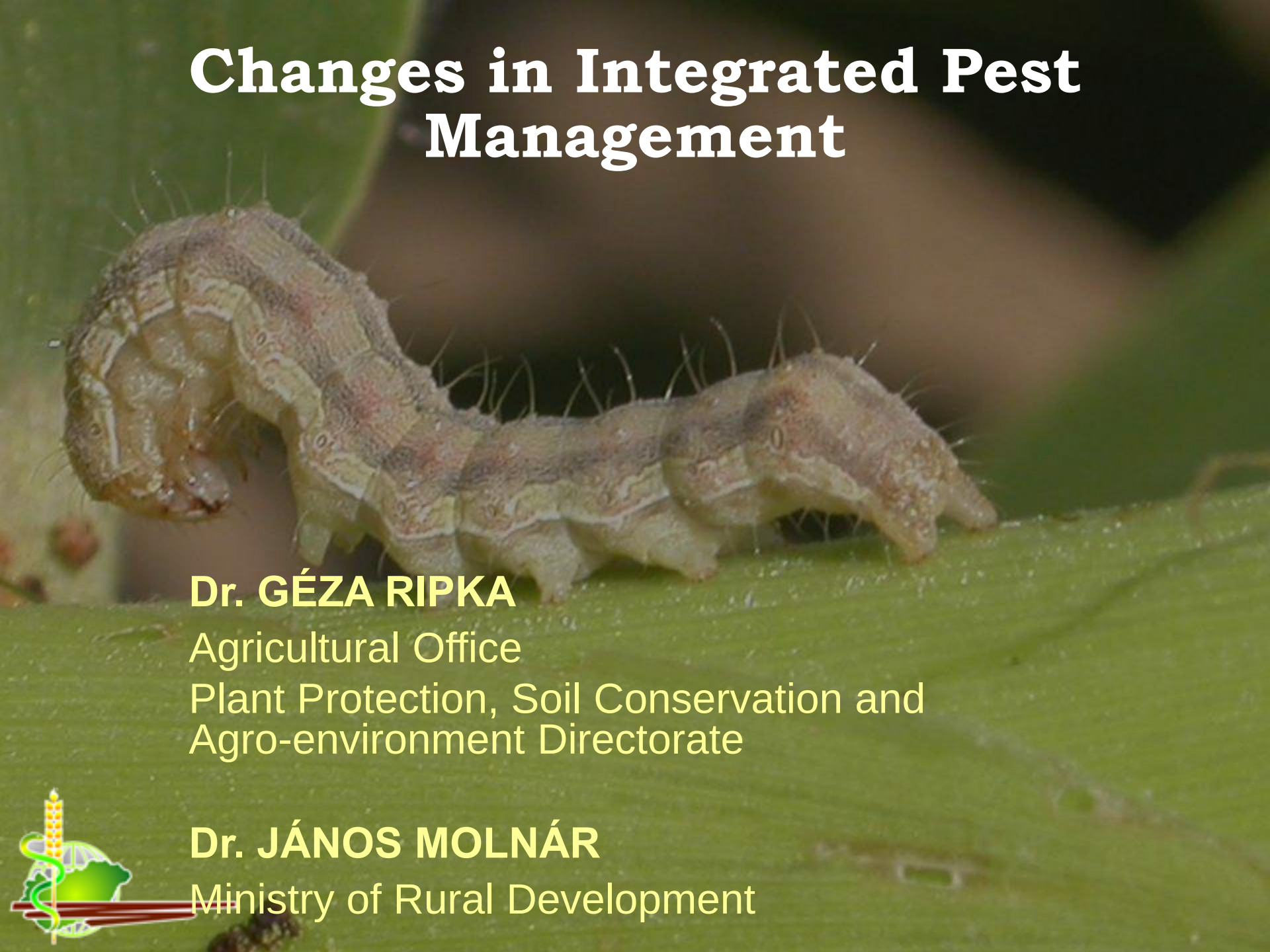
# Changes in Integrated Pest Management



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# Agriculture in New Millenium

- Ownership change
- Joining the EU
- Changing agriculture
- Changing rural population
- Changing laws and regulations
- Shrinking list of pesticides (terbufos, phosfamidon, diazinon, fenitrothion, malathion, dichlorvos, carbofuran, bensultap, etc. Non-inclusion/withdrawal)
- New EU Regulation 1107/2009/EC
- New Directive 2009/128/EC

**In some MS European water vole** *(Arvicola terrestris)* **and hamster** *(Cricetus cricetus)* **are protected, i.e. their control is forbidden**

# IPM meaning

- **Protection of natural resources** parallel with production of excellent quality
- Production aim – according to consumers' expectation -
  - healthy plant with **limited use** of mineral fertilizers, **PPPs** and chemical additives,
  - biological diversity,
  - keeping pests under economic (action) threshold using selective treatments,
  - maintaining insurance of profitability.

