POLJOPRIVREDNI FAKULTET
UNIVERZITET U NOVOM SADU
PFNS
DEPARTMAN ZA RATARSTVO I POVRTARSTVO

UNIVERSITÀ DEGLI STUDI FIRENZE
DISPAA
DIPARTIMENTO DI SCIENZE DELLE PRODUZIONI AGROALIMENTARI E DELL'AMBIENTE

UNIVERSITÄT FÜR BODENKULTUR WIEN
BOKU
DEPARTMENT FÜR WASSER-ATMOSPHÄRE-UMWELT

EUROPEAN COMMISSION
Horizon 2020
EUROPEAN UNION FUNDING FOR RESEARCH & INNOVATION

**Workshop 2018**

# PIS – Concept and activities

**Milena Marčić, Ivan Koči, Boško Jezerkić**

Forecasting and Warning Service of Plant Protection of Serbia (PIS), Novi Sad, Serbia

Imagine, you are an apple grower ...

and bad things, in your orchard, will happen soon ...

JUNE 2018

| MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY | SUNDAY |
|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 Recomandation issued | 8 Application | 9 The critical period begins | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| ... | | | | | | |

| Protection of apples | | |
|---|---|---|
| **Recomandation created** | 7.6.2018 15:43 | Apple scab (Venturia inaequalis)<br>Powdery mildew (Podosphaera leucotricha)<br>Green apple aphid (Aphis pomi)<br>Codling moth (Carpocapsa pomonella) |

Serbia for Excell

European Commission

Header

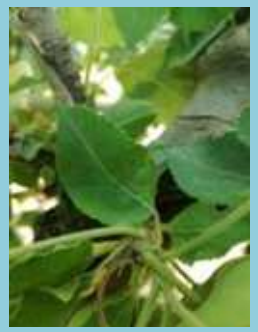
Visual observation

Measure: Why? When? What?

Protection of apples 7.6.2018 15:43 Apple scab (*Venturia inaequalis*); Powdery mildew (*Podosphaera leucotricha*); Green apple aphid (*Aphis pomi*); Codling moth (*Carpocapsa pomonella*)

In the teritory of the Regional Centre of Novi Sad apples are in phase fruits about half of the size (BBCH 75).

Idared BBCH 75



Egg *C. pomonella*

Colonie *A. pomi*

The discharge of the pseudothecium of the apple scab (*Venturia inaequalis*) is about 90% and that indicates the need for further protection from this pathogen. Announced unstable weather with precipitation for weekends, will create favorable conditions for the infection, so producers are recommended to use preventive fungicides based on active substance captan (Captan 50 WP, Capi, Merpan 50 WP) in the amount of 3 kg/ha.

If symptoms of powdery mildew of apples (*Podosphaera leucotricha*) are registered in the orhards, the use of Luna expirience (tebuconazole + fluopiram) in the concentration of 0.075% is recommended.

In the visual inspection of leaves and fruits, the presence of eggs of the codling moth (*Carpocapsa pomonella*) in different embryonic stages of development has been recoreded. At the comming weekend, the second generation larvae of the pest will begin hatching.

Also, on the peak of branches, the presence of the colonies of green apple aphids (*Aphis pomi*) are registered. Producers are advised to visit the orchards and if the presence of these pests is apparent, the combination of insecticides is recommended: Coragen 20 SC (chlorantraniliprole) 0.02% + Pyrinex 25 CS (chlorpyrifos) 0.25%. It is recommended that the treatment be carried out in the evening.

