Entomopathogenic nematodes to control the Hibiscus Bud Weevil

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A challenging pest …

A concealed pest during development

Potential of biological control to reduced chemical dependence, while not necessarily restricting its use

Some biological control agents are compatible with insecticide and fungicide applications (i.e., entomopathogenic nematodes EPNs)

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Exploring biological control of the HBW

Even though several biological control options have been tested against similar pests, no biocontrol alternatives have been reported against the HBW

Preliminary observations demonstrated a very low, if any, activity of EPNs on adult weevils

But …

Foliar application of EPNs could be targeting larvae <u>developing inside flower buds</u>, either when they are still attached to plants and/or when they are dropped

Treatments:

Heterorhabditis bacteriophora

Steinernema carpocapsae

S. kraussei

S. feltiae

S. riobrave

Water control

**Cruiser foragers of the genus Steinernema received priority aiming for foliage applications*

Dosage:

500 IJ/bud approx. on top of naturally infested buds

Experimental units: individual buds from HBW colony at three different levels of larvae development (N = 10)

Larval development:

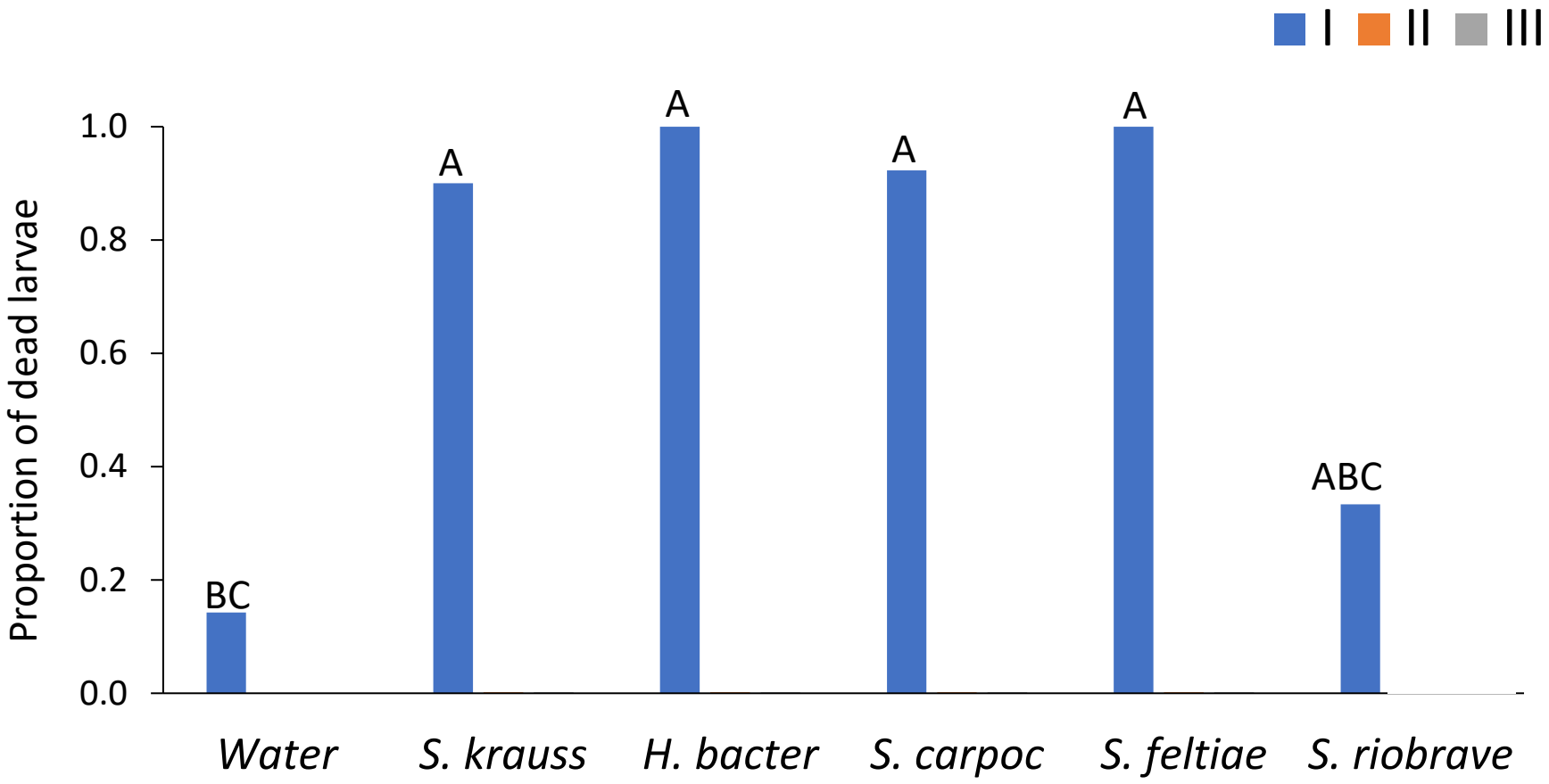
Buds were infested with adults 4, 8 and 12 days prior to EPNs application, which it translates in larvae reaching different larval instars

