



# Integrated Pest Management (IPM) with local natural enemies in Saudi Arabia

H. van der Heide, G.J. Messelink, I. Tsafaras, J.B. Campen, H.F. de Zwart, W. Voogt, M. Qaryouti, E. Mohamed, S. Al Sahly, A. Al Faihi, S. Althobiti

## Background

Maintaining access to safe and healthy food for a rapidly growing world population is a major challenge for the 21st century. Greenhouse cropping systems offer a great opportunity to this challenge. Biological pest control has become the most important pillar in Integrated Pest Management (IPM) to achieve this goal. Unfortunately, the availability of natural enemies in Saudi Arabia are subjected to regulations and delivery times are long. This hinders adequate response to pests and to the quality of natural enemies. The mean pests in greenhouse crops in Saudi Arabia are identified as *Tuta absoluta*, Thrips, Whiteflies, Aphids, Spider mites and Russet mites. During field trips around Riyadh several potential natural enemies against these pests were identified which include *Orius* sp., two species of the genus *Coccinella* and *Chrysoperla* sp.

## Objective

This research project aims to identify the most common pest species in Saudi Arabia and find their local natural enemies, mass-rear them and test their efficiency in greenhouse crops in Saudi Arabia.

## Methods

- Two easy to rear but highly effective natural enemies are Orius and Chrysoperla (fig. 1A and B). Orius is an excellent Thrips predator and can be reared on several banker plant species including *Tagetes*, *Calendula*, *Alyssum* and *Sedum* with supplemental food such as sterilized *Ephestia kuehniella* eggs and high quality *Artemia* cysts. Orius can be collected and released into the greenhouse, or banker plants can be placed directly inside the greenhouse to let Orius spread naturally (figure 1A.).

