: > 4.29
pH	Concentrated formulated product: pH 8.8 at 20 °C Spray solution 1 % v/v: pH 10.2 at 20 °C in de-ionised water
Stability	Storage stability: at least 2 years at room temperatures[1] No significant hydrolysis or photolysis
Emulsifiability	Good dilution stability, emulsification, and emulsion stability
Safety	Not explosive Not oxidising Not flammable

[1]Storage below 10 °C may cause crystallisation to occur. This is completely reversible and will not affect the effectiveness of the product. | *** (a.s. not in form of salt)* | ***** (main component)*

TOXICOLOGY AND ECOTOXICOLOGY

TOXICOLOGICAL PROPERTIES OF FLiPPER®

***FLiPPER®** has a very low toxicity profile.*

It is not mutagenic, carcinogenic or neurotoxic and does not have reproductive effects. None of the components are included in NTP, IARC or OSHA list of carcinogenic substances. Exposure is of low concern and the product is easily managed with standard label precautions. **FLiPPER®**'s active substance is not included in the EU list as a candidate for substitution. Co-formulants included in the product are also not included in the EU list of unacceptable co-formulants.

TOXICOLOGICAL DATA					
Property	**Target**	**Parameter**	**Assessment time**	**Endpoint or outcome**	**Unit of measure**
Oral	Rat male / female	LD_{50}	14 days	> 5050	mg/kg bw
Dermal	Rat male / female	LD_{50}	14 days	> 2020	mg/kg bw
Inhalation	Rat male / female	LD_{50}	14 days	> 2.15	mg/ℓ air
Dermal irritation	Rabbit			Non-irritant	
Eye irritation	Rabbit				
Skin sensitisation	Guinea pig male / female	Modified Buehler method		Non-sensitising	

OPERATOR SAFETY

FLiPPER® is a safe product when applied according to the use recommendations reported on the label. Workers can safely enter the **FLiPPER®**-treated crop areas, fields or glasshouses once the spray-film on the vegetation has dried.

ENVIRONMENTAL PROFILE OF FLiPPER®

FLiPPER® contains naturally occurring compounds of plant origin. Soil has a natural background concentration of long-chain carboxylic acids derived from plant metabolism and microbial action. Long-chain carboxylic acids such as those present in **FLiPPER®** are part of the normal daily diet of mammals, birds and invertebrates. **FLiPPER®** does not have acute toxicity effects to non-target organisms and is rapidly biodegraded. Use of **FLiPPER®** is very unlikely to lead to concentration thresholds that are of concern.

TOXICOLOGICAL DATA					
Property	**Target**	**Parameter**	**Exposure system**	**Endpoint**	**Unit of measure**
Acute toxicity – Fish	*Salmo gairdnerii*	LD_{50}	96 hrs (static)	8.79 (nom)	mg a.s./ℓ
Acute toxicity – Daphnia	*Daphnia magna*	EC_{50}	48 hrs (semi-static)	12.4 (nom)	mg a.s./ℓ
Acute Toxicity – Green Algae	*Pseudokirchneriella subcapitata*	Biomass E_yC_{50}	72 hrs (static)	1.02	mg a.s./ℓ
		Growth rate E_rC_{50}	72 hrs (static)	3.11	mg a.s./ℓ
Birds	*Anas platyrhynchos*	LD_{50}	14 days	>1268	mg a.s./kg bw
Honey bees	*Apis mellifera*	Contact LD_{50}	48 hrs	>448	µg a.s./bee
		Contact LD_{50}	48 hrs	>448	µg a.s./bee
Bumble bees	*Bombus terrestris*	Contact	IOBC	1	No significant impact

FATE AND BEHAVIOUR IN THE ENVIRONMENT

FLiPPER® is rapidly degraded in soil as a source of carbon by soil micro-organisms. The DT50 values for soil, water and air range from 2 to 28 hours and therefore **FLiPPER®** has no persistence in the environment. Metabolisation of the active substance produces naturally occurring substances with shorter carbon chains, which are finally degraded by microflora. Fatty acids are ubiquitous in the environment and are part of the natural diets of all animals. **FLiPPER®** does not bioaccumulate. Mobility in soil is limited and the use of **FLiPPER®** as per the label recommendations does not present any substantial risk for groundwater and surface water. There is no risk of soil persistence for following or adjoining crops even after frequent applications of **FLiPPER®**.

