Field evaluation of survival rates of *Harmonia axyridis* (Coleoptera: Coccinellidae) and other aphidophagous species

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Introduction

The multicoloured Asian ladybird *Harmonia axyridis* Pallas (Coleoptera: Coccinellidae), previously introduced as a biological control agent against aphids, is now frequently considered as an intraguild predator, consuming other aphid natural enemies. Interactions between this exotic ladybird and the other aphidophagous species present in Belgian agro-ecosystems such as *Coccinella septempunctata*, *Episyrphus balteatus*, *Chrysoperla carnea* are asymmetric to the benefit of *H. axyridis.*

This study focuses on the survival rate of three aphidophagous species *Harmonia axyridis (Ha), Coccinella septempunctata (C7)* and *Episyrphus balteatus (Eb*) in biological fields of potato and sugar beet.

Materials and Method

During June and July 2010, hermetic cages were disposed on sugar beet and potato in Belgium.

Each cage contained 10 larvae (second stage) of each aphidophagous (*Harmonia axyridis, Coccinella septempunctata*, *Episyrphus balteatus)*. There were 4 combinations of insects placed inside the cages (1) Ha+Eb +C7+aphids, (2) Ha+Eb+C7, (3) Eb+C7+aphids and (4) Eb +C7. Each combination was repeated three times. Aphids (*Aphis fabae*) were added in excess when needed.

Observations (number of alive insect species and development stage of each) were made each 2 days on each crop.

Experimental design:

REP1		REP2		REP3	
H. axyridis *C. 7-punctata* *E. balteatus*	*H. axyridis* *C. 7-punctata* *E. balteatus* *+ A. fabae*	*H. axyridis* *C. 7-punctata* *E. balteatus*	*H. axyridis* *C. 7-punctata* *E. balteatus* *+ A. fabae*	*H. axyridis* *C. 7-punctata* *E. balteatus*	*H. axyridis* *C. 7-punctata* *E. balteatus* *+ A. fabae*
C. 7-punctata *E. balteatus*	*C. 7-punctata* *E. balteatus* *+ A. fabae*	*C. 7-punctata* *E. balteatus*	*C. 7-punctata* *E. balteatus* *+ A. fabae*	*C. 7-punctata* *E. balteatus*	*C. 7-punctata* *E. balteatus* *+ A. fabae*

Results

Potato

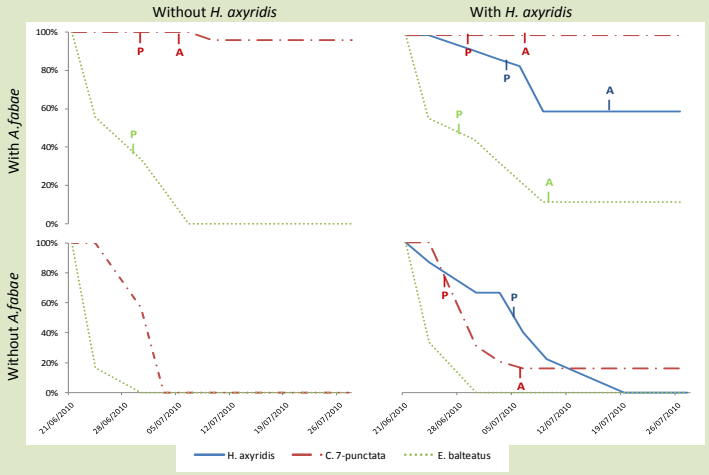

Fig1: Evolution in time of survival rates of *H. axyridis*, *E. balteatus* and *C. 7-punctata* in potato (P: start of pupae stage, A: start of adult stage)

The survival rate of aphidophagous species in potato was lower than in sugar beet probably because *A. fabae* reproduced less in potato. Nevertheless, we have observed in potato no mortality of C7 during all its development cycle. Eb was the species with the highest mortality rate. Without aphids Eb didn't reach pupae stage. Without aphids, Ha during its larval period had a higher survival rate than C7. Finally, at adult stage C7 is the species with the more alive individuals.

Sugar beet

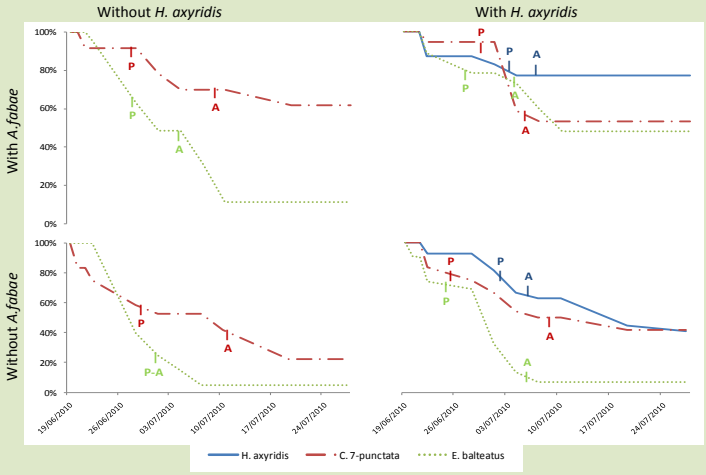

Fig2: Evolution in time of survival rates of *H. axyridis*, *E. balteatus* and *C. 7-punctata* in sugar beet (P: start of pupae stage, A: start of adult stage)

E. balteatus, as in potato, was the species with the highest mortality rate. The two coccinellid species had a better survival rate than Eb. All aphidophagous species had higher mortality rates in absence of aphids. Ha is the species with the highest survival rate. The larval period of Ha is longer than the other species making it a potential intraguild predator on pupae of other aphid enemies.

Conclusion

The survival rate of three aphidophagous species (*Harmonia axyridis*, *Episyrphus balteatus*, *Coccinella septempunctata*) commonly found in Belgian agro-ecosystems can be influenced by aphid amounts and interspecific interactions with the other aphid enemies. *H. axyridis* surviving more easily in sugar beet than in potato. *H. axyridis* had the longest development cycle, being still at the larval stage when *C. 7-punctata* and *E. balteatus* reached the pupae stage. Pupae are immobile and therefore more sensitive to the attack of predators. So, we can suppose that pupae of *E. balteatus* and *C. 7-punctata* were an alternative food (intraguild prey) for *H. axyridis* when aphids were lacking.

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