Region: Novi Sad

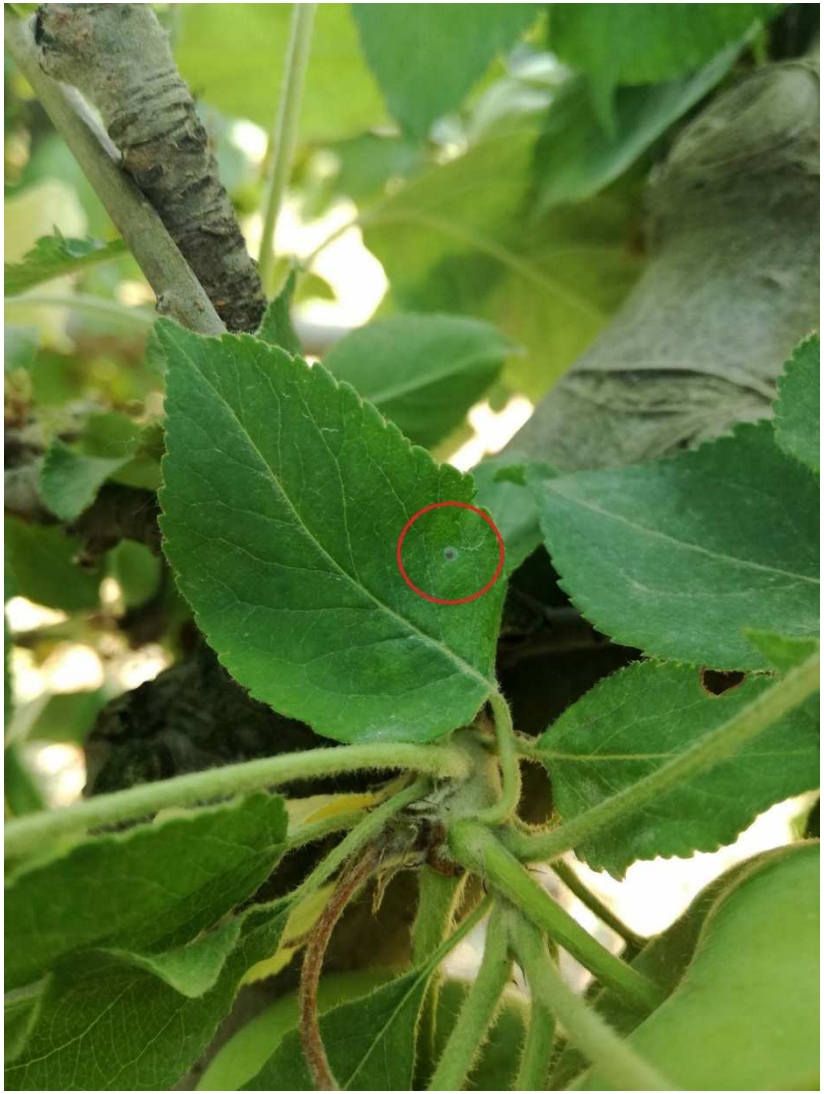
**In the teritory of the Regional Centre of Novi Sad apples are in phase „fruits about half of the size“ (BBCH 75).**

Idared BBCH 75

Egg C. pomonella

Colonie A. pomi

Idared BBCH 75



**Egg C. pomonella**

**Colonie A. pomi**

Apple scab

Why?

When?

The discharge of the pseudothecium of the apple scab (*Venturia inaequalis*) is about 90% and that indicates the need for further protection from this pathogen. Announced unstable weather with precipitation for weekends, will create favorable conditions for the infection, so producers are recommended to use preventive fungicides based on active substance captan (Captan 50 WP, Capi, Merpan 50 WP) in the amount of 3 kg/ha.

What?

Powdery mildew of apples

If symptoms of powdery mildew of apples (*Podosphaera leucotricha*) are registered in the orhards, the use of Luna expirience (tebuconazole + fluopiram) in the concentration of 0.075% is recommended.