EFFECT OF FLiPPER® ON BENEFICIAL ORGANISMS AND POLLINATORS

The use of **FLiPPER®** presents a minimal risk to beneficial arthropods or pollinators when applied according to the label recommendations.
After application of **FLiPPER®**, once the spray-film has dried, beneficial organisms and pollinators can be introduced without any risk to the population. When an established population of beneficial organisms is already present at the time of application, **FLiPPER®** applied at standard rates does not cause an unacceptable reduction to beneficial arthropod populations. In this case, many beneficials evade spray treatment thanks to their behaviour and mobility but those exposed to **FLiPPER®** also survive in large numbers.

BENEFICIAL ARTHROPODS AND POLLINATORS PRESENT IN CROP CULTIVATION

According to residual activity, laboratory trials, with application rates at 5-8 times higher than the labelled rates did not cause statistically significant mortality or reproductive effects for *Typhlodromus pyri, Aphidius rhopalosiphi* and *Chrysoperla carnea*. The selectivity of **FLiPPER®** has been confirmed for a list of beneficial insects and mites in lab and semi-field tests according to IOBC scale assessments.

Beneficial Organism Type	Beneficial Organism Species	Target of Beneficial Species	Test Results (FLiPPER® 1% v/v)
Parasitoid	*Aphidius colemani* (hatched mummies)	Aphids	IOBC 1[1]
	Diglyphus isaea	*Liriomyza* spp.	IOBC 1[1]
	Encarsia formosa (hatched pupae)	Whiteflies	IOBC 1–2[1]
	Lysiphlebus spp.	Aphids	IOBC 1[1]
	Trichogramma sp. (protected stage)	Lepidoptera	IOBC 1[1]
Predatory beetle	*Cryptolaemus montrouzieri*	Mealybugs	IOBC 2[1]
	Delphastus catalinae	Whiteflies	IOBC 2[1]
Predatory bug	Anthocoris nemoralis	*Psyllids*, others	IOBC 1–2[1]
	Macrolophus caliginosus	Whiteflies, *Tuta absoluta*	IOBC 2[1]
	Nesidiocoris tenuis	Whiteflies, *Tuta absoluta*	IOBC 2[1]
	Orius laevigatus	Thrips, others	IOBC 1–2[1]
Predatory gall midge	*Aphidoletes aphidimyza*	Aphids	IOBC 1[1]
	Feltiella acarisuga	Spider mites	IOBC 1[1]
Predatory mite	*Amblyseius californicus* (adults, nymphs)	Red spider mites, *Tarsonemidae* mites	IOBC 1[1]
	Amblyseius montdorensis	Thrips, whiteflies	IOBC 1[1]
	Amblyseius swirskii	Thrips, whiteflies, spider mites	IOBC 1[1]
	Kampimodromus aberrans	Spider mites, *Tarsonemidae* mites	IOBC 2[1]
	Neoseiulus cucumeris	Thrips, spider mites	IOBC 1[1]
	Phytoseiulus persimilis	Spider mites	IOBC 1–2[1]
	Typhlodromus pyri	Spider mites, *Tarsonemidae* mites	IOBC 1–2[1]

1 IOBC toxicity classification according to studies conducted at IPM Impact, Nederhespen Belgium, 2014 – 2016 and at Agronomic Solutions Department of **Bayer AG**.

Score value 1 = harmless < 25 % | 2 = slightly harmful 25 – 50 % | 3 = moderately harmful 50 – 75 % | 4 = harmful > 75 % corrected mortality

WHAT IMPACT ON BEES?

Regulatory evaluation has concluded that **FLiPPER®** may be applied during flowering except when bees are actively foraging. **FLiPPER®** does not pose a risk to bumble bees or honeybees, provided direct spraying with full coverage is avoided. In protected crops, hives should be closed during spraying but can be safely re-opened once the product has dried as there is no residual effect on bees. Specific studies have been conducted with **FLiPPER®** on A*pis mellifera* and *Bombus terrestris* confirming no negative effects.

