

**Biological control of the  
selected species  
of *Grapholitha* and *Cydia* by  
use of new ecological methods  
for IPM in Bulgaria**



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# Location and climate of Bulgaria

Climate in Bulgaria is moderate continental, with the mean temperature in fruit regions from 10.5 to 12.5°C. The frost-free period lasts 190-215 days, from April till November.



# Main fruit crops grown in Bulgaria are:

plum



pear



peach



sweet  
cherry



apple



apricot



# Main apple cultivars grown are:

**Red Delicious** and its mutations, like Mollie's Del., Starkrimson, etc.

**Jonagold** and its mutations, like Jonagored, Red Prince Jonagold, etc.

**Prima**

**Golden Delicious** and mutations, like Reinder's G. Delicious, Belgolden, Golden B.

**Melrose**

**Idared** →

**Granny Smith**



'Jonagored'



'Golden Delicious'



# Main pests of important fruits in Bulgaria and their control and monitoring

## Codling moth (CM) *Cydia pomonella* L.



Pheromone baits were used in form of capsules from PheroNet – Sweden.



Pherocon®  
1C Trécé  
Inc. -USA  
triangular  
trap



Black „Delta” trap in a tree canopy

# **Pheromone traps**

## **for monitoring fruit pests**

**Pheromones aimed at monitoring are used in Bulgaria mainly for:**

- detecting the incidence of pests;**
- following seasonal flight dynamics**
- forecasting and signalization, focused at timing of insecticide treatments.**

# **Codling moth** – *Cydia pomonella* L. is a key pest № 1 in fruit orchards

- It causes damage in apples, quinces, apricots, pear and walnuts.
- It is spread all over the country.
- Codling moth develops two generation per year and a partial third generation in some years
- The flights start in April and continue till they end of September.



*C. pomonella* L. – adult

# Damage

The larvae cause damage in apple. They feed with the seeds and seed cavity, which finally get completely destroyed.