Green apple aphids

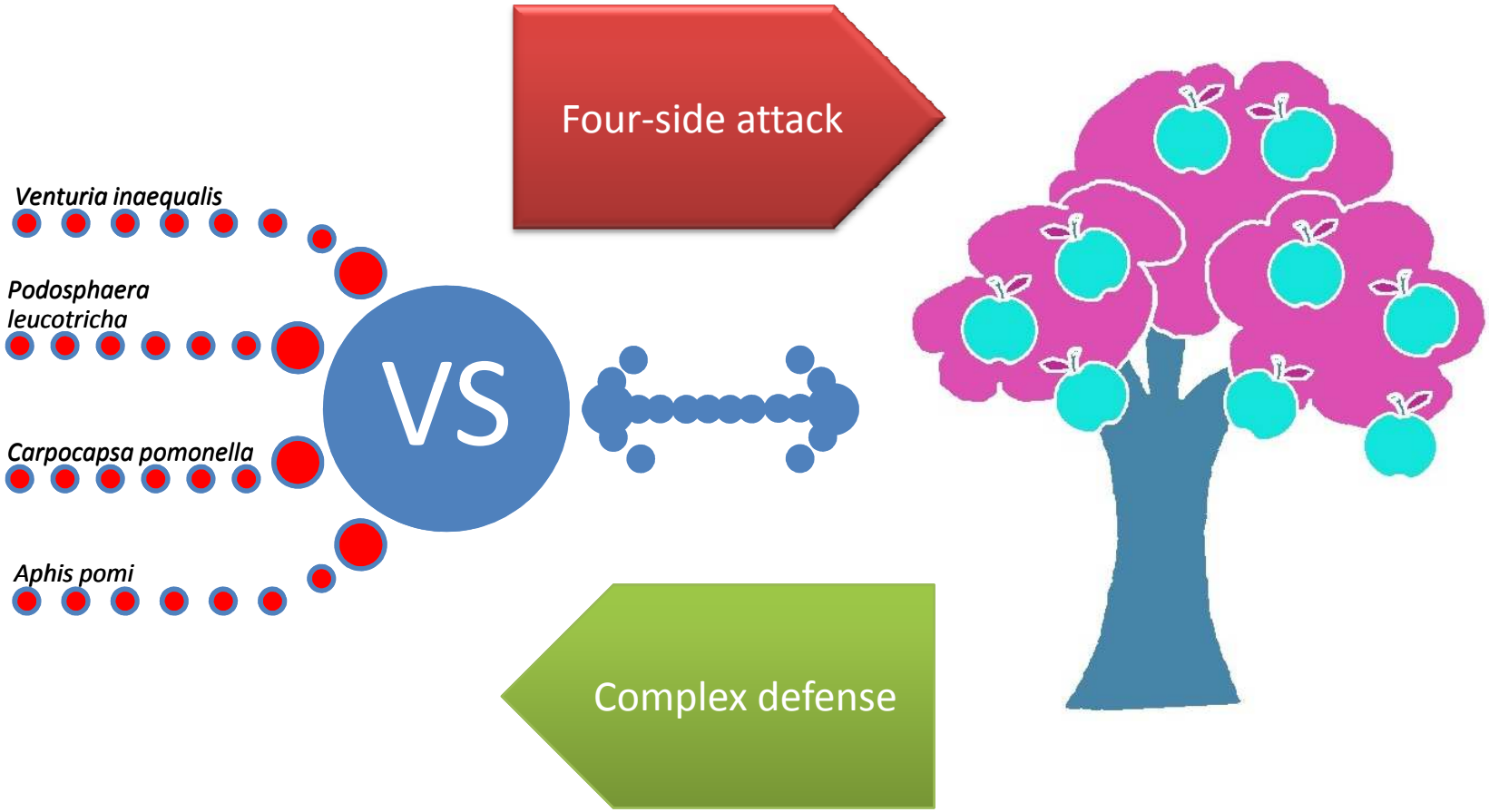
Also, on the peak of branches, the presence of the colonies of green apple aphids (*Aphis pomi*) are registered. Producers are advised to visit the orchards and if the presence of these pests is apparent, the combination of insecticides is recommended: Coragen 20 SC (chlorantraniliprole) 0.02% + Pyrinex 25 CS (chlorpyrifos) 0.25%. It is recommended that the treatment be carried out in the evening.

Codling moth

In the visual inspection of leaves and fruits, the presence of eggs of the codling moth (*Carpocapsa pomonella*) in different embryonic stages of development has been recoreded. At the comming weekend, the second generation larvae of the pest will begin hatching.

At the comming weekend, the second generation larvae of the pest will begin hatching.

Forecast part


Four-side attack
Venturia inaequalis
Podosphaera leucotricha
VS
Carpocapsa pomonella
Aphis pomi
Complex defense


ROLLBACK

DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

...establishing a framework for Community action to achieve the sustainable use of pesticides.

