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PLEASE CHECK THEIR  
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**CROP INFO SHEET**

# TOMATO



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IPM strategy for tomato



### Support your health

There are many health promoting properties attributed to tomatoes. Tomatoes are particularly rich in lycopene; a carotenoid (known as pro-vitamin A) and strong anti-oxidant. This substance protects against heart and vascular disease and cancer.

### What's the benefit of using bumblebees for natural pollination?

The use of bumblebees as natural pollinators creates an important labor saving, improvement of fruit quality and a substantial increase in yield.

Nowadays, bumblebees are worldwide integrated as a common pollination technique in tomato production.

### Why developing integrated pest management (IPM) for your tomato crops?

The main disadvantages of applying pesticides are pest resistance and chemical residues. Pesticides are also resulting to be less available due to decreasing effectiveness, imposed restrictions and even withdrawal from the market. Also the release of new active ingredients is submitted to strict regulations which results often in long term registration procedures.

IPM is a sustainable crop protection technique.

The use of natural organisms for pest control ensures a healthy crop by excluding the use of harmful and persisting chemicals.

Implementing IPM strategies results into a reduction of pesticide use, residue free produce, safer working environment for the employees, compatibility with bumblebees and beneficial organisms and a better fruit quality.

Due to the increasing awareness of the general public to food safety and environmentally friendly production, as well as the globalization of export markets, IPM strategies can be used as an important marketing tool.

### Technical advice

This crop info sheet is a tool intended to explain growers about the use of our products; target pest and dosages. The technical advice exposed in these sheets is based on a general strategy for areas with a temperate climate in Europe, and may vary from your specific situation and condition.

Check for product authorization and legislation in your country with the local authorities. Contact your nearest Biobest advisor to discuss an appropriate strategy to your conditions.

### Advantages

- Residue free
- Food safety
- Environmental friendly
- Sustainable crop protection

# POLLINATION



## Ventilation hive



### Hive type

	Standard Hive	Large Hive
Number of workers	60	80
Activity span	6-8 weeks	6-8 weeks
Use	General	Starter Hive Artificial light

### How to use the hives?

The theoretical introduction scheme of bumblebee hives in tomatoes:

Surface (m <sup>2</sup> )	Start up	After 3 weeks	After 4 weeks	After 5 weeks	After 6 weeks	After 7 weeks	After 8 weeks	After 9 weeks	After 10 weeks
1000-2000	1-2	0	1	0	0	1	0	0	1
3000-4000	2-3	1	0	1	0	1	0	0	0
5000-6000	3-4	1	0	2	0	0	1	0	0
7000-8000	4-5	2	0	1	0	2	0	1	0
9000-10000	5-7	2	0	2	0	2	0	2	0

Check for bite marks to determine the moment and amount of hives to be added; when the number of bite marks is decreasing, new hives must be added to reinforce the pollination activity inside the greenhouse.

More hives are requested in summer than in winter, in summer time plants grow faster and produce more flowers. Less hives are needed in beef tomatoes than in round tomatoes.

Cherry tomato produces much more flowers, its total bumblebee hive consumption can go up to 2-3 x the normal consumption.



## How to check the pollination?

Bumblebees leave bite marks on the stamen cone of the flower. By monitoring these bite marks, we check pollination.

Pollination levels are indicated with codes:

Code	Bite mark	Pollination level	Action
1	Very dark to black	Over-pollination	Close the hive for 2-3 days
2	Brown	Very well pollinated	
3	Slight brown	Well pollinated	
4	<60-70%	Poorly pollinated	Add hive
5	Poor to none	No pollination	Add hive

## Bitemarks of bumblebees



Bitemark 1



Bitemark 2



Bitemark 3

# WHITEFLY



The dosage is based on a standard advice, please check with your advisor to discuss the strategy adapted to your situation

## Pest



Egg

*Trialeurodes vaporariorum*



Larvae



Adult



*Bemisia tabaci*



## Damages



Honeydew



Sooty mold on leaf



Sooty mold on fruit



TYLCV

## Biocontrol agents



**Encarsia-System**  
(*Encarsia formosa*)

Parasitic wasp  
Target: *T. vaporariorum* (L3-L4)  
Dosage: 3-4 ind./m<sup>2</sup>/week, min. 4x  
Timing: at first sign of whitefly larvae



**Eretmocerus-System**  
(*Eretmocerus eremicus*)

Parasitic wasp  
Target: *T. vaporariorum* & *B. tabaci* (L2-L3)  
Dosage: 2 ind./m<sup>2</sup>/week, min 4x  
Timing: - in summer time  
- at mixed whitefly population