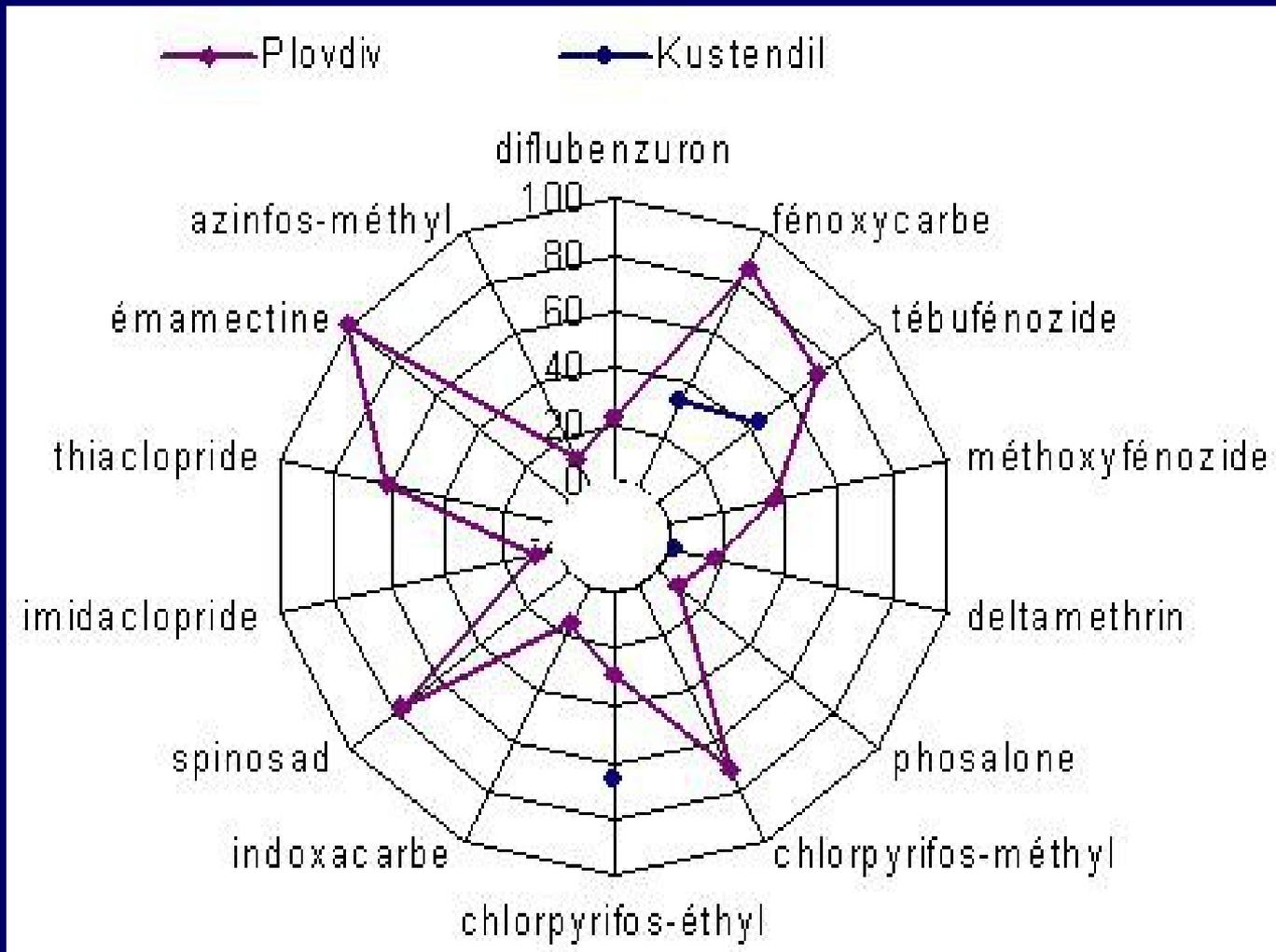


Damaged apple with a larva inside

# Pre -history

**The codling moth continues to present a serious threat, especially because of the development of resistance to various groups of insecticides in many countries around the world, including Bulgaria.**

# Test of resistance of codling moth larvae from the Plovdiv and Kustendil regions



On the 70-years anniversary of the Institute of Plant Protection in Kostinbrod the data about **codling moth resistance** were presented for the first time, by Dr. P.-J. Charmillot from Switzerland.

**Emamectine- efficacy - 100%**

**Spinozad - efficacy -80%**

**Thebufenozid - efficacy- 78%**

**Chlorpyrifos - methyl - efficacy -75%**

**Thiaclopride - efficacy - 60%**

**Methoxyfenozide - efficacy - 40%**

**Chlorpyrifos - ethyl - efficacy -30%**

**Indoxycarbe efficacy- 20%**

**Deltamethrin - efficacy-20%**

**Diflubenzuron - efficacy 20%**

# **Control of codling moth – the pest № 1**

**During the last few decades, the ecological approach to pest control in fruit production has become a worldwide tendency. It implies a wider spread of the methods for pest management, which allow for a decrease of use of chemicals that pollute the environment. The most frequently applied biological methods of pest control are those related to sex pheromones.**

# Pheromone dispensers for mating disruption of codling moth – *Cydia pomonella* L.



Isomate C plus

# CIDETRAK® CM DA COMBO™ MESO™ , Trécé Inc.-USA

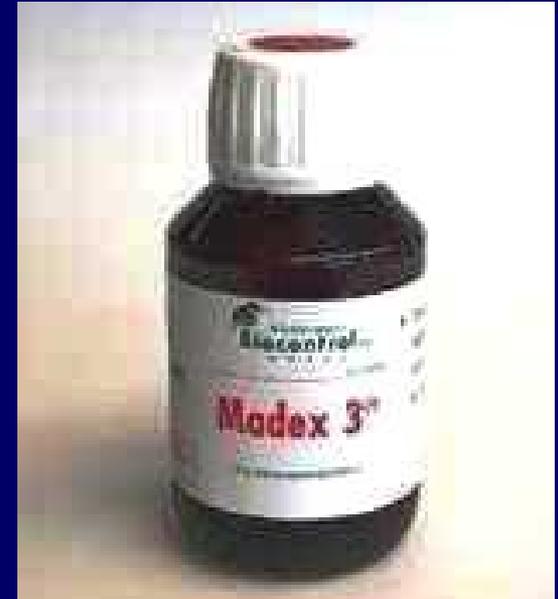


# **Biological insecticide**, based on the granulovirus

**Madex -3, Madex Max and Madex Top** against codling moth

CpGV provides a long-term control, where the population density is low or moderate