# About PIS

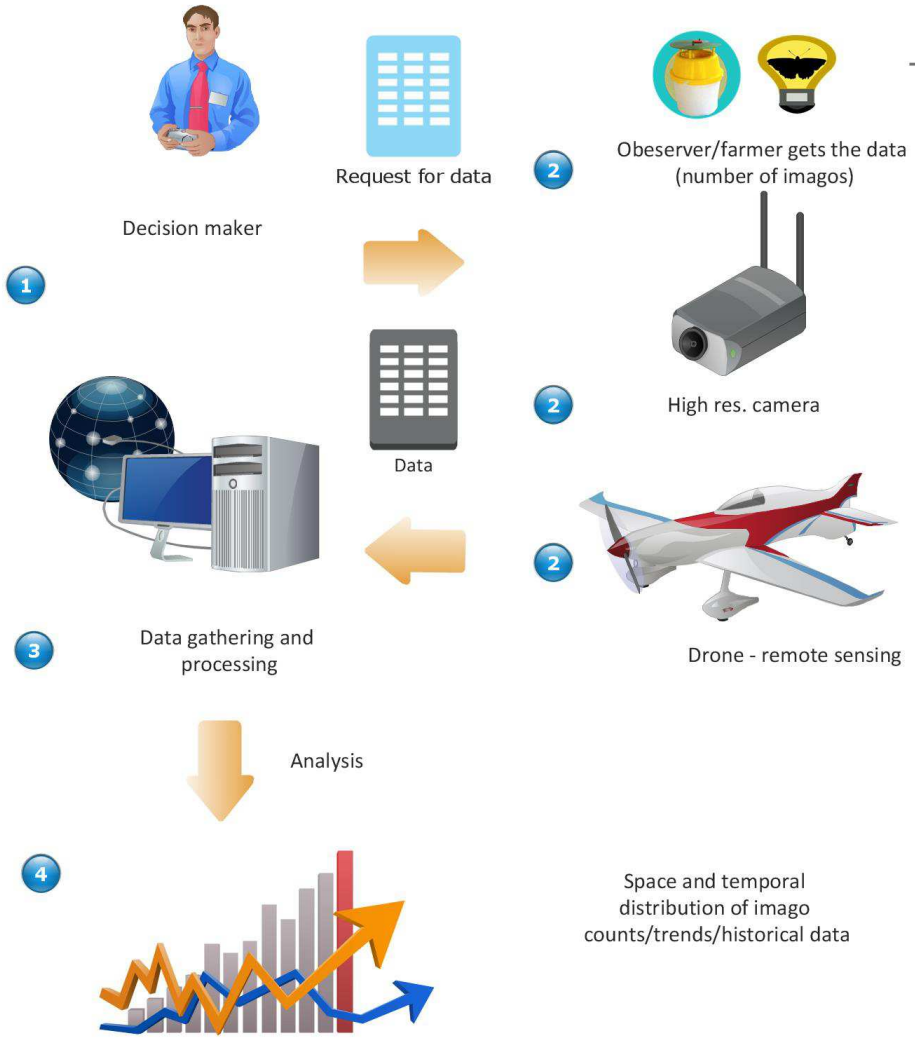
- Set in motion in April 2010
- 12 Regional offices in Vojvodina
- The main office

# About PIS

- Extended to the rest of the country in November 2012
- Total of 29 Regional offices
- The main office
- 80 participants

# BAD STRATEGIES

1. Spraying by calendar
2. Biofix identification and then spraying by calendar
3. Attack intensity monitoring (and then spraying)
4. Spraying randomly
5. „Aggregation Level 1“




## Aggregation level 1

**Paradigm:**
"timely and effective tracking"

**Goal:**
control of the population of the harmful organism by tracking the number of imagos using a trap and consequently the use of pesticides

**Result:**
reduction of a monitoring costs and less use of pesticides

?

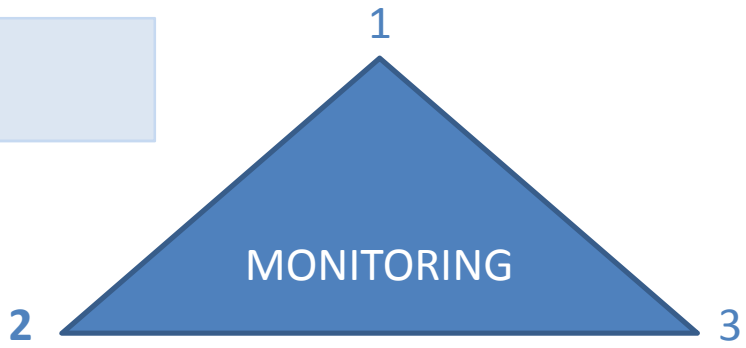
# ANSWER TO THE CHALLENGE

Establishing comprehensive monitoring of

**1** Host plants

**2** Harmful organisams

**3** Environmental conditions



# MONITORING TOOLBOX

| | |
|---|---|
| **Monitoring of harmful organism** | HO |
| Pheromone trap | PT |
| Light trap | LT |
| Spore catcher | SC |
| Visual exemination of pathogens | VEPa |
| Visual exemination of pests | VEPe |
| Trial | Trial |
| Laboratory analyzes | Lab |
| **Monitoring of host plant** | HP |
| Visual exemination of host plant | VEHP |
| **Monitoring of enviro. condition** | EC |
| Automatic weather station | AWS |