***Apis mellifera* (WORKERS)**	**LD_{50} CONTACT (48 HRS)**	**LD_{50} ORAL (48 HRS)**
FLiPPER®	> 448 µg/bee	> 448 µg/bee
Dimethoate	0.2 µg/bee	0.2 µg/bee

Data: Colli M., 2013

Bombus terrestris **FLiPPER®**	**MORTALITY % VS. UNTREATED CONTROL**	
	FLiPPER® 1 % v/v topical application	Imidacloprid standard rate topical application
Queens	25	100
Workers	11	100
Drones	0	100
Queens developed	10	100
Queens hatching	19	100

Data: IPM Impact, Nederhespen Belgium, 2014 – 2015

MAXIMUM RESIDUE LIMIT (MRL)

The active ingredient of **FLiPPER®** is included in the European list of active substances of plant protection products for which **MRL testing is NOT required** according to Annex IV of Reg (EC) No 396/2005. In order to ratify the exemption from MRL testing requirements, the full sourcing and production chain for the active ingredient of **FLiPPER®** has been formally evaluated by EU regulatory processes. The conclusion of this evaluation confirmed that the active ingredient of **FLiPPER®** is of Food Grade Material and that **FLiPPER®** is therefore exempt from EU MRL testing requirements.

PRODUCT COMPATIBILITY

PHYSICAL COMPATIBILITY

FLiPPER® is physically compatible for use in a tank mixture with a wide range of approved insecticides and fungicides. However, caution on compatibility needs to be taken when choosing the right *Bacillus thuringiensis* tank mix partner, as well as with sulphur and copper formulations. In addition, do not tank mix **FLiPPER®** with products containing, fosetyl-aluminium (e.g. Aliette WG), myclobutanil, cypermethrin or metallic ions different from copper (such as Ca, Zn, Mg, Mn, Fe etc.). In case of tank mixes with other products, **FLiPPER®** must be added in the correct order taking into account the other products in the tank mix and their respective formulation type. When using a water softener, this product must be added first in order to condition the entire volume of water, before **FLiPPER®** or other products are added. When using **FLiPPER®** in a tank mix, select only products authorised for the considered crops. Read the labels of all partner products carefully and follow the precautions of the product with the highest toxicity, respecting the pre-harvest interval of all products applied with the mixture. In all cases, conduct preliminary tests on a small area to verify the physical compatibility of the mixture, its crop selectivity and whether expected efficacy performances are reduced. Any tank mixes conducted are done so at grower's risk.

CROP SELECTIVITY

FLiPPER® is a contact insecticide and does not have any translaminar or systemic activity. **FLiPPER®** has been subject to multiple GEP trials and has demonstrated excellent crop safety at label recommended rates. Several factors play a role in crop selectivity such as cultivar selection, plant vigour, environmental conditions (air temperature, relative humidity, moisture availability, light intensity, etc.), spray concentration, spray additives, pH of the sprayed solution, delivery volume, timing, number and frequency of applications, as well as tank mixes and preceding spray applications or crop treatments.

In general, we recommend:

/// To thoroughly clean the spray tank prior to the use of **FLiPPER®**.

/// To adjust the water volume used to the actual development stage of the crop in order to avoid run-off, as run-off may lead to product accumulation and thus over-concentration on leaf margins or fruits.

/// To follow the crop-specific proposals on seasonal application window for **FLiPPER®**.

In some cases, it is advisable to carry out tests on a limited area or on a few plants before applying FLiPPER® to the entire crop area, such as:

/// When applying on new varieties or cultivars for the first time.

/// Application in a tank mix not previously tested on the intended crop to be treated.

/// Application under extreme climatic conditions that will stress the plants, such as high temperature, extremely humid or dry conditions.

/// Application under conditions that are suboptimal for plant growth (low light levels, cold cropping cycles, etc.).

PHYSICAL PROPERTIES

RAINFASTNESS

Rainfastness to the leaf / plant with **FLiPPER®** is not a concern: **FLiPPER®** works solely on contact with the pest. However, **FLiPPER®** should be applied as much in advance of rain as possible and ideally the spray solution needs to have dried on the leaf prior to rainfall.

pH STABILITY

FLiPPER® is stable in aqueous solution across a wide range of water pH levels without any adverse effect on the efficacy of the product. The addition of **FLiPPER®** will increase the pH of water and the final spray solution pH may in some cases be >10, which should not be of any concern. However, it needs to be kept in mind when tank-mixing with a different compound, that the spray solution should be directly applied and longer waiting times should be avoided, as the stability and solubility of the mixing-partner might be affected by higher pH levels.

