Biology of the green lacewing *Chrysoperla carnea* and its use in biological control

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Outline

- **Biology**
  - Taxonomy
  - Life cycle
  - Nutrition
  - Natural enemies
- **Use in biological control**
  - Application
  - Limitations
  - Experiments to field application
  - Integrated pest management
Taxonomy

- **Chrysoperla carnea** (green lacewing)
- **Class:** Insecta
  - **Order:** Neuroptera
    - **Family:** Chrysopidae
      - **Genus:** Chrysoperla
        - **Species:** carnea

- **Distribution:**
  - worldwide except Australia
  - low vegetation, shrubs, trees
  - lowlands till above the timberline

Life cycle

- Holometabolous
  - Imago deposit eggs either in groups or solitary
  - 3 larval stages
  - Pupation: 2-layered kokon

- Multivoltin: 2-3 generations per year
Life cycle

• Facultative diapause:
  – Overwintering as adult
  – Color change in autumn from green to brown, in spring reverse

• Mating behavior: vibrations of abdomen to attract the mating partner

Nutrition

• Larvae:
  – Predatory stage: aphids → “aphid lion“, mites, lepidopteran eggs,…
  – Cannibalism → eggs on stalk
  – Actively search for the prey
  – Specialized mouth parts
  – Extraintestinal digestion

• Adults:
  – Honey dew, pollen, fungi, algae
Natural enemies

• Parasitoids: important mortality factor
  – Larval parasitoids: Braconidae, e.g. Chrysophthorus chrysopimaginis, Hemiteles floricolator
  – Pupae parasitoids
  – Egg parasites: Telenomus spec.

• Parasites
  – On imagos: ectoparasites, e.g. sucking dipterans

• Predators
  – Larval predators: larvae of ladybird (Coccinellidae)
  – On imagos: birds

Biological control

• Application:
  – In greenhouses
  – In some row crops

• Inundative release

• Prerequisites for use in biological control:
  – Larvae are voracious predators
  – Adaptable
  – Multivoltin \(\rightarrow\) mass rearing by breeding companies
Apply of *C. carnea*

- Release as eggs or larvae
- Eggs are separated from each other -> prevent cannibalism
- Mostly applied by hand
  - Spread application (greenhouse)
  - Spray application (in the open land)
- Careful handling
  - Survival of eggs during procedure of applying

Limitations

- Intraguild predation: Vulnerable to predation from other predators (mainly parasitoids) → better suited for greenhouse use where presence of other predators can be managed
- Larvae disappear when the amount of prey decreases
- Imago leave the greenhouse → cannot be established
- Constraints in the field application
Experiments to application-methods in the open land (Löchte, 1995)

- Cultivars: *Vicia faba* and *Beta vulgaris* subsp. *vulgaris*
- *C. carnea* applied as eggs or larvae
- Application methods:
  - Spread application
  - Spray application over closed plant population
  - Spray application in rows
- Problems:
  - Mortality/ Hatching rate
  - Adherence of the eggs to the plants → low recovery rate

Application of *C. carnea* as part in the integrated pest management

- Tolerance against pesticides
  - Compared to other insects (Wilkinson et al. 1975)
- Great differences in sensitivity in different larval stages:
  - Larvae of 3. stage less vulnerable to insecticides (Kowalska & Pruszynski after Bay et al. 1993)
- Integrated pest management possible, but if tolerance of *C. carnea* against a certain pesticide is not clear the sensitivity should be tested
Green lacewing *Chrysoperla carnea*

References

- Wachmann, Ekkehard / Saure, Christoph: Netzflügler, Schlamm- und Kamelhalsfliegen, Naturbuch-Verlag, Augsburg 1997
- http://bugguide.net/node/view/9107 accessed on 23.1.12

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Thanks for your kind attention!