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A instrument shelter

**Workshop, 2018 Novi Sad**

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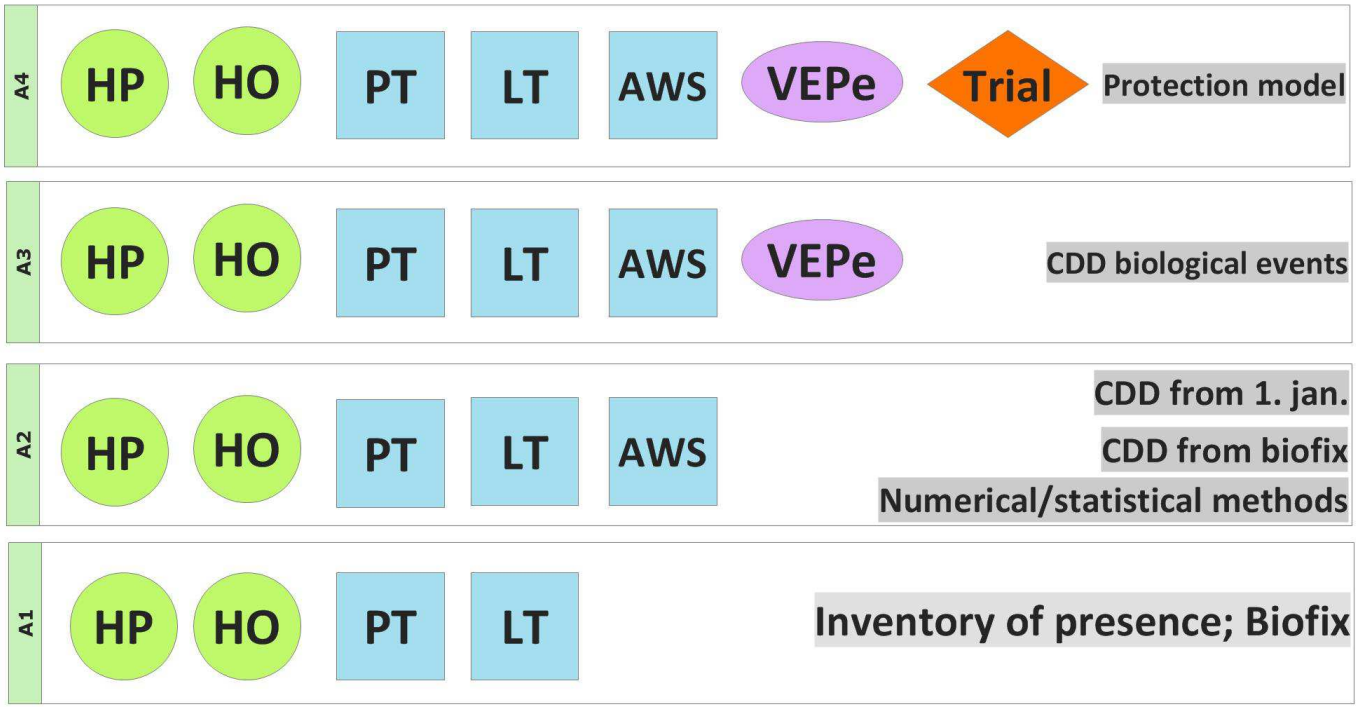
A soil sensors position