# IPM

- Role and significance of **beneficial living organisms** are different in the pest management of field crops and orchards
  - fruit orchards, or grapevines – several yrs
  - arable crops – one year

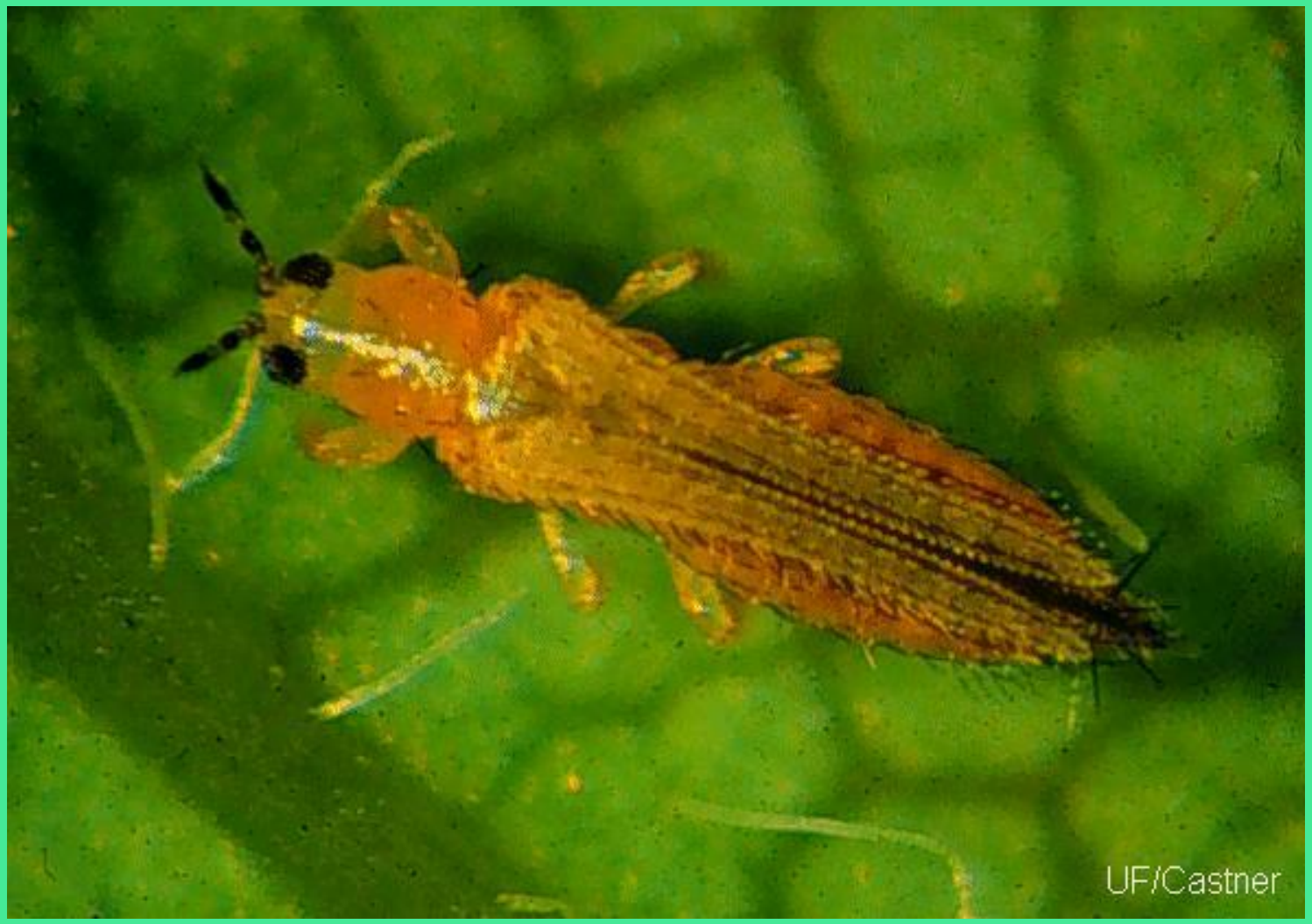
# Phytosanitary problems

- ***Invasive pests***
  - **Cultivated areas**
  - **Natural habitats**

# New pests, diseases & weeds

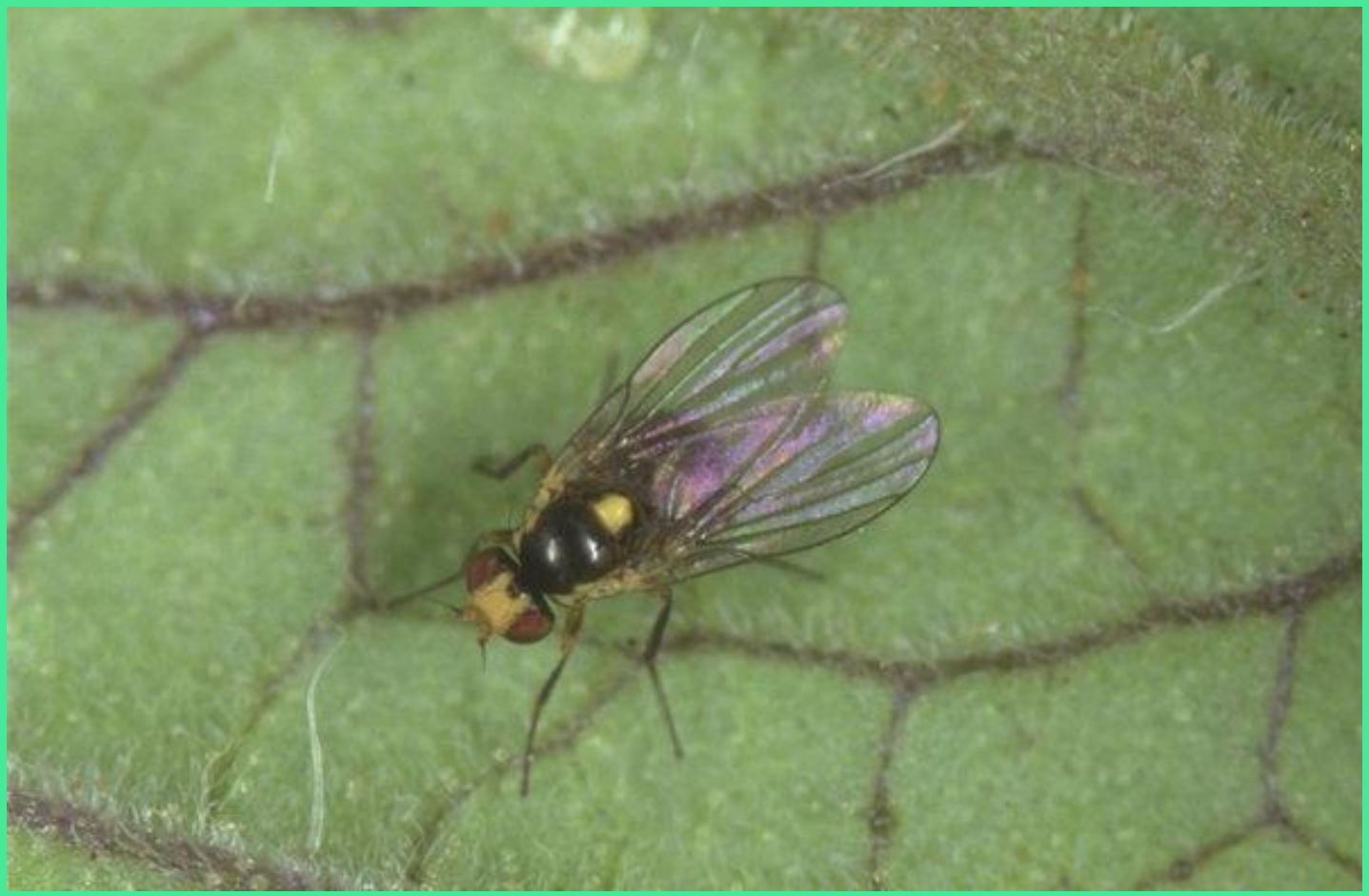
- ***Frankliniella occidentalis*** **western flower thrips**
- ***Cameraria ohridella*** **horse chestnut leaf miner**
- ***Diabrotica virgifera virgifera*** **Western corn rootworm**
- ***Liriomyza huidobrensis*** **pea leaf miner**
- ***Rhagoletis cingulata*** **Eastern cherry fruit fly**
- ***Erwinia amylovora*** **fire blight**
- ***Ralstonia solanacearum*** **brown rot bacterial wilt**
- ***Monilinia fructicola*** **brown rot, twig canker**
- ***Cyperus esculentus*** **yellow nutsedge**
- ***Tuta absoluta*** **tomato leaf miner**