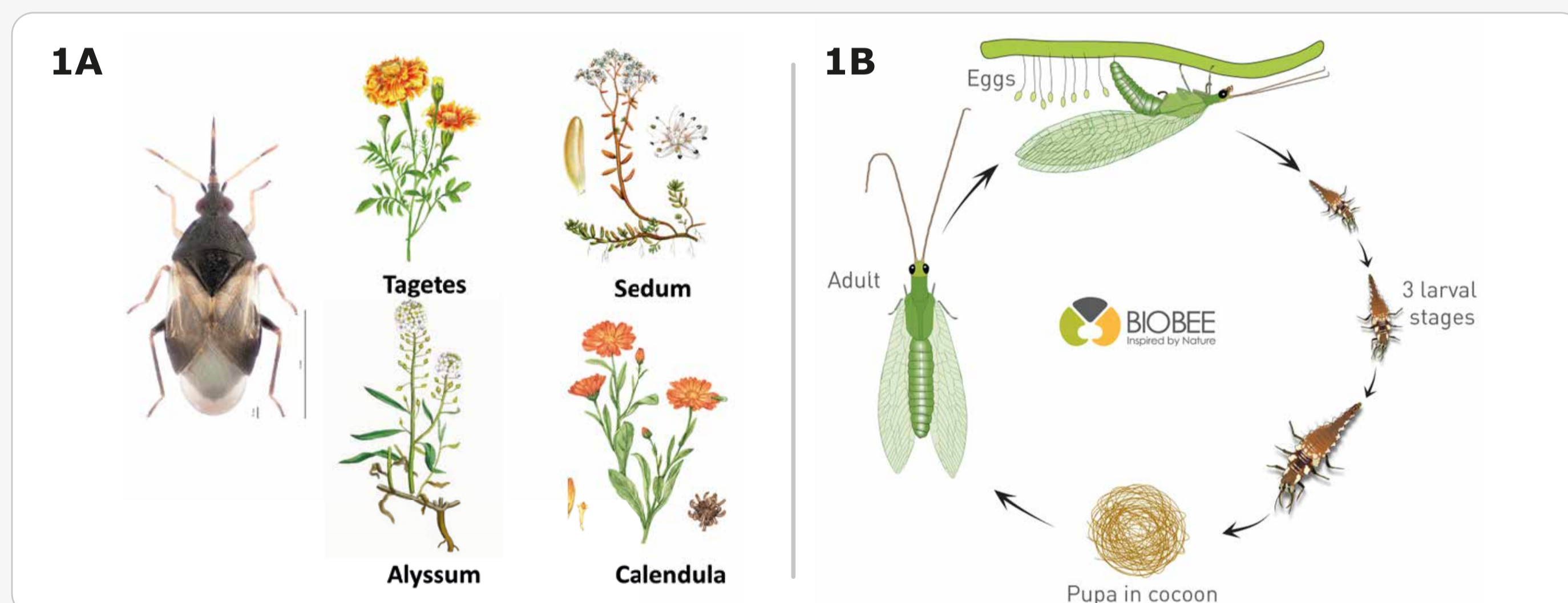


Figure 1.A. Orius and suitable bankerplants. 1B. The life cycle of Chrysoperla.

- The rearing of Chrysoperla is split into two; one for the adults and one for the larvae. The adults feed on flower pollen and nectar. The rearing is done in buckets with a layer of buckwheat husks as a hiding substrate and a piece of string as egg-laying substrate. As a food and water source the buckets are provided with honey water in cotton and pollen (figure 2 A-D.)

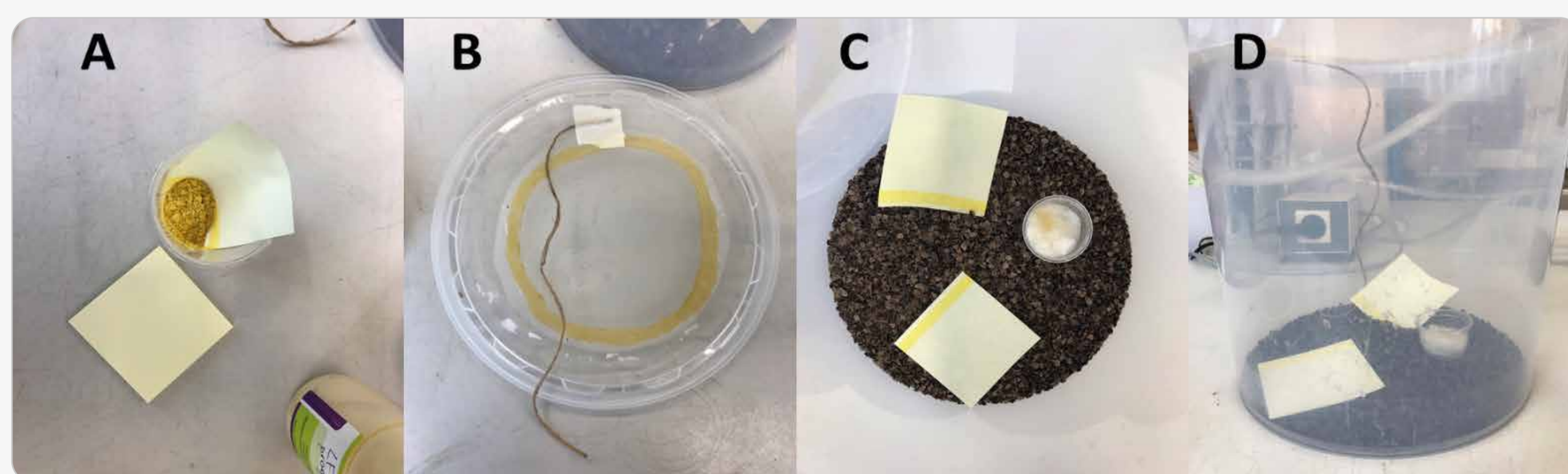


Figure 2.A-D. Rearing buckets for Chrysoperla adults.

- The larvae of Chrysoperla are ferocious aphid predators (fig. 1B). They are reared in the same buckets as the adults but are fed with sterilized *Ephestia kuehniella* eggs twice a week. The larvae can be collected from the rearing and introduced in aphid or spider mite colonies to control the pest.