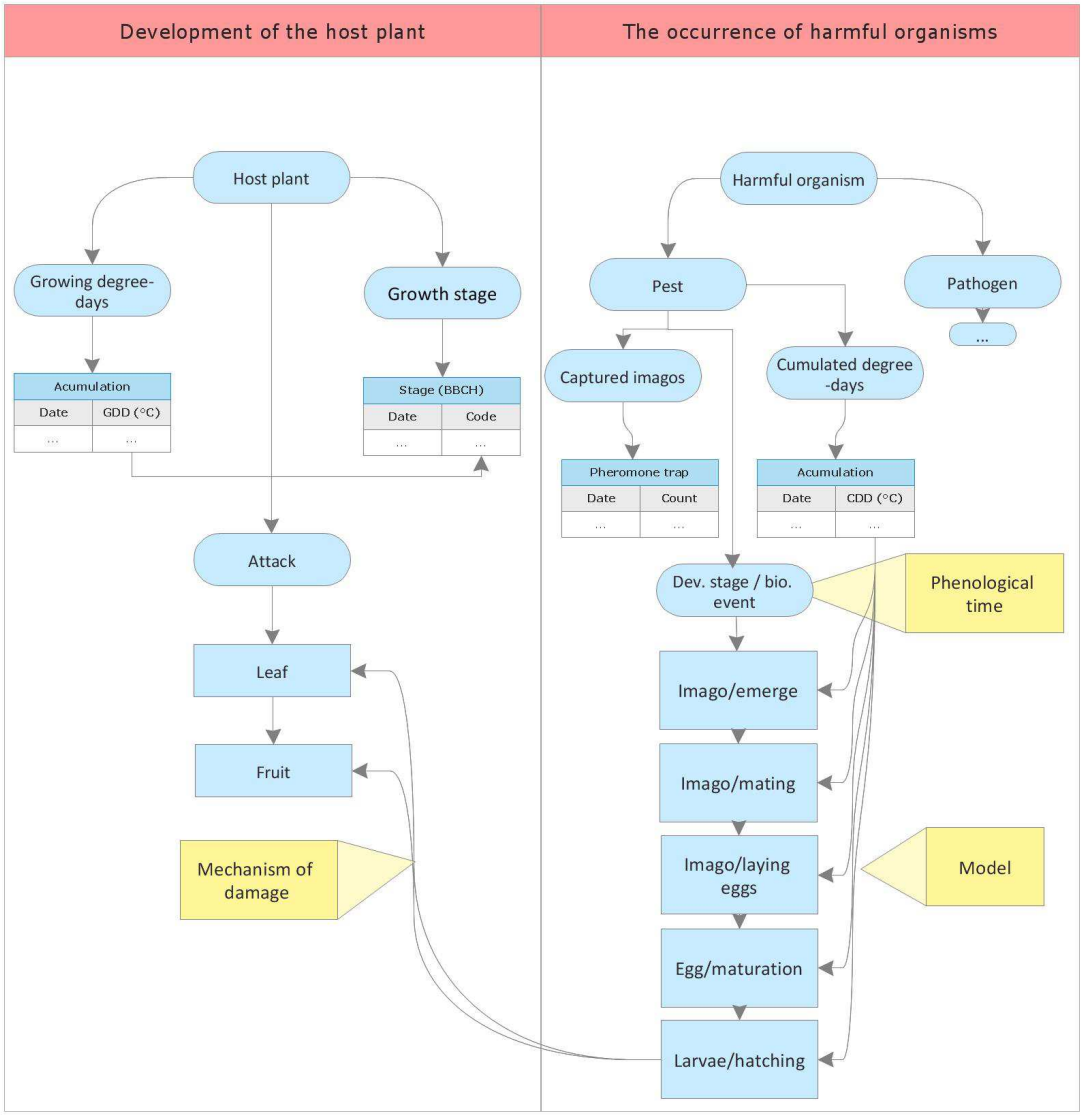
**Workshop, 2018 Novi Sad**


AWS main unit box


Setting on one rod

# TOOL AGGREGATION LEVELS




Development of the host plant
The occurrence of harmful organisms
Host plant
Growing degree-days
Growth stage
Acumulation
Date
GDD (°C)
Stage (BBCH)
Date
Code
Attack
Leaf
Fruit
Mechanism of damage
Harmful organism
Pest
Pathogen
...
Captured imagos
Cumulated degree -days
Pheromone trap
Date
Count
Acumulation
Date
CDD (°C)
Dev. stage / bio. event
Phenological time
Imago/emerge
Imago/mating
Imago/laying eggs
Model
Egg/maturation
Larvae/hatching

## Development of the host plant

| # | BBCH code - description | Date |
|---|---|---|
| 1 | 0- Dormancy: leaf buds and the thicker inflorescence buds clos... | 25.1.2018 |
| 2 | 1- Beginning of leaf bud swelling: buds visibly swollen, bud scal... | 9.2.2018 |
| 3 | 1- Beginning of leaf bud swelling: buds visibly swollen, bud scal... | 12.2.2018 |
| 4 | 3- End of leaf bud swelling: bud scales light coloured with so... | 6.3.2018 |
| 5 | 3 - End of leaf bud swelling: bud scales light coloured with so... | 9.3.2018 |
| 6 | 3 - End of leaf bud swelling: bud scales light coloured with so... | 15.3.2018 |
| 7 | 7- Beginning of bud break: first green leaf tips just visible | 26.3.2018 |
| 8 | 7- Beginning of bud break: first green leaf tips just visible | 26.3.2018 |
| 9 | 9- Green leaf tips about 5 mm above bud scales | 30.3.2018 |
| 10 | 10- Mouse-ear stage: Green leaf tips 10 mm above the bud scale... | 2.4.2018 |
| 11 | 11- First leaves unfolded (others still unfolding) | 5.4.2018 |
| 12 | 57- Pink bud stage: flower petals elongating; sepals slightly ope... | 10.4.2018 |
| 13 | 61- Most flowers with petals forming a hollow ball | 13.4.2018 |
| 14 | 65- Full flowering: at least 50% of flowers open, first petals falling | 19.4.2018 |
| 15 | 71- Fruit size up to 10 mm; fruit fall after flowering | 25.4.2018 |
| 16 | 71- Fruit size up to 10 mm; fruit fall after flowering | 27.4.2018 |
| 17 | 72- Fruit size up to 20 mm | 30.4.2018 |
| 18 | 73- Second fruit fall | 3.5.2018 |
| 19 | 73- Second fruit fall | 7.5.2018 |
| 20 | 73- Second fruit fall | 11.5.2018 |
| 21 | 73- Second fruit fall | 15.5.2018 |
| 22 | 73- Second fruit fall | 21.5.2018 |
| 23 | 74- Fruit diameter up to 40 mm; fruit erect (T-stage: underside ... | 31.5.2018 |
| 24 | 74- Fruit diameter up to 40 mm; fruit erect (T-stage: underside ... | 4.6.2018 |
| 25 | 75- Fruit about half final size | 7.6.2018 |