# *Frankliniella occidentalis*



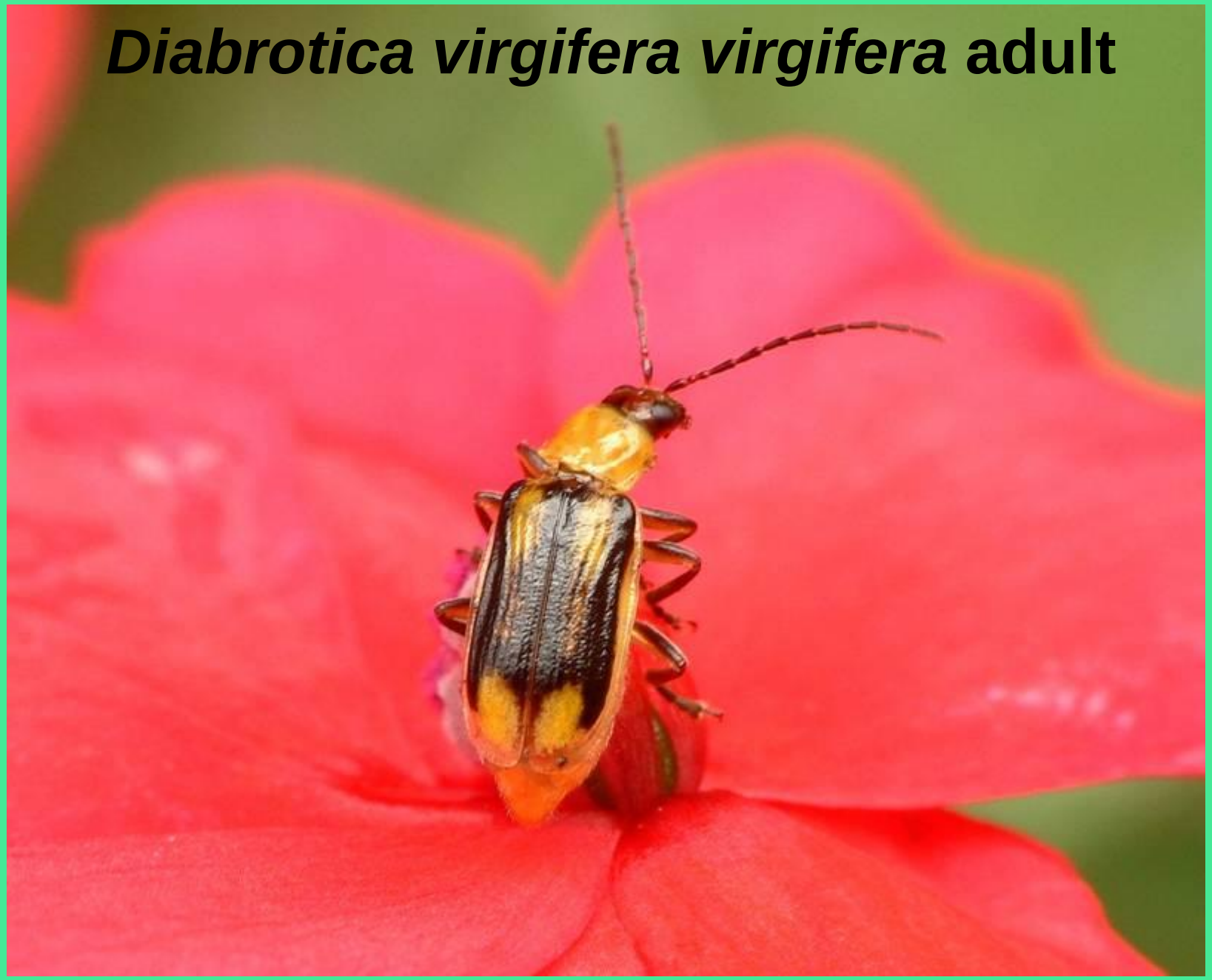
# Damage caused by *Tuta absoluta*

# *Liriomyza huidobrensis* adult



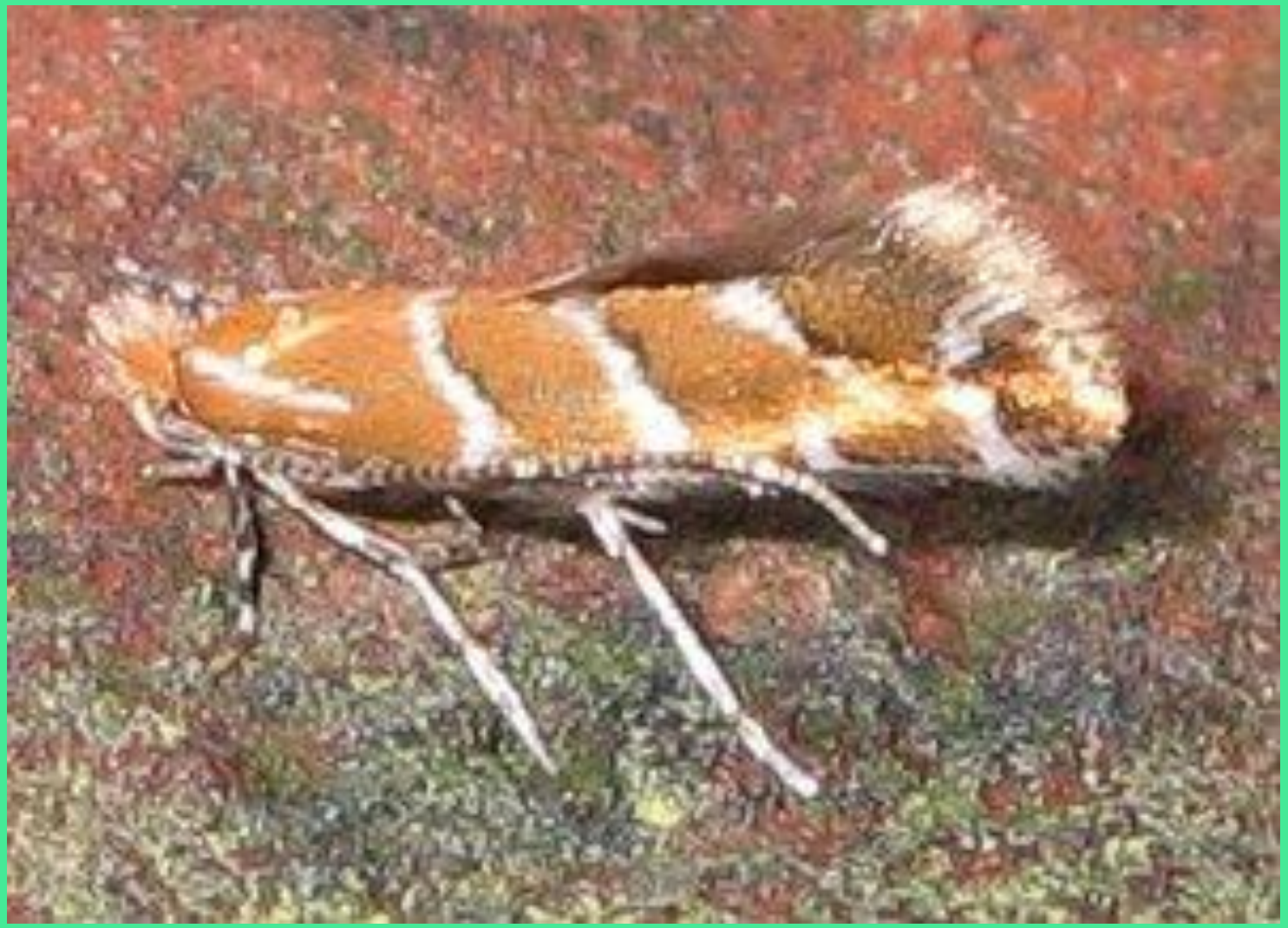
# Pupa of and damage caused by *Liriomyza huidobrensis* on pea