Infestation prior EPNs application (days)	Expected larval instar
4	I
8	II
12	III

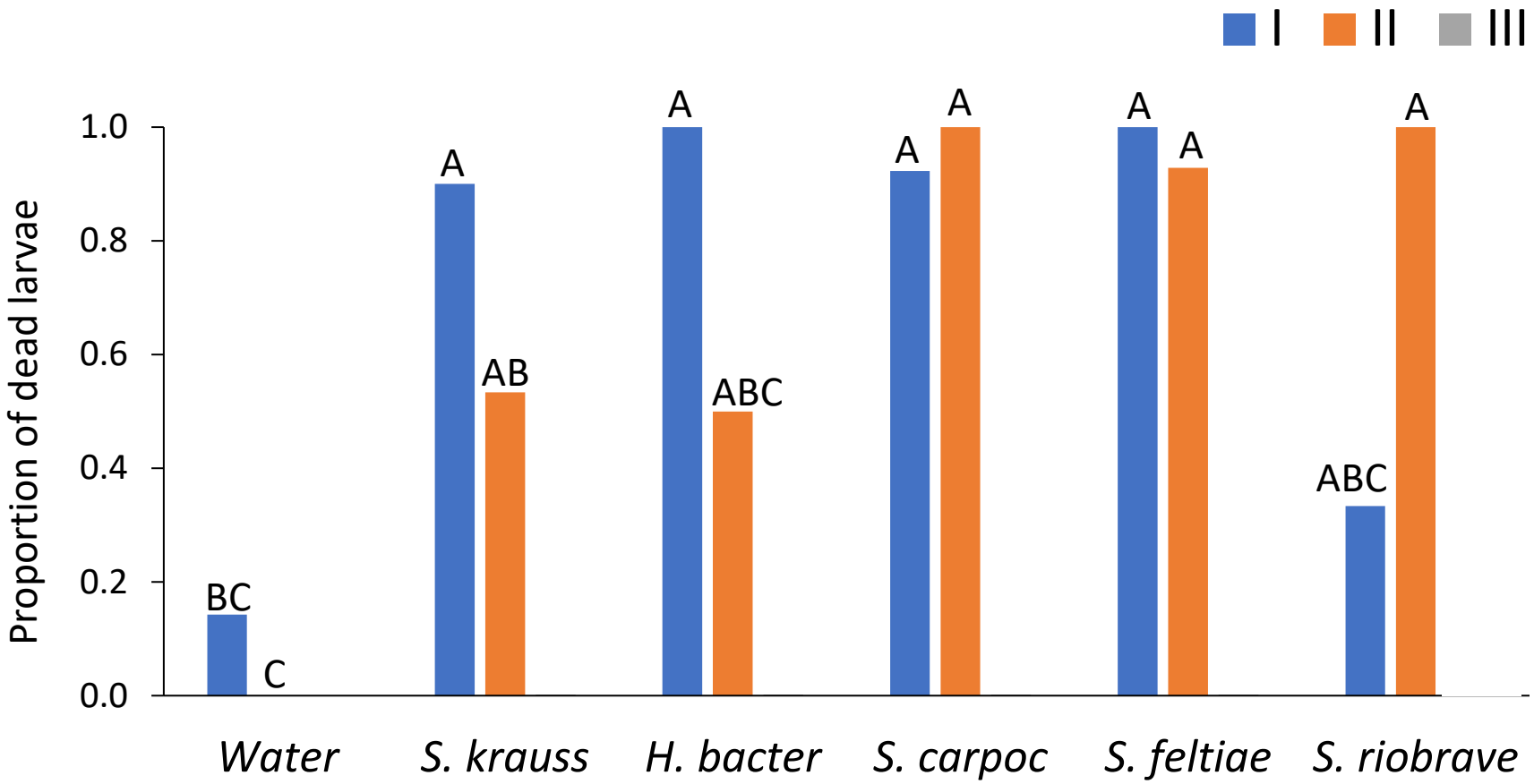
Observations were made 4 days after EPNs application:

number of surviving larvae and the number of larvae killed by EPNs per bud

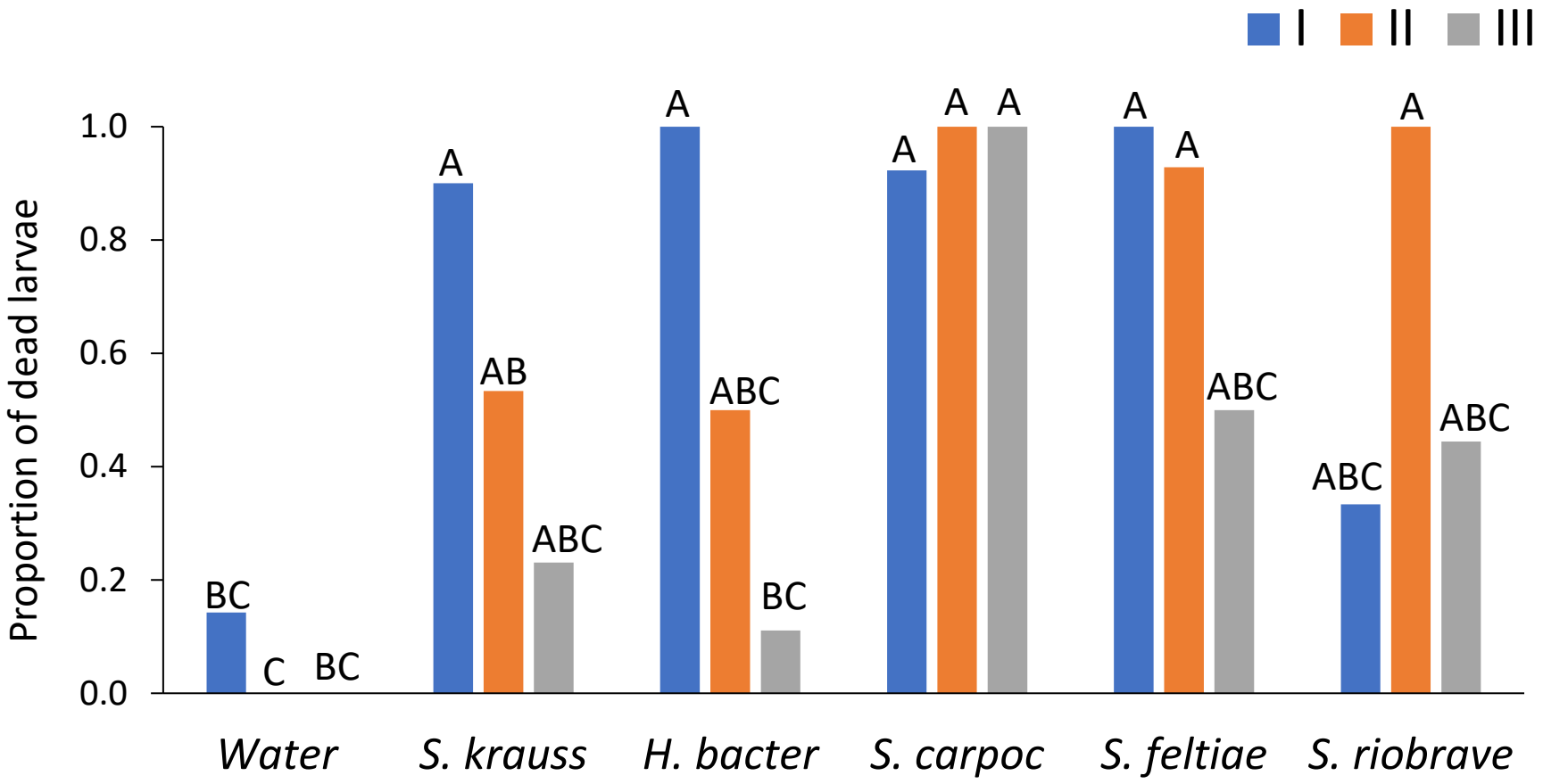
Proportion of dead larvae/bud



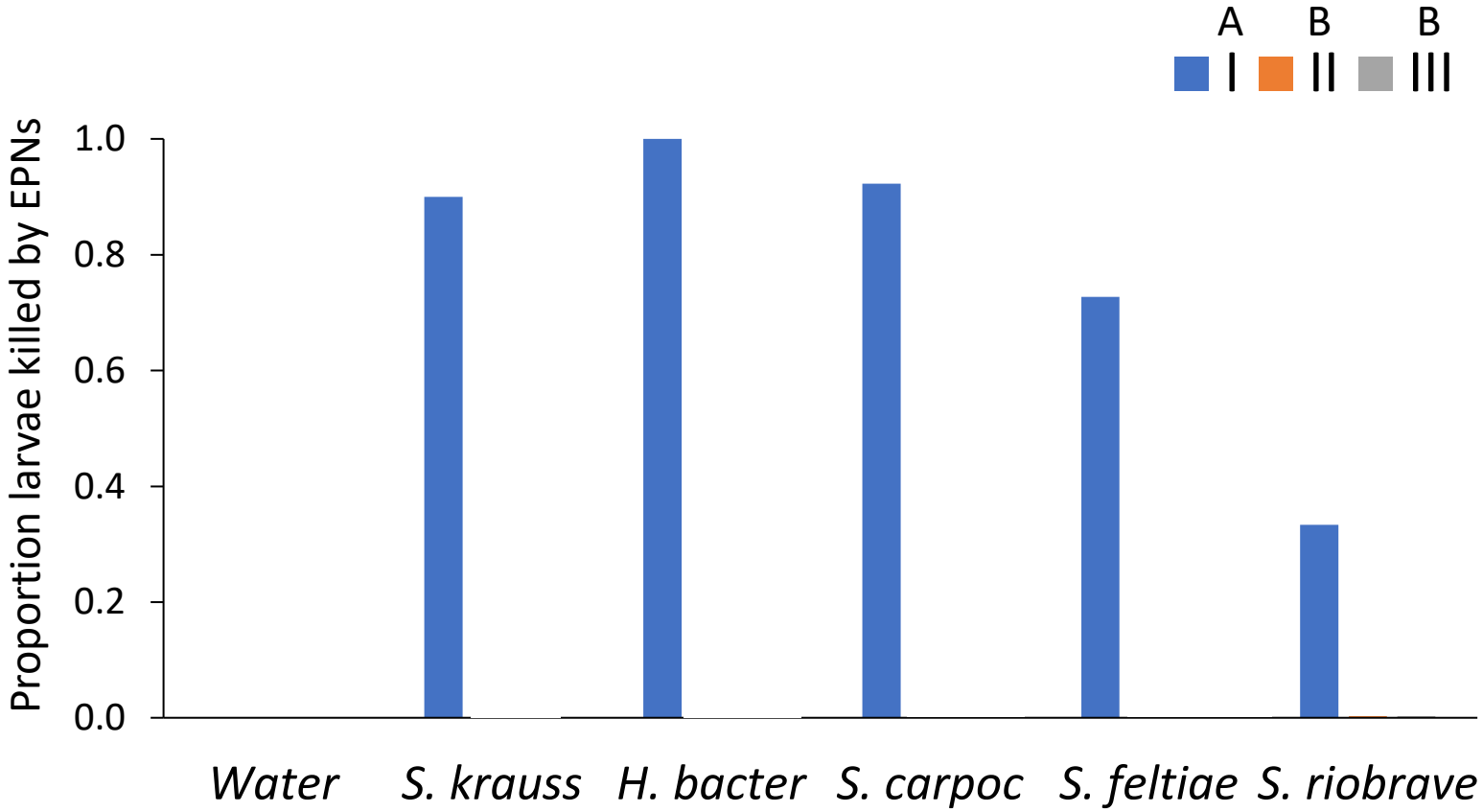
Proportion of dead larvae/bud



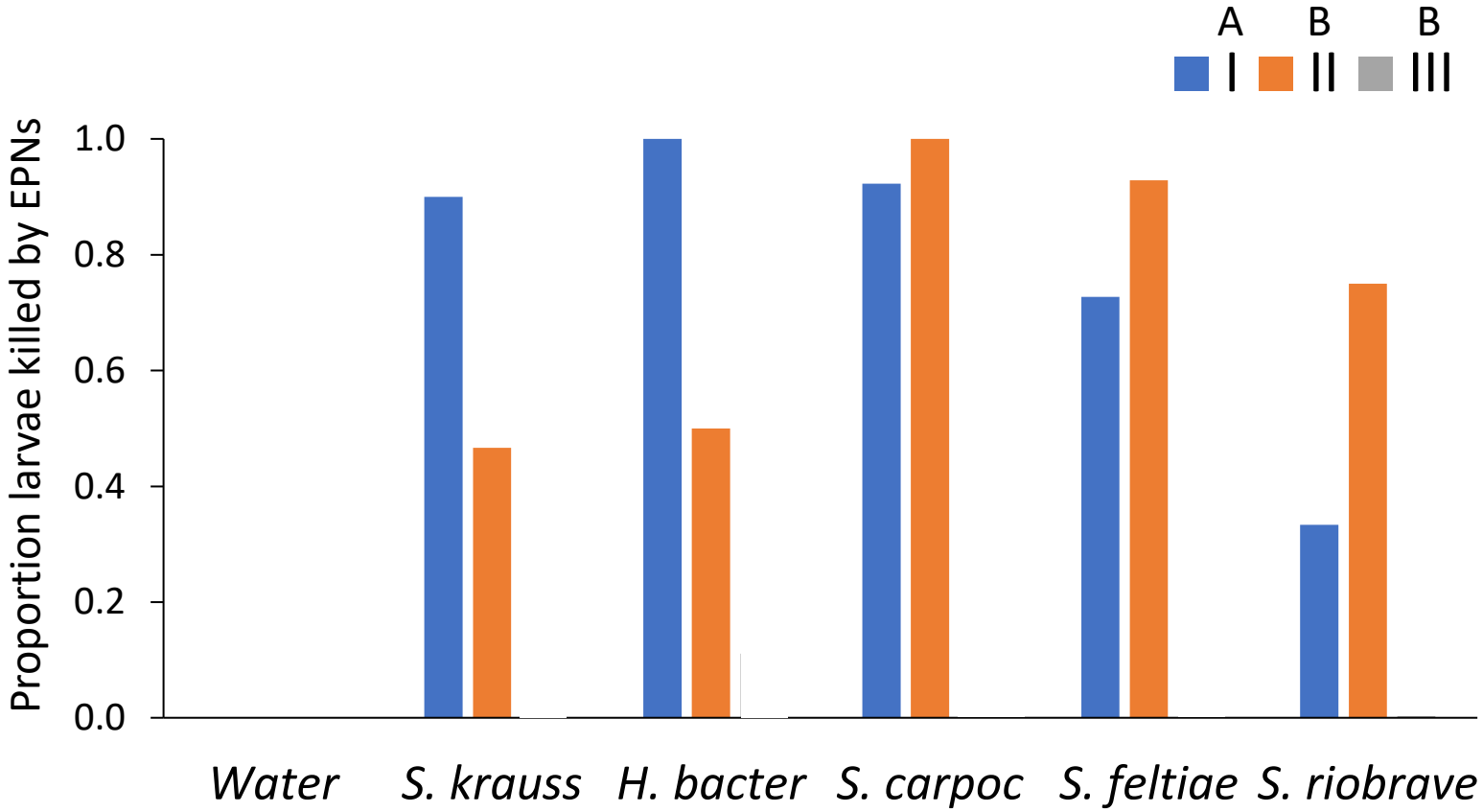
Proportion of dead larvae/bud