7.6.2018

75- Fruit about half final size

## The occurrence of harmful organisms

| # | Examination | Plant part | Stage | Index | Date |
|---|---|---|---|---|---|
| 1 | Eggs per leaf | Leaf | Egg | 0 | 19.4.2018 |
| 2 | Eggs per leaf | Leaf | Egg | 0 | 25.4.2018 |
| 3 | Eggs per fruit | Fruit | Egg | 0 | 25.4.2018 |
| 4 | Eggs per leaf | Leaf | Egg | 0 | 27.4.2018 |
| 5 | Eggs per fruit | Fruit | Egg | 0 | 27.4.2018 |
| 6 | Eggs per leaf | Leaf | Egg | 0.5 | 30.4.2018 |
| 7 | Eggs per fruit | Fruit | Egg | 0 | 30.4.2018 |
| 8 | Eggs per leaf | Leaf | Egg | 1 | 3.5.2018 |
| 9 | Eggs per fruit | Fruit | Egg | 0 | 3.5.2018 |
| 10 | Eggs per leaf | Leaf | Egg | 1.5 | 7.5.2018 |
| 11 | Eggs per fruit | Fruit | Egg | 0 | 7.5.2018 |
| 12 | Eggs per leaf | Leaf | Egg | 1.5 | 11.5.2018 |
| 13 | Eggs per fruit | Fruit | Egg | 0 | 11.5.2018 |
| 14 | Eggs per leaf | Leaf | Egg | 0.5 | 15.5.2018 |
| 15 | Eggs per fruit | Fruit | Egg | 0 | 15.5.2018 |
| 16 | Eggs per leaf | Leaf | Egg | 0 | 21.5.2018 |
| 17 | Eggs per fruit | Fruit | Egg | 0 | 21.5.2018 |
| 18 | Eggs per leaf | Leaf | Egg | 0 | 31.5.2018 |
| 19 | Eggs per fruit | Fruit | Egg | 0 | 31.5.2018 |
| 20 | Eggs per leaf | Leaf | Egg | 0 | 4.6.2018 |
| 21 | Eggs per fruit | Fruit | Egg | 0 | 4.6.2018 |
| 22 | Eggs per leaf | Leaf | Egg | 0.5 | 7.6.2018 |
| 23 | Eggs per fruit | Fruit | Egg | 0 | 7.6.2018 |

7.6.2018

Eggs present on leafs
Index of presence 0.5

Date

T avg (°C)

Daily increment (°C)

CDD from biofix (°C)

Flight I gen (%)

Egg laying I gen (%)

Egg hatching I gen (%)

Flight II gen (%)

Egg laying II gen (%)