STABILITY IN HARD WATER

The quality of water is important to take into consideration when making any application of a plant protection product. In water with carbonate and/or sulphate hardness levels <500 ppm (50 °F or 28 °dH), the performance of 1% (v/v) **FLiPPER®** is not affected. However, in cases of using cold water or water with known very high calcium concentrations, **FLiPPER®** might flocculate even below <500 ppm (50 °F or 28 °dH). Such flocculation of **FLiPPER®** is indicated in the pictures to the right in super hard water of 1500 ppm (150 °F or 84 °dH). Depending on ppm levels, the spray solution will change from clear (e.g. rainwater) to milky. A milky solution is normal when using water harder than rainwater (e.g. borehole water). Where the water hardness, and thus the contents of carbonates and/or sulphates are very high (>500 ppm, 50 °F, 28 °dH) an effective water conditioner is recommended to avoid flocculation. Some examples of spray solutions containing 1% **FLiPPER®** in water of different hardness levels are shown in pictures to the right.

*Before using **FLiPPER®** we recommend conducting a jar test to evaluate solubility of **FLiPPER®** and water hardness level (using appropriate testing strips or measurement instruments for hardness).*

1% FLiPPER in rainwater

Mixed with soft water alike rainwater, **FLiPPER®** will just slightly change the clear appearance of the slurry.

1% FLiPPER® water hardness 250 ppm

In case of hard water with 250 ppm, the solution containing **FLiPPER®** will turn slightly whitish.

1% FLiPPER® water hardness 500 ppm

When adding **FLiPPER®** to hard water with 500 ppm, the spray slurry will become milky, but will maintain a homogenous appearance.

1% FLiPPER® water hardness 1500 ppm

In extremely hard water of 1500 ppm, **FLiPPER®** is strongly flocculating, which can cause nozzle and overall equipment blockage.

HOW TO CONDUCT A JAR TEST:

/// Read the **FLiPPER®** label carefully and make sure to comply with all use and safety recommendations (e.g. self-protection, etc.).

/// Take a small glass jar or vial with an appropriate volume to mimic a miniature sprayer mixture preparation. Ensure the size of jar and chosen mixture volume fit together to not spill over during mixing (e.g. when aiming for 100 mℓ mixture, take a 200 mℓ jar or vial).

/// Fill in 99 % of your chosen volume with your water of concern (e.g. in case of a chosen volume of 100 mℓ, fill in 99 mℓ water).

/// Carefully shake the **FLiPPER®** bottle to ensure that the product is thoroughly mixed (do not shake too strongly to avoid formation of foam).

/// Take out the volume of **FLiPPER®** you need to reach 1% of **FLiPPER®** in your chosen mixture volume and add it to the water in the jar (e.g. in case of a chosen volume of 100 mℓ, add 1 mℓ **FLiPPER®**).

/// Agitate/stir the mixture until the solution becomes homogenous. Usually this takes a maximum of 30 seconds, depending on the agitation.

/// Flocculation is visible within a very short time, e.g. in case of high calcium levels, within a few seconds.

/// If you observe flocculation, use a water softener.

If flocculation occurs during the jar test or hardness is in excess of 500 ppm (50 °F or 28 °dH), the water will need conditioning prior to adding **FLiPPER®** to the spray tank.