**Madex Twin** against codling moth and oriental fruit moth



# Leaf miners:



pear leaf blister moth  
*Leucoptera scitella* Zell.

spotted tentiform leaf miner  
*Lithocolletis blancardella* F.

hawthorn red midget moth  
*Phylonorichter (Lithocolletis) corylifoliella* Hub.

The Hungarian pheromones from the company “Csalomon” were used as lures in monitoring of these pests.



“Delta” sticky traps RAG used for catching leaf miner moths

# **Control strategy**

**Chitin synthesis inhibitors  
(triflumoron, diflubenzuron and e.c )  
applied at the beginning of egg  
layering are the most effective  
pesticides against these pests.**

# **Plum fruit moth** – *Grapholitha. funebrana* Tr. is the main pest in plum orchards

- It causes damage on plum and blackthorn, sometimes also on apricot and peach.
- It is spread all over the country.
- It develops two generations every year and a partial third generation in some seasons.
- The flights begin in April, a week before codling moth and continue till the first or second decade of September.



*G. funebrana* Tr. - adult



*G. funebrana* Tr. - larva

# Plum fruit moth - damage

The larvae feed  
in the fruit  
around the stone  
The damaged fruits  
have a violet colour →  
and drop prematurely.



Damaged fruit  
with a larva  
inside →



# Pheromone dispensers for control of plum fruit moth *G. funebrana* Tr.



Isomate OFM rosso



Cidetrak CM/OFM

# **Oriental fruit moth** – *Cydia molesta* Busck. The main pest of the peach orchards

This pest causes damage on shoots and fruits of peach, apricot, quince and pear.

It may also cause damage on apple, especially when a peach orchard is located in the vicinity.

*C. molesta* is spread all over the country

The pest develops 3-4 generations per year, depending on weather conditions.

The flights begin earlier than flights of other moth pests – at the end of March or at the beginning of April and continue till the first decade of October.