**Eretmix-System**  
(*E. formosa* + *E. eremicus*)

Parasitic wasp  
Target: *T. vaporariorum* & *B. tabaci* (L2-L4)  
Dosage: 3-4 ind./m<sup>2</sup>/week, min. 4x  
Timing: - during transition period from spring to summer releases  
- at mixed whitefly population



**Mundus-System**  
(*Eretmocerus mundus*)

Parasitic wasp  
Target: *B. tabaci* (L2-L3)  
Dosage: 3 ind./m<sup>2</sup>/week, min. 4x  
Timing: at first sign of *Bemisia* larvae



**Macrolophus-System**  
(*Macrolophus pygmaeus*)

Predatory bug  
Target: *T. vaporariorum* & *B. tabaci* (eggs & larvae)  
Dosage: 0,5-1 ind./m<sup>2</sup>, in 2-4 releases,  
1-2 weeks interval  
Timing: 1,5-2 months after planting



**Nesiodiocris-System\***  
(*Nesiodiocris tenuis*)

Predatory bug  
Target: *T. vaporariorum* & *B. tabaci*  
(eggs & larvae)  
Dosage: 0,5-1 ind./m<sup>2</sup>/in 2-4 releases  
1-2 weeks interval  
Timing: 1,5-2 months after planting

\* for Mediterranean countries (check local legislation)

# WHITEFLY



## Biocontrol agents



**PreFeRal**  
(*Paecilomyces fumosoroseus*)  
Entomopathogenic fungus  
Target: *T. vaporariorum* & *B. tabaci* (larvae & adults)  
Dosage: 100 gr/100L water, min. 1.000L/ha  
Timing: corrective treatments

## Monitoring & Scouting



**Bug-Scan Yellow**  
Yellow sticky traps  
Goal: monitoring adult whiteflies  
Dosage: 20-40 traps/ha



**Signal Clip Yellow**  
Goal: Indicator clip for hotspots of whitefly larvae in the crop  
Dosage: 1 clip per hot spot

# APHIDS



The dosage is based on a standard advice, please check with your advisor to discuss the strategy adapted to your situation

## Pest



Foxglove aphid  
(*Aulacorthum solani*)



Potato aphid  
(*Macrosiphum euphorbiae*)



Peach aphid  
(*Myzus persicae*)

## Damages



Molt



Honeydew and sooty mold  
on leaf



Honeydew and sooty mold  
on fruits

## Biocontrol agents



**Aphidius-System**  
(*Aphidius colemani*)  
Parasitic wasp  
Target: *Myzus persicae*  
Dosage: 0,25 ind./m<sup>2</sup>/week, min. 4 x  
Timing: at first sign of aphids



**Matricariae-System**  
(*Aphidius matricariae*)  
Parasitic wasp  
Target: *Myzus persicae* and related species  
*Aulacorthum solani*  
Dosage: 0.25 ind./m<sup>2</sup>/week, min. 4x  
Timing: at first sign of aphids



**Ervi-System**  
(*Aphidius ervi*)  
Parasitic wasp  
Target: *Aulacorthum solani*,  
*Macrosiphum euphorbiae* (\*)  
Dosage: 0.25 ind./m<sup>2</sup>/week, min 4x  
(\*double dosage needed)  
Timing: at first sign of aphids



**Aphidoletes-System**  
(*Aphidoletes aphidimyza*)  
Predatory gall midge  
Target: most aphid species  
Dosage: <5 hot spots/ha:  
0.5-1 ind./m<sup>2</sup>/min. 4x  
>5 hot spots/ha:  
1 ind./m<sup>2</sup>/week, min. 4x  
>10 hot spots/ha:  
4 ind./m<sup>2</sup>/week, min. 4x  
Timing: in support of parasitic wasps



**Aphelinus-System**  
(*Aphelinus abdominalis*)  
Parasitic wasp  
Target: *Aulacorthum solani*,  
*Macrosiphum euphorbiae*, *Myzus persicae*  
Dosage: 0.25 ind./m<sup>2</sup>/week, min. 4x  
Timing: in case of hyperparasitism

# APHID



## Monitoring & Scouting



### Bug-Scan Yellow

Yellow sticky traps

Goal: monitoring winged aphids

Dosage: 20-40 traps/ha



### Signal Clip Green

Goal: Indicator clip for hotspots of aphid adults and nymphs in the crop

Dosage: 1 clip per hot spot

# TWO SPOTTED SPIDER MITE



The dosage is based on a standard advice, please check with your advisor to discuss the strategy adapted to your situation