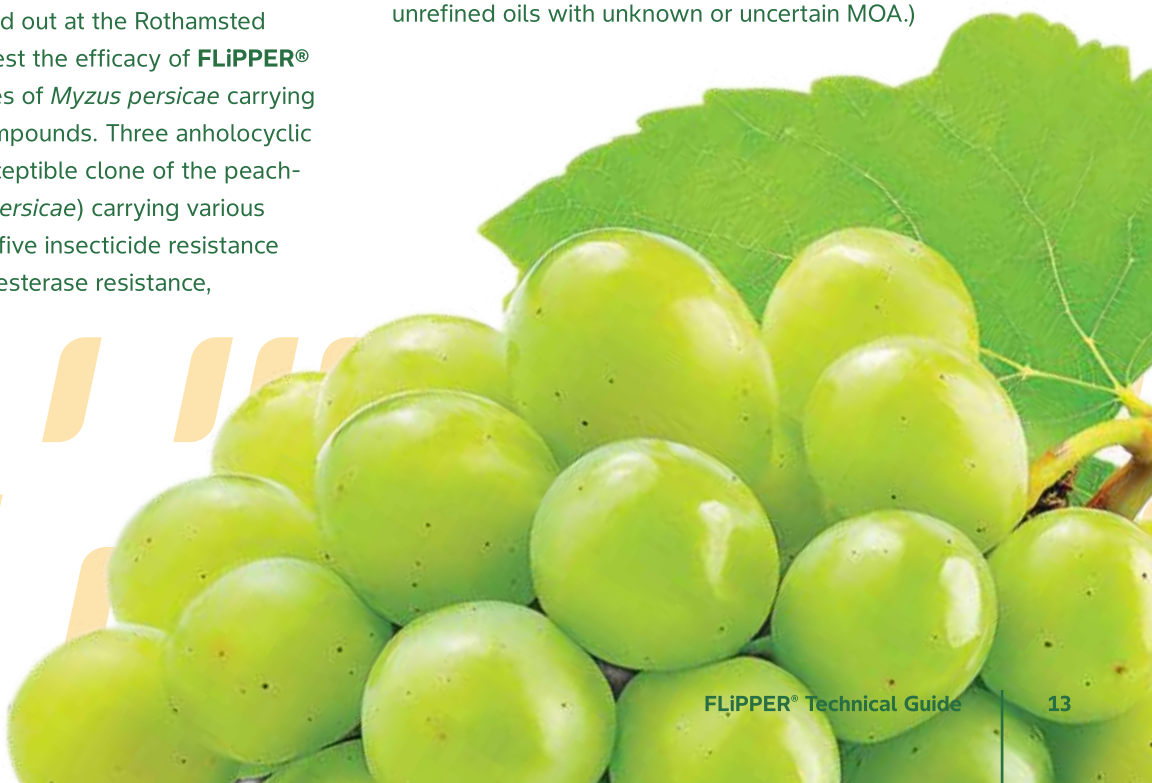
RESISTANCE MANAGEMENT

FLiPPER® is a naturally occurring, biological insecticide demonstrating consistently high levels of efficacy against a broad spectrum of important pests across a wide range of crops. There is no reported resistance or reduced sensitivity against **FLiPPER®** and there is no reported cross-resistance with any other existing insecticide chemistry group.

Trials have been carried out at the Rothamsted Research Institute to test the efficacy of **FLiPPER®** on the control of clones of *Myzus persicae* carrying resistance to other compounds. Three anholocyclic clones and a fully susceptible clone of the peach-potato aphid (*Myzus persicae*) carrying various combinations of up to five insecticide resistance mechanisms: carboxylesterase resistance, modified acetylcholinesterase (MACE) resistance, knock down resistance (kdr) and super-kdr (to pyrethroids), and strong (Nic-R++) resistance to neonicotinoids.

Results of these tests concluded that there is no evidence of any cross-resistance to **FLiPPER®** in *Myzus persicae* conferred by the known insecticide resistance mechanisms.

FLiPPER® is currently classified by IRAC as UNE (Botanical essence including synthetic, extracts and unrefined oils with unknown or uncertain MOA.)



APPLICATION

As **FLiPPER®** is a contact insecticide with no translaminar or systemic activity, good coverage of the crop and pest population is vital for a satisfactory efficacy.

The product dose rate needs to be adjusted according to the specific water volume used to maintain the optimum concentration of **FLiPPER®** in the spray solution. Fixed chemical rates in g/ha can result in poor efficacy. Instead, when describing the product dose rate, it is essential to use units that allow to adjust the product amount to the actual foliage and water volumes in the field, such as "spray concentration" rate in [% V/V] or ℓ/ha/LWA.

TOP TIPS FOR GETTING THE BEST OUT OF YOUR FLIPPER® APPLICATION

/// **FLiPPER®** should always be used in accordance with the label at the recommended rates for maximum benefit in terms of insect control and resistance management.
/// Conduct applications at the first signs of infestation build-up, or when founding colonies of the target pest appear.
/// Apply during the period of the day when the pest is likely to be most vulnerable to contact.
/// Avoid applications at the heat peak of the day or when rainfall is imminent.
/// Always use clean spraying equipment, ensuring all residues from previous applications have been removed from the spray tank and spray lines.
/// Check to ensure correct functionality of nozzles for optimum application.
/// Check your water hardness level before preparation of the spray solution. If required, add an effective water conditioner to the water prior to adding **FLiPPER®**.
/// Use minimum agitation during preparation and application to avoid the formation of foam.
/// Use the spray solution immediately following preparation. Do not store for future use as this may lead to some separation and consequent dilution of efficacy.
/// Apply an appropriate water volume to ensure complete wetting of the target pests. Aim to achieve good placement of the spray solution on the target foliage covering the different areas on the plant where the respective pests are located, including the underside of the leaves, but avoiding run-off.