## Results

- The rearing of Orius on Calendula and Tagetes was contaminated with Whiteflies, Thrips and Macrolophus.
- Macrolophus competes for the same food as Orius and can also feed on Orius nymphs (intraguild predation) limiting the population build-up of Orius.
- Chrysoperla was encountered multiple times in the field, but a mass-rearing is yet to be started.

## Conclusion

- Strict hygiene protocols must be followed to prevent the spreading of pest insects into the insect rearings.
- Strict working orders must be followed to prevent unwanted spreading of natural enemies between rearings.

## Discussion

- Orius and *Chrysoperla* rearings can be started with locally collected *Coccinella septempunctata* (Fig. 3A) or *Coccinella undecimpunctata* (Fig. 3B).
- C. septempunctata* was already successfully reared in ESTIDAMAH (Fig. 3C).

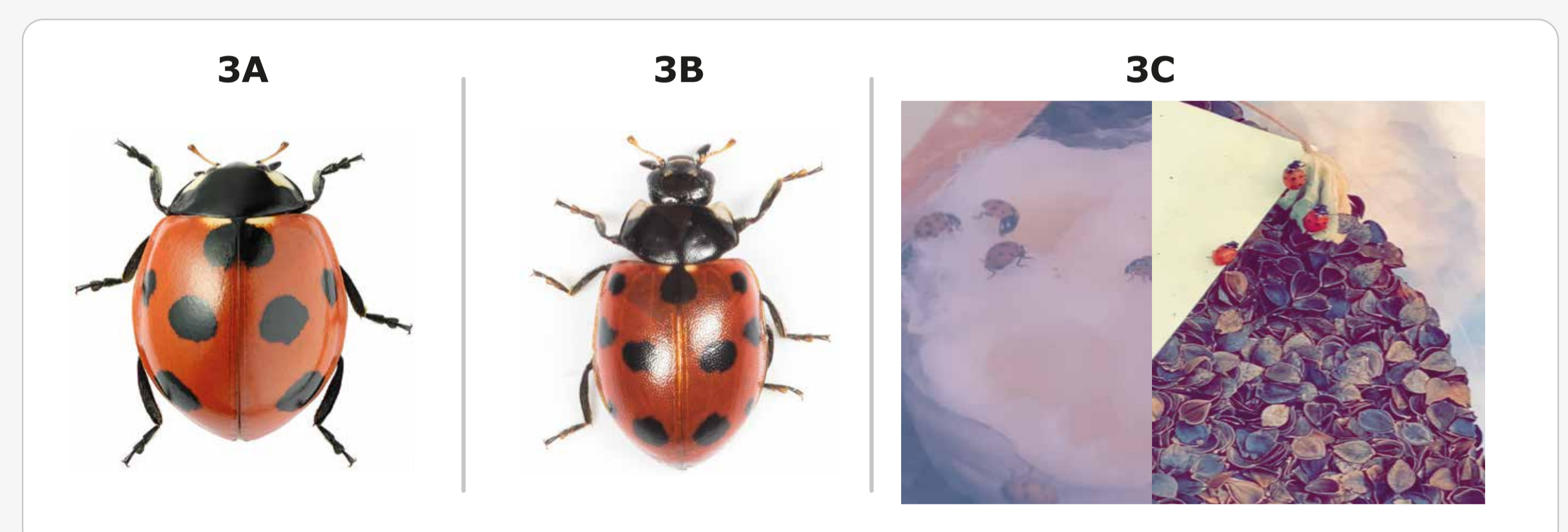


Figure 3A. *Coccinella septempunctata*. 3B. *Coccinella undecimpunctata*. 3C. Rearing of *Coccinella septempunctata* in ESTIDAMAH.

- Besides local natural enemies the commercial aphid parasitoids *Aphidius colemani* and *Aphidius ervi* can be reared on wheat bankers with respectively *Rhopalosiphum padi* or *Sitobion avenae* aphids (Fig. 4).
- Wheat bankers with aphids can be placed in the greenhouse to maintain a population of parasitoids during the entire cultivation.



Figure 4. Bankerplant system with wheat, aphids and *Aphidus* sp.

