BerryProtect:

The Use of a Mix of five Parasitoid Species to control all Aphid Species in Berry Crops

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Parasitoids used

Aphidius ervi
Aphidius colemani
Aphidius matricariae
Praon volucre
Aphelinus abdominalis

Fig. 1: Emerging *Aphidius*

Fig. 2: Attackng *Aphelinus*

Fig. 3: *Praon volucre mummy*

Fig. 4: BerryProtect

BerryProtect: Aphids-parasitoids relations

Aphid / parasitoid	*Aphidius ervi*	*Aphidius matricariae*	*Praon volucre*	*Aphidius colemani*	*Aphelinus abdominalis*
Acyrtosiphon malvae	+ +		+ + +		
Amphorophora idaei	+ +		+ + +		
Aphis gossypii		+ +	+	+ + +	x
Aphis idaei		+ +		+ +	
Aphis pomi		x		x	
Aphis schneideri		+		+ +	
Aphis spiraecola		+ +	x	+ +	x
Cryptomyzus ribis		x		x	
Ericaphis fimbriata	+ +		+ + +		+ +
Hyperomyzus lactucae	+ +		+ + +		+ +
Illinoia pepperi	x		x		
Macrosiphum euphorbiae	+ + +		+ + +		+ + +
Myzus persicae	+	+ +	+ +	+ + +	+ +

Berries can be attacked by far more than ten different aphid species. The table lists the most important aphid species attacking berry plants (left column, in bold are the most common species or those which are economically important). The parasitoids present in BerryProtect 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.

Trials have been conducted in different countries, including Germany, Belgium, Italy and Switzerland

Exemples of varieties:

- Blueberries : Duke, Nui
- Raspberries : Tulameen,Sugana, Polka, Autumn Bliss
- Blackberries : Obsidian

Fig. 5-8: Different berries where BerryProtect was used

Advantages :

- Protects berry plants against aphids
- No need to identify aphids
- No development of resistance possible
- No harvest interval
- Saves on aphicides, so less residue in IPM
- Easy integration with chemical crop protection
- Long lasting effect at broad temperature range
- Reliable and consistent quality
- Quick and easy application
- Safe for humans, plants, and the environment

Fig 9-10 : Installation of BerryProtect and parasitoids on honey point

Application :

- Preventive use : Before aphids appear in the crop.
- 1 release every 3 weeks
- 1 dose covers 200 m²

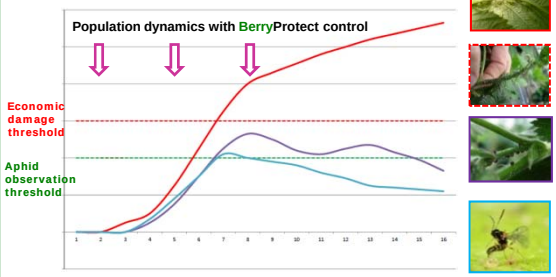

Fig. 11: Population dynamics model of the aphids in a berry crop

Uncontrolled aphids. Aphids controlled by BerryProtect. Parasitoids individuals. Releases of BerryProtect.

Results :

- Parasitism and subsequent control confirmed for the most relevant species: *Ericaphis fimbriata, Aphis gossypii, Amphorophora idaei, Macrosiphum euphorbiae*
- Efficient under different growing conditions (temperature, covering, crop calendar)
- Positive feedback from growers :
  - ➢ No need to identify aphids before taking a decision
  - ➢ Easy to use and saving time in application
  - ➢ Very efficient and less or no chemical treatment applied

Fig. 12-18: Releasing point and increasing control level through the season

Conclusions :

- The first release of BerryProtect has to be done at the beginning of the vegetative phase before any aphid can be spotted. Parasitoids will adapt themselves to the temperatures and environment. At low temperature, they hatch more slowly and are less active, however, their life span is considerably increased.
- The release point consists of a cardboard tube with an integrated feeding point. The access to food for freshly emerged parasitoids is important in a preventive strategy, in which releases start before flowers appear. Our experience showed that the integrated feeding point contributes to a longer life span of the parasitoids.
- Due not only to a mix of different species but also different development stages, the parasitoids emerge over at least 3 weeks. This and the relatively long life span allows to release only every 3 weeks and to insure the continuous presence of fresh adults in the crop. One tube covers 200 m²
- BerryProtect offers an excellent protection against *Amphorophora idaei and Ericaphis fimbriata*, both vectors of virus complexes on raspberries and blueberries respectively. Virus infection in raspberries can reduce fruit yields by 70 percent or more.
- To allow the installation of the parasitoids (and other naturally occurring controlling agents), a controlled presence of aphids must be tolerated by the grower. These aphids, not exceeding the economic damage threshold, serve as a reservoir for the parasitoids populations.
- Even if mummies are not always observed, the efficacy of the parasitoids can be noted by the presence of cleaned hotspots (exuviae, honeydew, but no aphids) at different locations in the crop.
- The use of BerryProtect is at least as easy and efficient as a chemical response and demonstrates no over time resistance. It has to be used as a preventive agent, and can be integrated in a larger scale pest management program (in order to be compatible with the actions taken against i.e. mites, thrips…), may it be chemical, integrated or biological.
- Caution has to be applied with the use of non-compatible chemical products, even in neighboring cultures.

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Fig. 19 : *Aphidius colemani* parasitizing an aphid