# *Diabrotica virgifera virgifera* adult




Plant lodging due to larval root damage

# *Cameraria ohridella* adult



# *Cameraria ohridella* larva

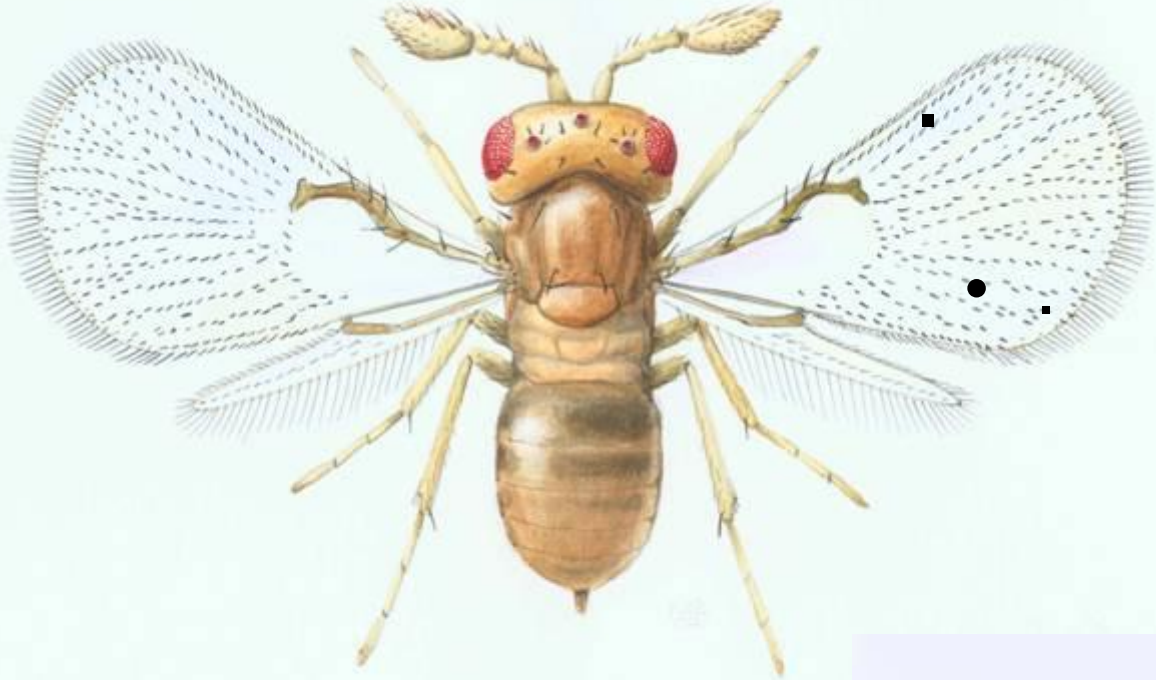
# *Cameraria ohridella* damage

# Selective pesticide use

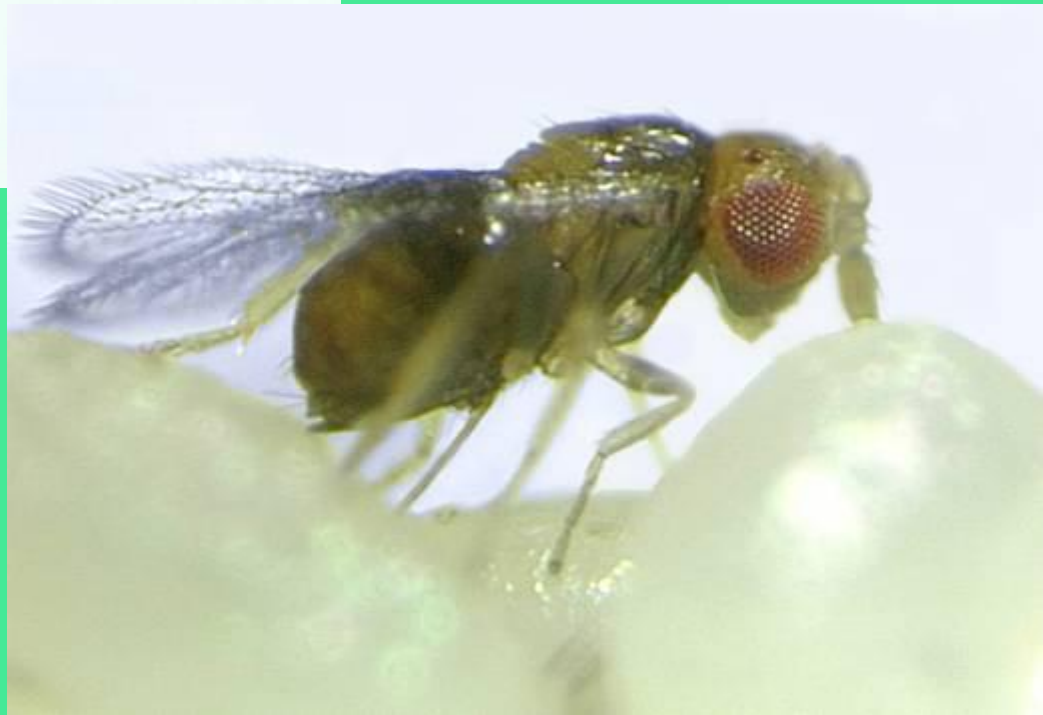
- Use of **natural control mechanisms**:
  - support of predator, parasitoid sp.
- **Specific**, not wide spectrum pesticides
- **Insect growth regulators** a.i.
  - e.g. chitin-synthesis inhibitors, juvenoid, etc.
- **Delaying development of resistance** in pests
- Biological control (e.g. *Bacillus thuringiensis*)
- Attractive a.i. (e.g. cucurbitacin)