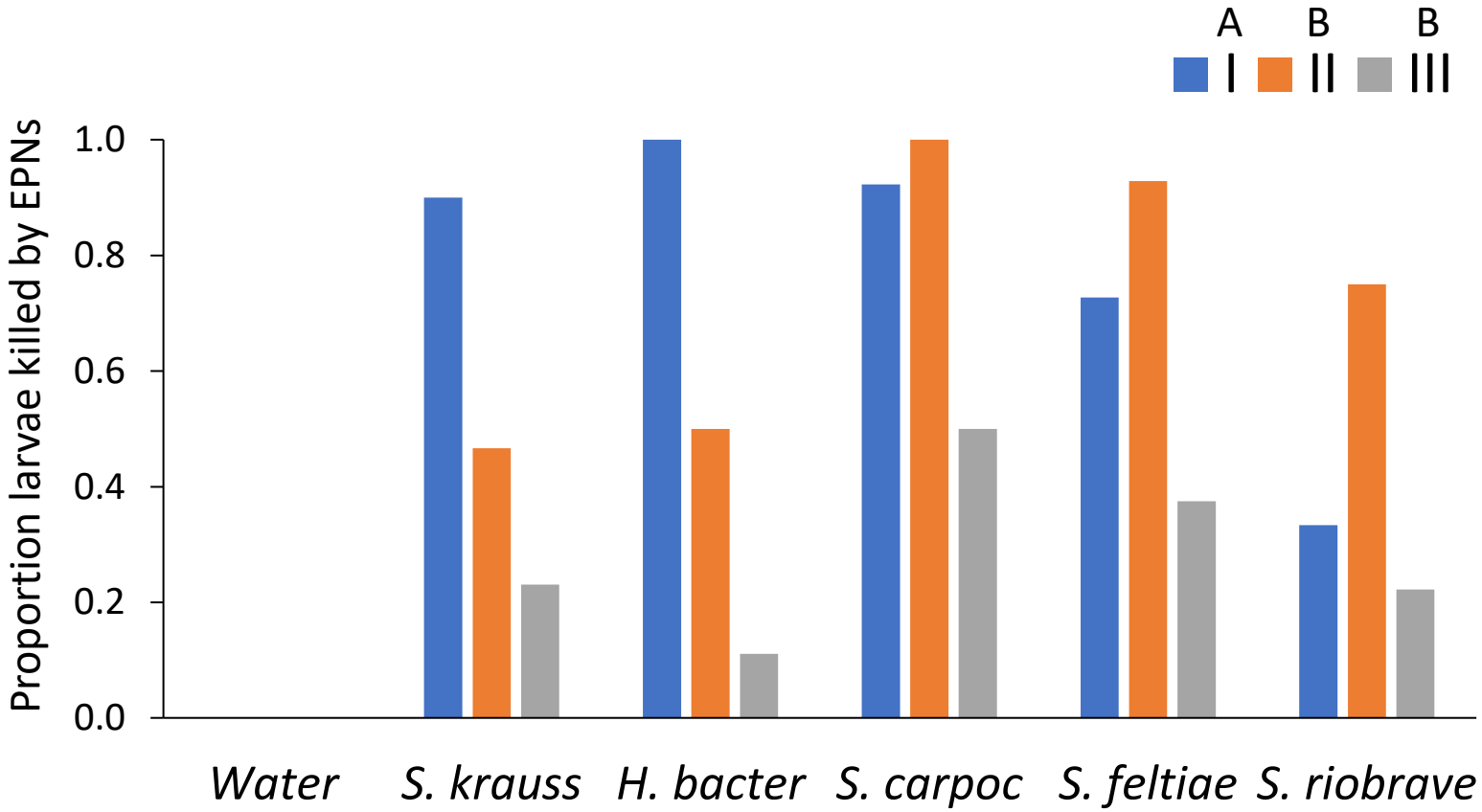
Proportion larvae killed by EPNs/bud



Proportion larvae killed by EPNs/bud



Proportion larvae killed by EPNs/bud



Additional observations …

In relation to pupation (from III instar larvae), we found different number of pupae in the treatments:

3 pupae in *S. kraussei*