## Pest

*Tetranychus urticae*



Egg



Nymph



Adult

## Damages



Feeding damage on leaf



Leaf discoloration



Webbing



Feeding damage on fruit

## Biocontrol agents



### Phytoseiulus-T-System (*Phytoseiulus persimilis*)

Predatory mite  
Target: all stages of *T. urticae*  
Dosage: min. 20 ind./m<sup>2</sup>, in hotspots,  
repeat if necessary  
Timing: at first sign of spider mites



### Macrolophus-N-System (*Macrolophus pygmaeus nymph*)

Predatory bug  
Target: all stages of *T. urticae*  
Dosage: 100-150 ind./hot spot  
Timing: in support of  
Phytoseiulus-T-System



### Feltiella-System (*Feltiella acarisuga*)

Predatory gall midge  
Target: all stages of *T. urticae*  
Dosage: low infestation: 2-3 x 250 ind./ha/week,  
in hot spots  
high infestations: 8 x 250 ind./ha/week,  
min. 4x, in hotspots  
Timing: in support of Phytoseiulus-T-System

## Monitoring & scouting



### Signal Clip Red

Goal: Indicator clip for spider mite hotspots in the crops  
Dosage: 1 clip per hotspot

# LEAFMINER



The dosage is based on a standard advice, please check with your advisor to discuss the strategy adapted to your situation

## Pest

*Liriomyza* spp.



Larva



Pupa



Adult

## Damages



Feeding spots on leaf



Galleries

## Biocontrol agents



### Diglyphus-System (*Diglyphus isaea*)

Parasitic wasp

Target: leafminer larvae

Dosage: 0,1-0,25 ind./m<sup>2</sup>/week, min. 4 x

Timing: at general appearance of galleries

## Scouting & monitoring



### Bug-Scan Yellow

Yellow sticky traps

Goal: Monitoring adult leafminer

Dosage: 20-40 traps/ha



### Signal Clip Orange

Goal: indicator clip for leafminer hotspots (feeding dots and galleries) in the crop

Dosage: 1 clip per hotspot

# CATERPILLARS



The dosage is based on a standard advice, please check with your advisor to discuss the strategy adapted to your situation

## Pest



## Damages



Feeding damage on leaf



Excrements



Feeding damage on fruit

## Monitoring & scouting



### Delta trap

Pheromone trap, triangle shaped  
Goal: monitoring moth  
Dosage: 2 traps/ha



### Attract lure

Pheromone lure  
Dosage: 1 per trap, replace every  
4-6 weeks



### Signal Clip Purple

Goal: Indicator clip for feeding damage and presence  
of caterpillars in the crop  
Dosage: 1 clip per hotspot

CROP INFO SHEET TOMATO  
**SOUTH AMERICAN TOMATO  
 PINWORM**



The dosage is based on a standard advice, please check with your advisor to discuss the strategy adapted to your situation

**Pest**

*Tuta Absoluta*



Egg



Larva



Pupa



Adult

**Damages**



Galleries on leaf



Damage on stem



Fruit damage

**Biocontrol agents**



**Macrolophus-System**  
 (*Macrolophus pygmaeus*)  
 Predatory bug  
 Target: eggs  
 Dosage: 1,5-2 ind./m<sup>2</sup>/week, min. 2-4 releases,  
 1-2 weeks interval  
 Timing: according to whitefly control strategy



**Nesidiocoris-System**  
 (*Nesidiocoris tenuis*)\*  
 Predatory bug  
 Target: eggs  
 Dosage: 1,5-2 ind./m<sup>2</sup>, in 2-4  
 releases, 1-2 weeks interval  
 Timing: according to white fly control  
 strategy

\* for Mediterranean countries (check local legislation)

**Monitoring & scouting**



**Delta Trap**  
 Pheromone trap, triangle shaped  
 Goal: monitoring moth  
 Dosage: 2 -3 traps/ha



**Tutasan**  
 Pheromone water trap  
 Goal: monitoring adults  
 Dosage: 15 traps/ha, 20 cm height



**Attract *Tuta absoluta***  
 Pheromone lure  
 Dosage: 1 per trap, replace every 4-6 weeks



**Singal Clip Purple**  
 Goal: indicator clip for first galleries  
 in the crop  
 Dosage: 1 clip per hotspot