

VerdaProtect:

A mix of parasitoids to control all common aphid species on protected vegetable crops



Introduction

Aphid control in protected vegetable crops is increasingly facing different challenges. Due to multiple insecticide resistance and to the pressure of the market to reduce the level of residues in the final products, chemical products are progressively abandoned and biological and integrated methods meet a growing success. Viridaxis developed an innovative concept to fight against all different species of aphid attacking protected vegetable crops such as sweet peppers, eggplants, cucumbers. It is a cocktail of six different species of parasitoids (Order: *Hymenoptera*, Family: *Braconidae* (subfamily: *Aphidiinae*) and *Aphelinidae*) called VerdaProtect. When used preventively, it is able to control all commonly appearing aphids attacking vegetable crops. One advantage of working with a mix is that the aphids do not have to be identified to choose the right parasitoid. Furthermore, one aphid species can be attacked by several species of parasitoid increasing the efficiency of the biocontrol (Table 1).

Table 1: List of the most important aphid species attacking vegetable plants (left column, in bold are the most common species or those which are economically important). The parasitoids present in VerdaProtect are listed in the first line. Their efficacy in the control of the different aphids is indicated by '+' for proven control under field conditions (+++: very high efficacy, ++: high efficacy, +: good efficacy) or 'X' for control under laboratory and semi field conditions.

Aphid/Parasitoid	<i>Aphidius colemani</i>	<i>Aphidius ervi</i>	<i>Aphidius matricariae</i>	<i>Aphelinus abdominalis</i>	<i>Ephedrus cerasicola</i>	<i>Praon volucre</i>
<i>Acyrtosiphon pisum</i>	X	++				+++
<i>Aphis craccivora</i>	+++		++	X		+
<i>Aphis fabae</i>	+		+	X		+
<i>Aphis frangulae</i>	+++	++			X	+
<i>Aphis gossypii</i>	+++	++		X	X	+
<i>Aphis nasturtii</i>			++			+
<i>Aphis spiraeola</i>	++	++		X		X
<i>Aulacorthum circumflexum</i>		+++	X	++	++	++
<i>Aulacorthum solani</i>	X	++	X	++	+++	++
<i>Macrosiphum euphorbiae</i>	X	+++		+++		+++
<i>Myzus ascalonicus</i>			X	X	X	X
<i>Myzus nicotianae</i>	+		+++		X	X
<i>Myzus ornatus</i>	++	X	++		X	+
<i>Myzus persicae</i>	+++	+	++	++	++	++

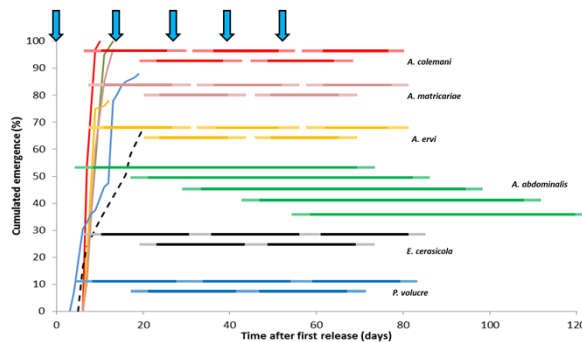


Fig. 1: Emergence dynamics and life span of the six parasitoid species of VerdaProtect. Releases (blue arrows) in intervals of two weeks guarantee the permanent presence of fresh adult parasitoids in the crop.



Material and methods

In 2012, trials have been conducted with VerdaProtect (Fig. 2) in France and in The Netherlands in organic vegetable production (peppers, cucumbers, zucchini, eggplants) under unheated tunnels as well as in big heated glasshouses. Releases were done every two weeks (Fig. 1) starting at plantation using fixed release points (Fig. 3). The crops were regularly monitored and counting of aphids and mummies was performed on a fixed number of randomly chosen plants using the counting key (Table 2).

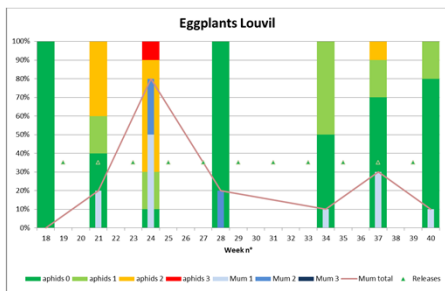
Table 2: Counting key for aphids and mummies

Key for aphid intensity		Key for mummy intensity	
0	Absence of aphids	0	Absence of mummies
1	1-4 aphids per plant present	1	1-2 mummies per plant present
2	5-10 aphids per plant present	2	>2 mummies per plant present
3	Spot with colonies	3	Estimated parasitism superior to 50 %

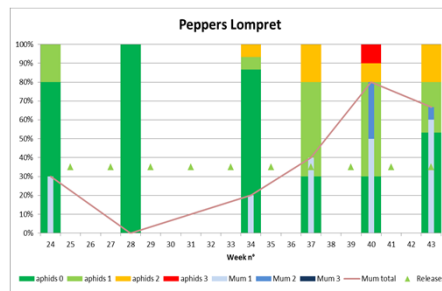


Fig. 2 & 3. VerdaProtect is a ready to use unit with integrated feeding point (honey). The tubes are installed in the crop (1 tube for 200 m²) on fixed release points which protect the tubes against ants, direct sunshine and water.

Results

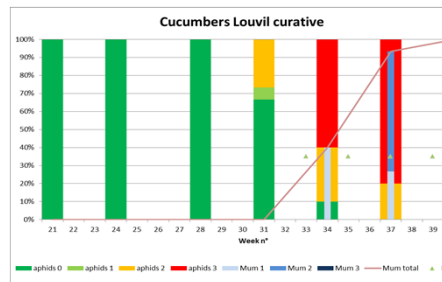
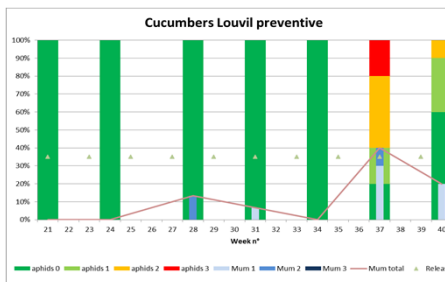


- *Aulacorthum solani* present in the spring but rapidly controlled
- Excellent control of the different species (*A. nasturtii*, *Myzus persicae*, *Macrosiphum euphorbiae*) arriving in summer and autumn



- Good control of aphids (*A. solani*, *M. persicae*, *M. euphorbiae*) in spring and summer
- Delayed control of aphids in late summer when fruits were present due to a delayed installation of the tubes in week 35

Preventive vs. Curative



- In the preventive strategy, excellent control of *Aphis gossypii*. Aphids in small colonies were rapidly parasitized (Fig. 4).
- In the curative strategy, the first parasitoids were released in week 33 when 50% of the plants had already big *Aphis gossypii* colonies. Many mummies formed (Fig. 5) on all plants but control was never reached.



Fig. 4 : Small colony of *Aphis gossypii* on cucumber with high mummification rate.

Fig. 5 : Big colony of *Aphis gossypii* on Cucumber with lots of winged aphids. Some mummies were formed but not enough to reach a control

Conclusions

In the different situations (unheated tunnel, heated greenhouse) and on all crops (peppers, cucumbers, zucchini, eggplants), when used preventively, VerdaProtect kept the different appearing aphid species (*Aphis gossypii*, *A. nasturtii*, *Macrosiphum euphorbiae*, *Aulacorthum solani*...) under the economic damage threshold. Furthermore, the application of the product is quick and easy and this was much appreciated by the growers involved in the trials.

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