4 pupae in *H. bacteriophora*

3 pupae in *S. feltiae*

4 pupae in *S. riobrave*

<u>while no pupae on *S. carpocapsae*</u>

Three larvae and 2 pupae in bud treated with *S. kraussei*

Steinernema carpocapsae infective juvenile egressing cephalic capsule of HBW larvae

Pilot trial of EPNs in the greenhouse

Testing *Steinernema carpocapsae* and *S. feltiae*, with and without Barricade®

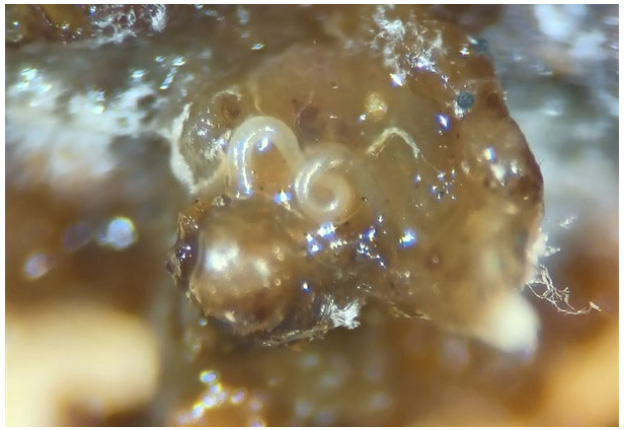
S. carpocapsae and *S. feltiae*

Final rate = 188.374 IJ/m2

Protectant: Barricade in a 0.3% concentration

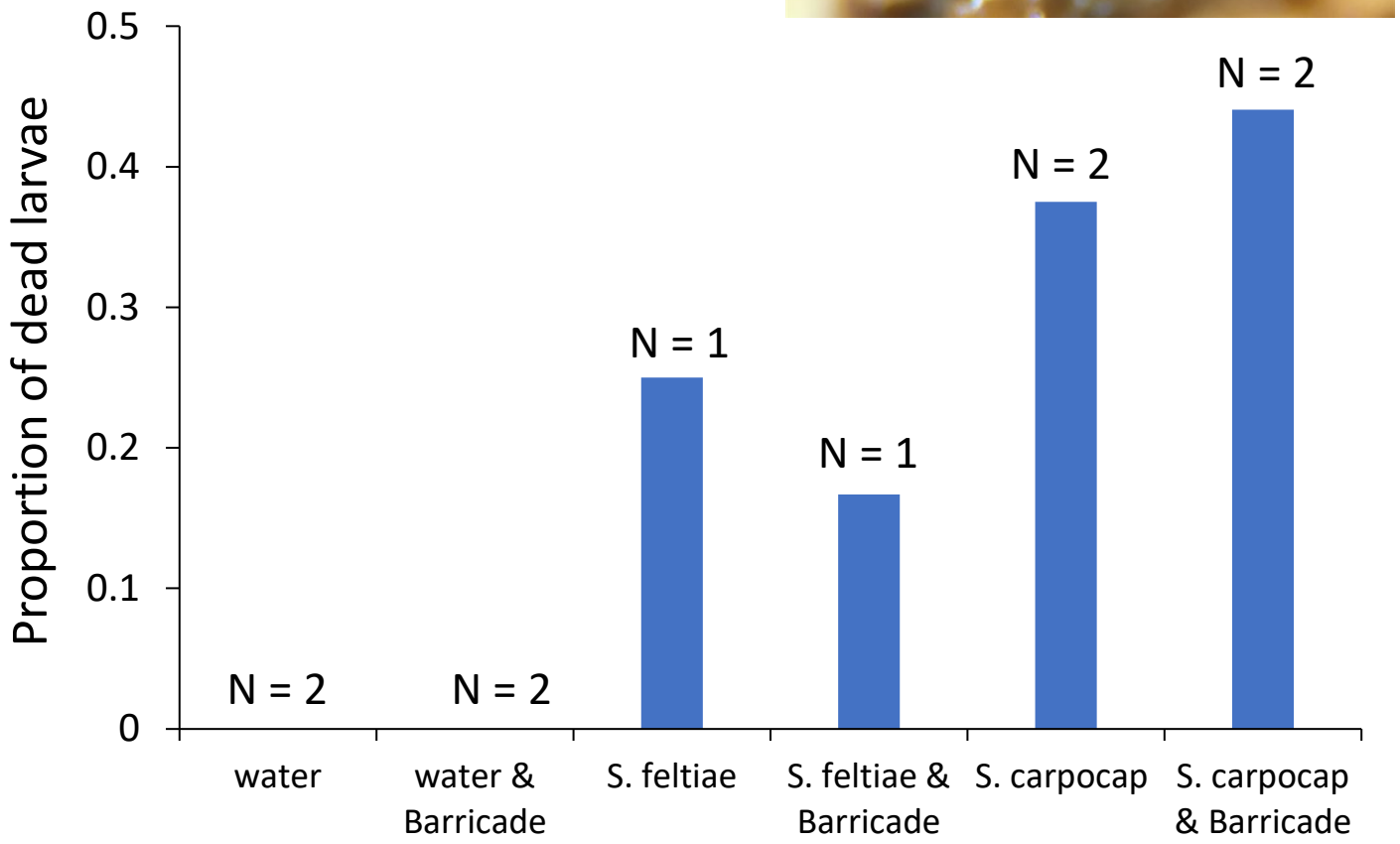
Treatments, N = 6; Painted Lady plants in individual cages