*C. molesta* Busck.  
adult

# **Oriental fruit moth**

## ***Cydia molesta* Busck**

### **damage**

**The larvae of overwintering generation feed in the young shoots.**

**The larvae of summer generations feed in the fruit around the stone.**



**Damaged tip of a peach shoot, with a larva inside**



**Damage to fruits**

# Pheromone dispensers for oriental fruit moth *C. molesta* Busck.



**Isomate OFM  
rosso**



**Cidetrak OFM/PTB  
Meso**

# Different pheromone dispensers of the Japanese company Shin Etsu

*Isomate C plus*

*Isomate C TT*

*Isomate C LR*

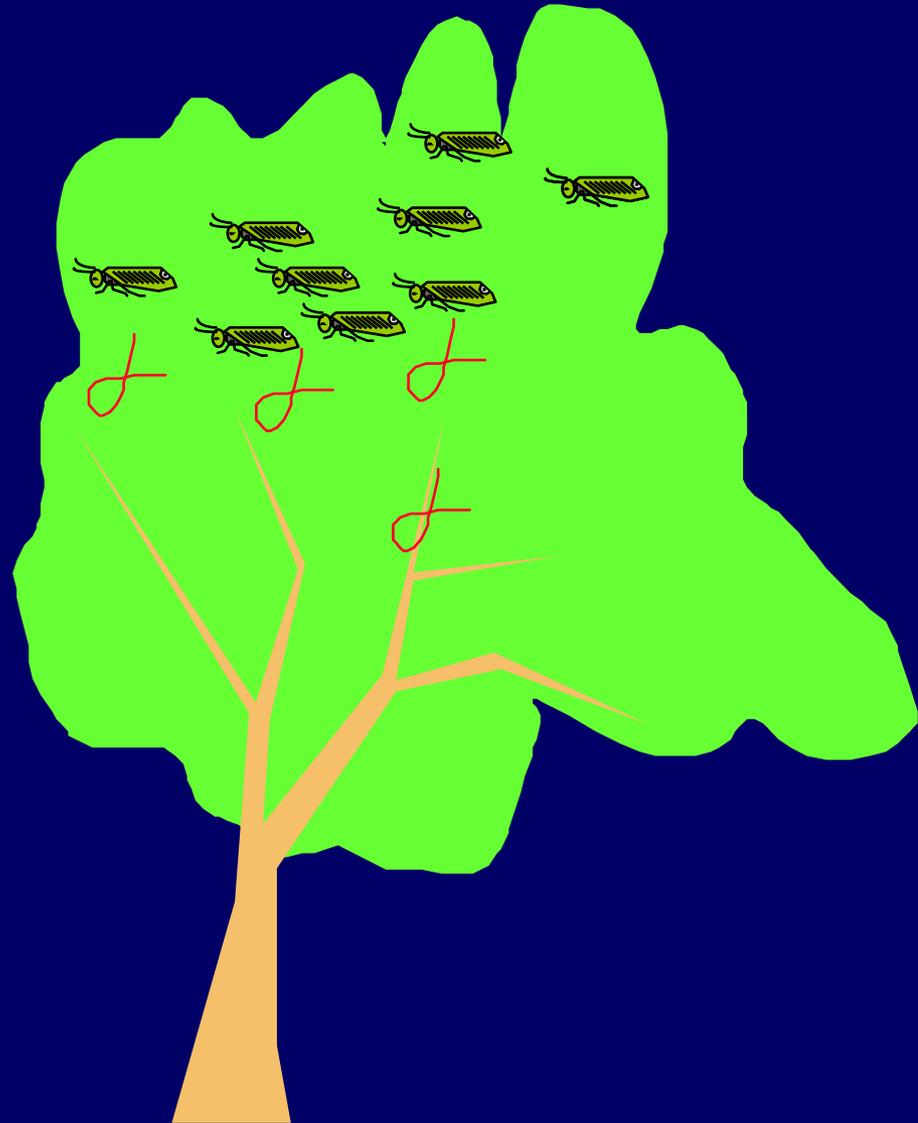
*Isomate C/OFM*

*Isomate OFM – rosso*

*Flex*

*Isomate A/OFM*

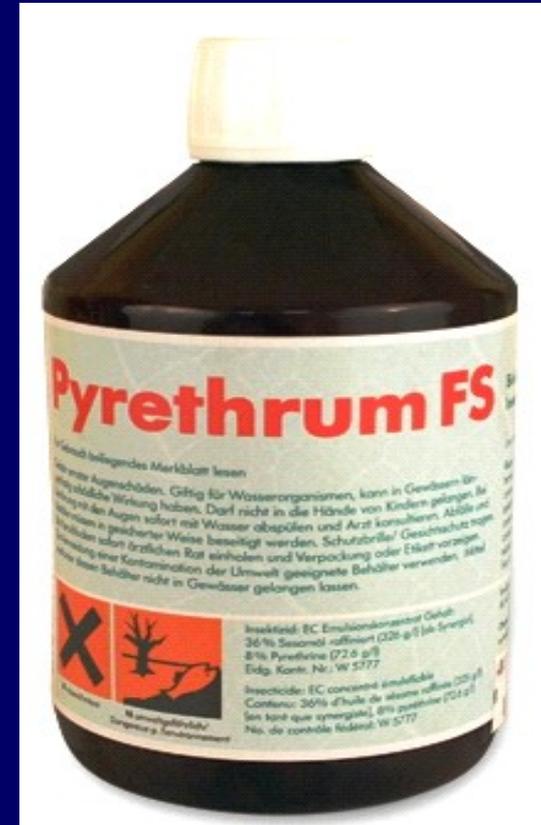
*Isonet A*



# Bio-insecticides for control of other fruit pests

## Pyrethrum

against aphids, fruit wasps, mites, trips



Thank you  
for your attention !



**We are waiting your questions !**



## **ACKNOWLEDGEMENTS:**

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