APPLICATION TIMING

/// Initiate applications at the first signs of the pest infestation build-up.
/// **FLiPPER®** has effects on most stages of pest life cycles but nymphs and juveniles are usually the most vulnerable.
/// Apply when the target pest is exposed to contact, likewise when motile forms are still and feeding.
/// Ideally, avoid applications during very hot conditions or during the heat peak of the day.
/// **FLiPPER®** will remain active whilst the spray film persists. Slower drying conditions may improve control.
/// Apply when there is no likelihood of rain and at least 1 day before the use of overhead irrigation. Avoid outdoor applications when wind conditions may impair thorough coverage.
/// Assess the effects not earlier than 3 days (72 hours) after the first application to evaluate the success of the target pest control. Repeat applications at 7-day intervals if needed, depending on pest pressure, or to control re-infestation.
/// **FLiPPER®** can be used throughout the crop cycle: It can be used during bloom (with the exception of periods of the day when bees are actively foraging) and it can be used throughout the harvesting period.
/// **FLiPPER®** has a zero-day pre-harvest interval (PHI) for the authorised crops and uses.

RATES OF APPLICATION

/// The recommended spray concentration of **FLiPPER®** is: 1 ℓ (formulated product) in 100 ℓ of water (1% v/v). This means: 10 ℓ of product /ha with a spray solution volume of 1000 ℓ/ha.

/// Please always refer to the label.

CROP	DOSAGE RATE	REMARKS
Table Grapes Western Flower Thrips (*Frankliniella occidentalis*) (Suppression of adults and nymphs only) Thrips (*Scirtothrips aurantii*) (Suppression of adults and nymphs only)	1 ℓ/100 ℓ water	Apply as a foliar spray at the first signs of infestation. Repeated applications at a minimum of 7 days interval may be required, depending on pest pressure, respecting the maximum rate per application, with maximum 3 subsequent applications. Respect the maximum total rate per season.
Citrus Thrips (*Scirtothrips aurantii*)	10 ℓ/ha	Apply at 10 ℓ/ha irrespective of specific water volume used but do not exceed 1% formulated product or 10 ℓ/1000 ℓ of water volume applied. Apply as a foliar spray at the first signs of infestation. Repeated applications at a minimum of 7 days interval may be required, depending on pest pressure, respecting the maximum rate per application, with maximum 3 subsequent applications. Respect the maximum total rate per season.
Blueberries Thrips (*Scirtothrips aurantii*) (Suppression of adults and nymphs only) Cotton aphid (*Aphis gossypii*) (Suppression of adults and nymphs only)	1 ℓ/100 ℓ water	Apply as a foliar spray at the first signs of infestation. Repeated applications at a minimum of 7 days interval may be required, depending on pest pressure, respecting the maximum rate per application, with maximum 3 subsequent applications. Respect the maximum total rate per season.

VOLUME OF SPRAY SOLUTION

/// Selecting the correct water volume for the spray solution is a key success factor in achieving the required coverage of the host crop and the target pest.

/// Apply the product using a sufficient quantity of water to achieve a thorough wetting of the target pest and host crop. But, avoid excess water volumes, which may lead to run-off of the spray solution.

/// The volume of water and type of spray will vary according to plant size, development stage, density of vegetation, spraying equipment settings and the wetting level required to fully cover the target pests.

/// The volume of the solution to be sprayed can vary according to the size of the plants, the density of the vegetation, the level of wetting necessary to fight the pest and of the equipment used for distribution. Complete coverage of the inflorescences and bunches/fruits is required, thus avoiding run-off.

/// The recommended volume for Citrus is 800-4000 ℓ/ha; for Table grape is 500-1000 ℓ/ha; for Blueberries is 200-1000 ℓ/ha.

PREPARATION OF THE SPRAY SOLUTION

FLiPPER® spray solution is simple to prepare. It is easily stored, handled and transported. **FLiPPER®** mixes readily with water when poured into the tank and forms a true solution.

/// Thoroughly wash and clean the spray tank before preparing **FLiPPER®** solution.

/// Always use clean spraying equipment, ensuring all residues from previous applications have been removed from the spray tank and spray lines. Check to ensure correct functionality of nozzles for optimum application.