- **Mating disruption** to control moths
- **Possible less pollution of soil, water and air**

# Useful biological agents

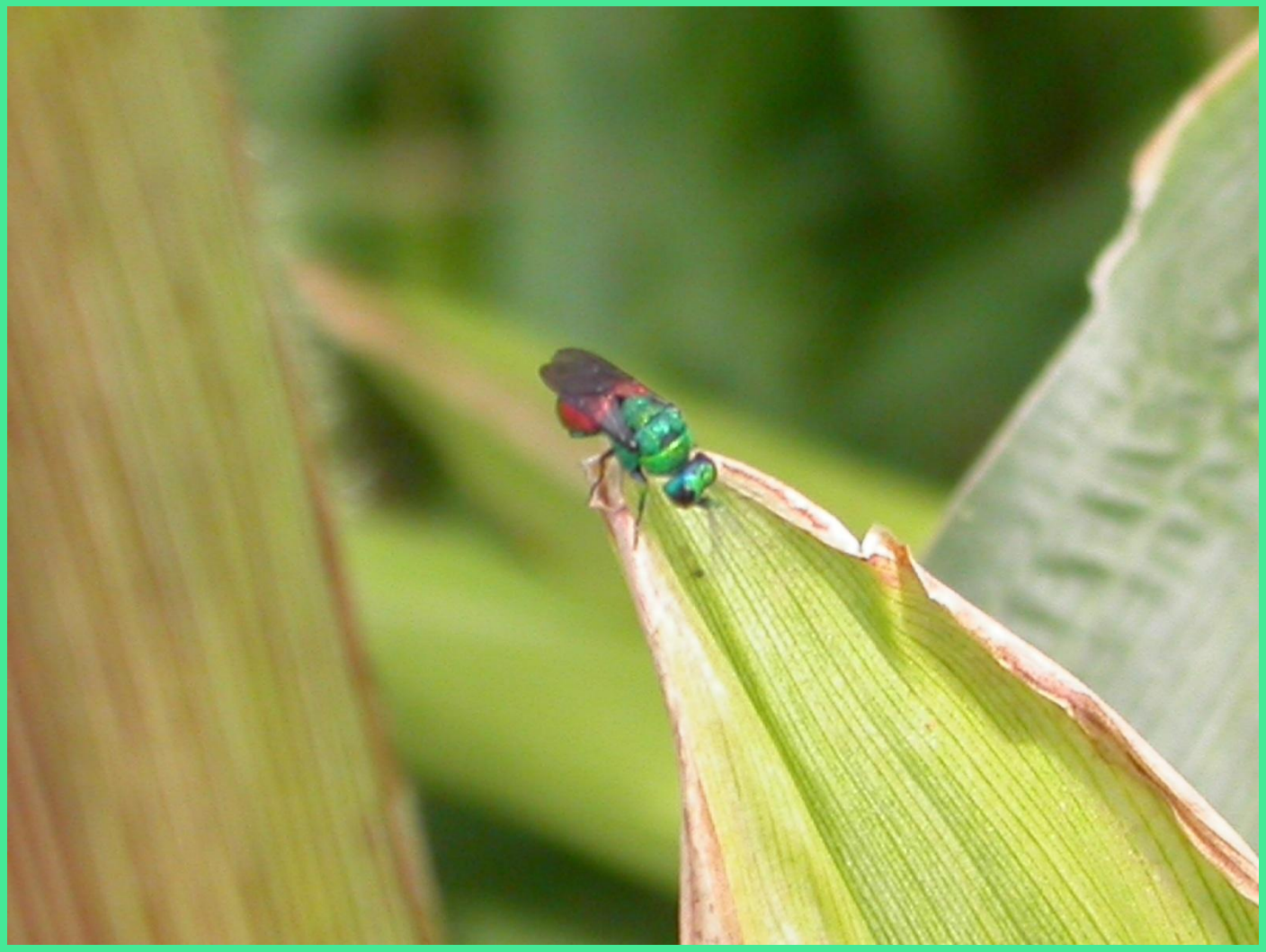
- ***Encarsia formosa*** (to control whitefly)
- ***Diglyphus isaea*** (to control flies)
- ***Dacnusa sibirica*** (to control flies)
- ***Eretmocerus californicus*** (to control whitefly)
- ***Macrolophus caliginosus*** (to control whitefly)
- ***Phytoseiulus persimilis*** (to c. spider mites)
- ***Trichogramma* spp.** (to control lepidopteran species)
- ***Heterorhabditis* & *Steinernema* spp.** (to control the larvae of weevils and flies)