(1) Water,
(2) Water w/ Barricade,
(3) S. feltiae,
(4) S. feltiae w/ Barricade,
(5) S. carpocapsae,
(6) S. carpocapsae w/ Barricade.



Greater proportion of dead larvae on *S. carpocapsae*

Confirmation of larvae parasitized by EPNs only in *S. carpocapsae*



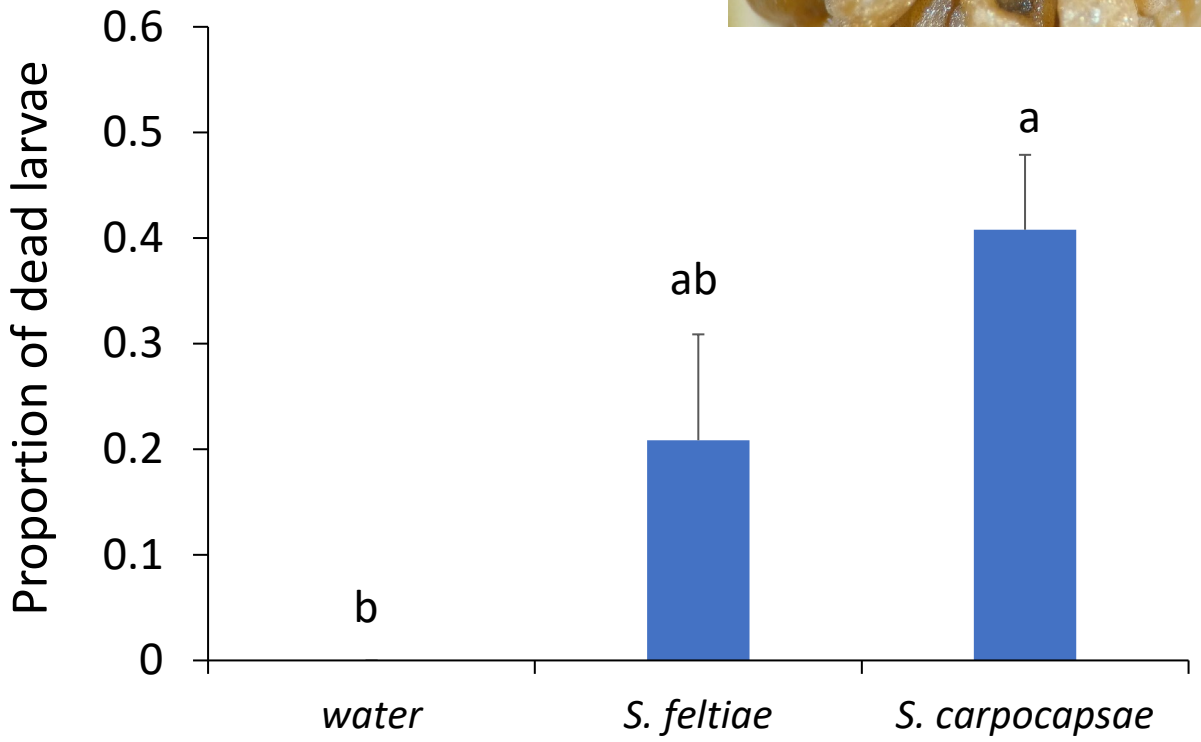
F = 2.04; df = 5, 9; P = 0.255

Pooling treats…

Greater proportion of dead larvae on *S. carpocapsae*

On main experiment adjusts on:

- 500.000 IJ/m^2 - recommended rate



Conclusions

The number of surviving larvae was lower in *S. carpocapsae*, *S. feltiae* in comparison to water control, especially in early and intermediate instars

Steinernema carpocapsae and *S. feltiae* tended to greater proportion of larvae killed by EPNs

Larvae treated in earlier developmental stages were more susceptible than those from more advanced stages.

Now working on …

We are testing *S. carpocapsae* and *S. feltiae* under greenhouse conditions, testing use of adjuvants (i.e., Barricade), rates of IJs and effects on fallen buds


The problem …

Future directions…

Future experiments will evaluate the effect of other entomopathogenic agents such as fungi, also trials on parasitoids such as the larval parasitoid *Catolaccus hunteri* are planned

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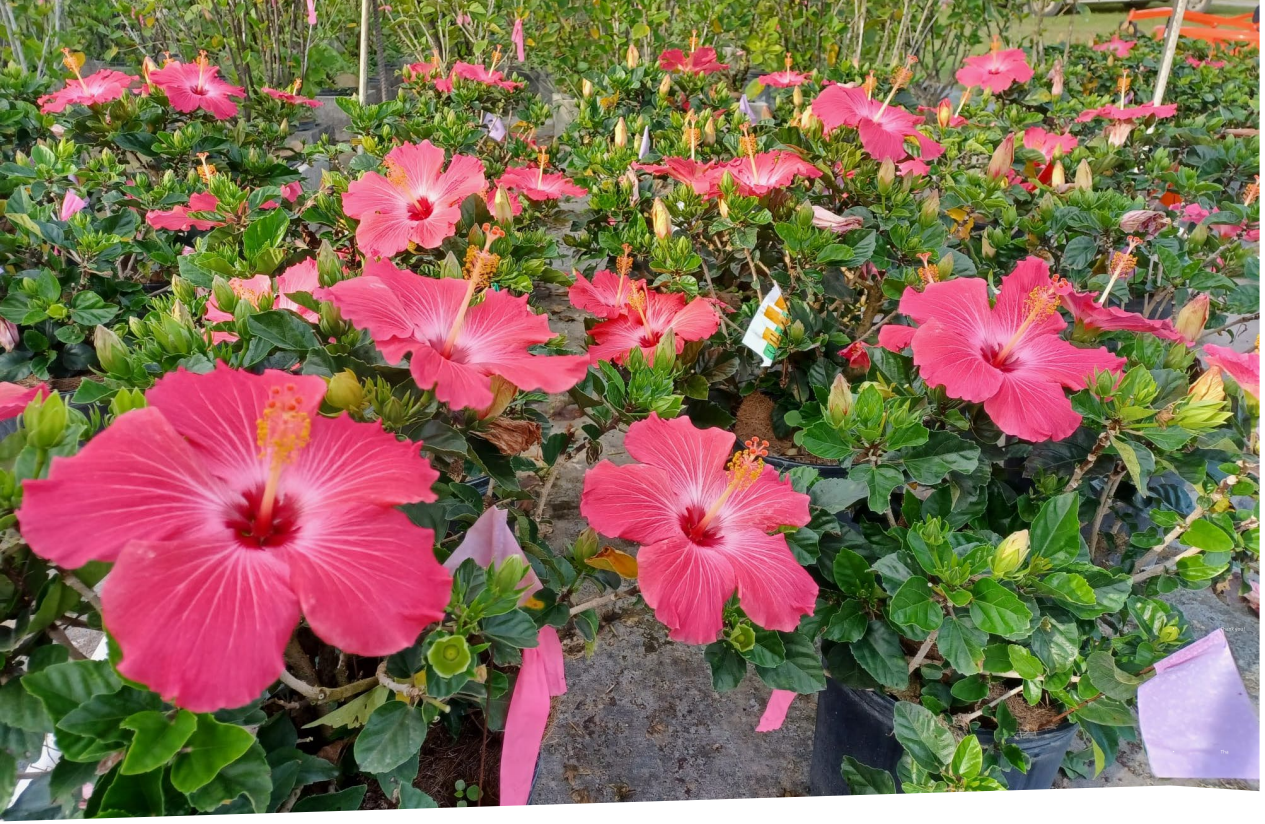

Thank you!