/// Check your water hardness level before preparation of the spray solution. If required, add an effective water conditioner to the water prior to adding **FLiPPER®** in order to facilitate the formation of a good solution. Please refer to page 12 and 13 for water hardness management recommendations.

/// For optimal mixing, introduce **FLiPPER®** through the sprayer's induction hopper, pouring **FLiPPER®** slowly and steadily down the side, not directly into the water.

/// **DO NOT** "**dump**" **FLiPPER®** directly into the sprayer or spray mix tank.

/// The product mixes readily with water and does not require vigorous agitation. Excessive use of an agitator may cause the formation of foam. **Keep stirrer and mixer at a minimum speed**.

/// The **FLiPPER®** formulation will be more viscous at lower temperatures. When using cold water, a slightly longer time may be required to create the solution and the product should be introduced to the spray tank more slowly while stirring.

/// Do not leave the spray solution to sit for any length of time prior to application. Use the freshly mixed spray straight away.

METHOD OF APPLICATION

FLiPPER® can be applied using most types of conventional spray equipment.

/// Apply as a high-volume foliar spray with good quality conventional spraying equipment.

/// Consider the different parts of the plants where the pest may be located according to its respective developmental stage and the meteorological conditions.

/// Set the spraying equipment to achieve good placement of the spray solution on the target foliage covering the different areas on the plant where the respective pests are located, including the underside of the leaves, if applicable.

/// Select appropriate pressure, nozzle type and orientation, as well as suitable forward tractor speed to ensure deposition of the right quantity of spray solution on the target area only – ensuring it is not blasted over or through the canopy and avoid run-off.

/// Empty the spray tank completely. Do not keep any unused solution. After the application always thoroughly rinse the equipment with clean water.

POSITIONING STRATEGIES

FLiPPER® offers a number of good positioning opportunities in both conventional and organic farming.

USES IN CONVENTIONAL AGRICULTURE

Programme positioning opportunities in conventional agriculture include where growers are looking for an option to reduce pesticide residues; to use a product with no EU MRL; to manage pest resistance issues; to fill gaps in programmes where the use of other chemistry is restricted; to reduce the impact on natural predators; to support food chain partner sustainability imperatives; where no alternative chemistry is available.

USE IN ORGANIC AGRICULTURE

FLiPPER® can be used in programmes that meet organic production standards as defined in EU, USA and other geographies. **FLiPPER®** has been certified by FiBL for use in organic production.

FLiPPER® SUMMARY

FLiPPER® is a registered insecticide according to Act 36. It is a biological effective solution that deals with a multitude of the core issues confronting farmers and food chain producers. **FLiPPER®** comes with a wide range of defined and valuable benefits[1]:

/// Proven efficacy when applied according to recommendations.
/// Controls multiple stages of key target pests.
/// Suitable for use in resistance management strategies.
/// Selective on beneficial arthropods and pollinators.
/// A naturally occurring active ingredient, classified as Food Grade Material.
/// Exempt from EU MRL testing, no detectable residues.
/// Short or zero-day pre-harvest interval (0 day PHI).
/// Good environmental impact profile.
/// Not persistent; very short re-entry period.
/// Low toxicity to operators, workers, and bystanders, no hazardous co-formulants.
/// Simple preparation of the spray solution, easy to store and handle.
/// Wide range of physically compatible products for tank mix applications.
/// Authorised for use in organic agriculture.

*[1] Listed benefits are all supported by data and grower experience of **FLiPPER®** use in standard conditions according to registered label indications. Always refer to the label and technical advice for best management practices.*

WARNING

Hazard statements:
- Causes skin irritation.
- Causes serious eye irritation.
- May cause respiratory irritation.
- Harmful to aquatic life with long-lasting effects.

Let's talk ...

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READ THE LABEL BEFORE USE:

FLiPPER® Reg. No. L11949 (Act No. 36 of 1947). Contains Fatty acids potassium salts 479,8 g/ℓ; oil-in-water emulsion. Warning.
The registration holder of **FLiPPER®** is **Bayer AG. Bayer** (Pty) Ltd. Reg. No. 1968/011192/07.
Collaboration Hub, First Floor, Waterfall Circle, 9 Country Estate Drive, Waterfall City, Midrand, 2090.
FLiPPER® is a registered trademark of De Sangosse S.A.S.