- ***Trichogramma***
  egg parasitoid

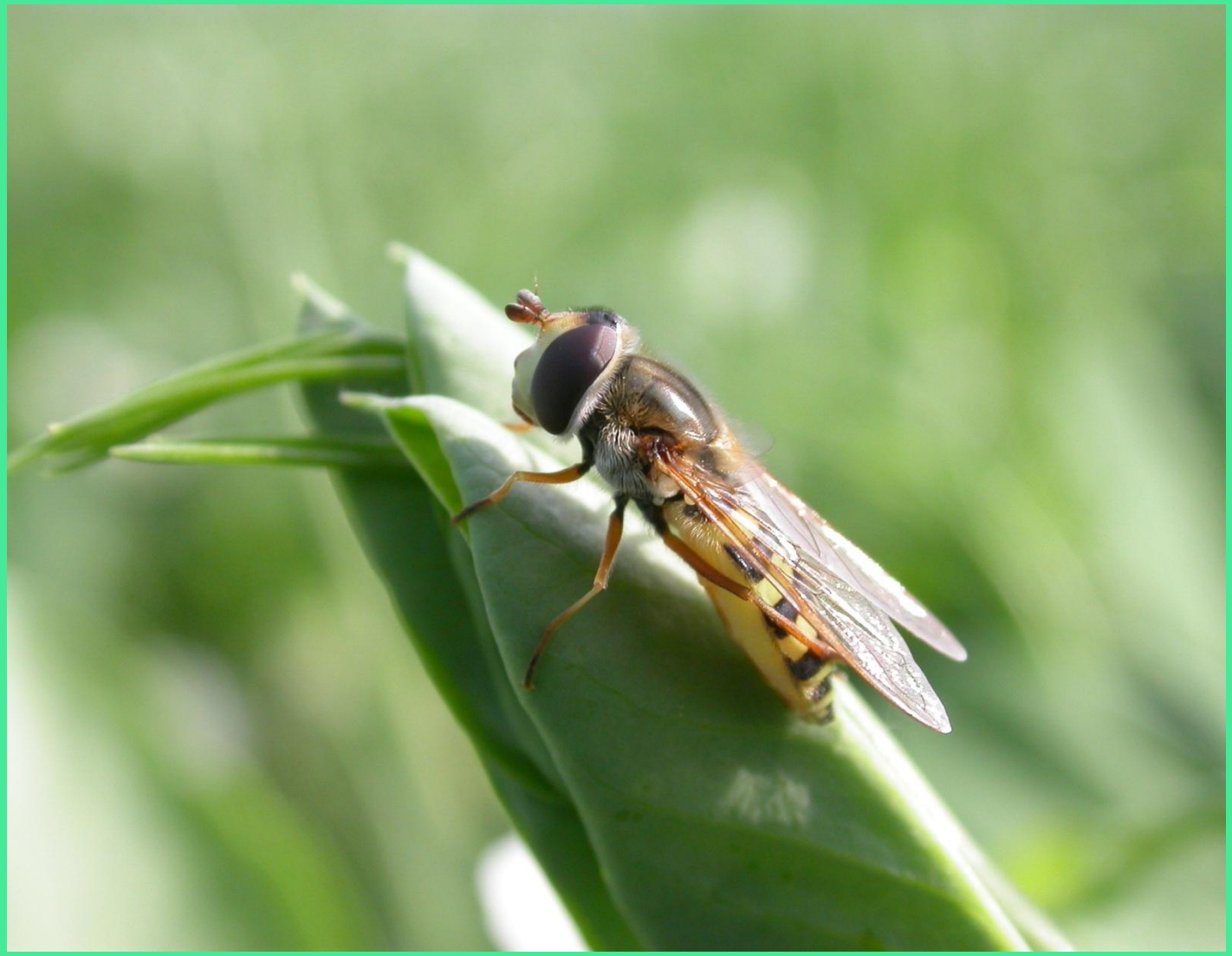


# Chalcid wasp adult



# Hoverfly /Syrphiade/ larva

# Hoverfly /Syrphiade/



# Biopesticides
## 1. Fungicides

- ***Coniothyrium minitans*** (Koni WG – to control *Sclerotinia*)
- ***Streptomyces griseoviridis*** (Mycostop – to control *Fusarium*)
- ***Trichoderma harzianum*** (Trichodex WP – to control *Botrytis*)

# Biopesticides
## 2. Insecticides

- ***Bacillus thuringiensis*** Dipel, Dipel ES – to control lepidopteran larvae; Novodor FC – to control the larvae of Colorado potato beetle
- ***Beauveria bassiana*** Naturalis-L – insect pathogen fungus – to control whitefly
- **Carpovirusine** (granulose virus M) – to control codling moth
- **Ethylalcoholic plant extract** Fito-Insect – to control aphids
- **(azadirachtin** – botanical insecticide to control moth)
- **Nemasys-M** (*Steinernema f*.) – to control the larvae of fungus gnats
- **Nematop** (*Heterorhabditis b*.) – to control the larvae of weevils

# 3. Insecticides (cont.)

- **Isomate OFM Rosso** – **Mating disruption** to control moth
- **Isomate CLR** – **Mating disruption** to control moth
- **Isonet A** – **Mating disruption** to control moth
- **Isonet L plus** – **Mating disruption** to control moth
- **SpinTor** (spinozad) – to control butterfly, thrips
- **Teppeki 50 WG** (flonicamid) – to control aphids
- **Biscaya** (tiacloprid) – to control beetles, moths, flies in maize, sunflower, rape
- **Affirm** (emamectin benzoat) – to control moths
- **Forester** (animal fat) – game repellent in forest, fruits, grapevines

| | | |
|---|---|---|
| **Biobest Amblyseius** | **Amblyseius cucumeris** | **02.5/1561/3/2009.** |
| **Biobest Encarsia** | Encarsia formosa | 02.5/1560/3/2009. |
| **Biobest Macrolophus** | Macrolophus caliginosus | 02.5/1559/3/2009. |
| **Biobest Orius** | Orius laevigatus | 02.5/1558/3/2009. |
| **Koppert En-Strip** | Encarsia formosa | 11484/2002. |
| **Kopper Ercal** | Eretmocerus eremicus | „ |
| **Koppert Mirical** | Macrolophus caliginosus | „ |
| **Koppert Aphipar** | Aphidius colemani | „ |
| **Koppert Ervipar** | Aphidius ervi | „ |
| **Koppert Aphidend** | Aphidoletes aphidimyza | „ |
| **Koppert Minusa** | Dacnusa sibirica | „ |
| **Koppert Migliphus** | Diglyphus isaea | „ |
| **Koppert Spidex** | Phytoseiulus persimilis | |
| **Koppert Spidend** | Feltiella acarisuga | „ |
| **Koppert Thripor** | Orius laevigatus | „ |
| **Koppert Tripex** | Amblyseius cucumeris | |
| **Nemacell M** | Steinernema feltiae | 02.5/585/1/2008. |
| **Nemasys M** | Steinernema feltiae | 1269/2006. |
| **Nemastop** | Heterorhabditis bacteriophora | 1227/2005. |
| **Naturalis L** | Beauveria bassiana | 02.5/1400/1/2010. |
| **Caprovirusine** | Cydia pomonella Granulo virus | 02.5/1051/1/2010. |
| **Dipel ES** | Bacillus thuringiensis (Kurstaki) | 15.158/1994. |
| **Dipel** | Bacillus thuringiensis | 14.205/1977. |
| **Trichodex 80 WP** | Trichoderma harzianum T-39 | visszavont |
| **Constans WG** | Coniothyrium minitans | 04.2/784/1/2011. |
| **Blossom Protect**<br>**Boni Protect** | Aureobasidium pullulans | 04.2/2735/1/2011.<br>04.2/6163-1/2011. |
| **Trichoplus** | Trichogramma pintoi<br>Trichogramma evanescens | 12.180/2002. |
| **Mycostop** | Streptomyces griseoviridis | 28412/1991. |

# Application methods and techniques for environment risk reduction

- To control ***Diabrotica virgifera virgifera*** **adults**: insecticide + **phagostimulant** (chlorpyrifos 1/10 dose + **cucurbitacin**)
- **Additives to spraying** – Agrocer, Silwet L-77, Melius
- **High clearance** tractor
- **Precision** production / PP
- **Mating disruption** using pheromones to control moths

# THANKS FOR YOUR ATTENTION