**MODEL**

| Date | T avg (°C) | Daily increment (°C) | CDD from biofix (°C) | Flight I gen (%) | Egg laying I gen (%) | Larvae hatching I gen (%) | Flight II gen (%) | Egg laying II gen (%) |
|---|---|---|---|---|---|---|---|---|
| 15.4.2018 | 18.94 | 8.94 | 8.94 | 1.9 | 0 | 0 | 0 | 0 |
| 16.4.2018 | 18.74 | 8.74 | 17.68 | 3.76 | 0 | 0 | 0 | 0 |
| 17.4.2018 | 14.74 | 4.74 | 22.42 | 4.77 | 0 | 0 | 0 | 0 |
| 18.4.2018 | 15.45 | 5.45 | 27.87 | 5.93 | 0 | 0 | 0 | 0 |
| [illegible].2018 | 16.73 | 6.73 | 34.6 | 7.36 | 1.43 | 0 | 0 | 0 |
| 20.4.2018 | 16.41 | 6.41 | 41.01 | 8.73 | 2.8 | 0 | 0 | 0 |
| 21.4.2018 | 15.51 | 5.51 | 46.52 | 9.9 | 3.97 | 0 | 0 | 0 |
| 22.4.2018 | 18.34 | 8.34 | 54.86 | 11.67 | 5.74 | 0 | 0 | 0 |
| 23.4.2018 | 20.38 | 10.38 | 65.24 | 13.88 | 7.95 | 0 | 0 | 0 |
| 24.4.2018 | 18.82 | 8.82 | 74.06 | 15.76 | 9.83 | 0 | 0 | 0 |
| 25.4.2018 | 20.59 | 10.59 | 84.65 | 18.01 | 12.08 | 0 | 0 | 0 |
| [illegible].2018 | 20.82 | 10.82 | 95.47 | 20.31 | 14.38 | 0 | 0 | 0 |
| 27.4.2018 | 15.44 | 5.44 | 100.91 | 21.47 | 15.54 | 0 | 0 | 0 |
| 28.4.2018 | 19.67 | 9.67 | 110.58 | 23.53 | 17.6 | 2.06 | 0 | 0 |
| 29.4.2018 | 22.79 | 12.79 | 123.37 | 26.25 | 20.32 | 4.78 | 0 | 0 |
| 30.4.2018 | 23.2 | 13.2 | 136.57 | 29.06 | 23.13 | 7.59 | 0 | 0 |
| 1.5.2018 | 20.97 | 10.97 | 147.54 | 31.39 | 25.46 | 9.92 | 0 | 0 |
| 2.5.2018 | 22.71 | 12.71 | 160.25 | 34.1 | 28.17 | 12.63 | 0 | 0 |
| 3.5.2018 | 23.12 | 13.12 | 173.37 | 36.89 | 30.96 | 15.42 | 0 | 0 |
| 4.5.2018 | 22.46 | 12.46 | 185.83 | 39.54 | 33.61 | 18.07 | 0 | 0 |
| 5.5.2018 | 19.24 | 9.24 | 195.07 | 41.5 | [illegible] | 20.03 | 0 | 0 |
| 6.5.2018 | 19.39 | 9.39 | 204.46 | 43.5 | 37.57 | 22.03 | 0 | 0 |
| 7.5.2018 | 18.81 | 8.81 | 213.27 | 45.38 | 39.45 | 23.91 | 0 | 0 |
| 8.5.2018 | 17.19 | 7.19 | 220.46 | 46.91 | 40.98 | 25.44 | 0 | 0 |
| 9.5.2018 | 18.98 | 8.98 | 229.44 | 48.82 | 42.89 | 27.35 | 0 | 0 |
| 10.5.2018 | 17.9 | 7.9 | 237.34 | 50.5 | 44.57 | 29.03 | 0 | 0 |
| 11.5.2018 | 20 | 10 | 247.34 | 52.63 | 46.7 | 31.16 | 0 | 0 |
| 12.5.2018 | 20.69 | 10.69 | 258.03 | 54.9 | 48.97 | 33.43 | 0 | 0 |
| 13.5.2018 | 18.66 | 8.66 | 266.69 | 56.74 | 50.81 | 35.27 | 0 | 0 |
| 14.5.2018 | 15.85 | 5.85 | 272.54 | 57.99 | 52.06 | 36.52 | 0 | 0 |
| 15.5.2018 | 16.86 | 6.86 | 279.4 | 59.45 | 53.52 | 37.98 | 0 | 0 |
| 16.5.2018 | 15.09 | 5.09 | 284.49 | 60.53 | 54.6 | 39.06 | 0 | 0 |
| 17.5.2018 | 17.2 | 7.2 | 291.69 | 62.06 | 56.13 | 40.59 | 0 | 0 |
| 18.5.2018 | 17.3 | 7.3 | 298.99 | 63.61 | 57.69 | 42.14 | 0 | 0 |
| 19.5.2018 | 17.38 | 7.38 | 306.37 | 65.19 | 59.26 | 43.71 | 0 | 0 |
| 20.5.2018 | 17.49 | 7.49 | 313.86 | 66.78 | 60.85 | 45.31 | 0 | 0 |
| 21.5.2018 | 18.12 | 8.12 | 321.98 | 68.51 | 62.58 | 47.04 | 0 | 0 |
| 22.5.2018 | 20.57 | 10.57 | 332.55 | 70.76 | 64.83 | 49.29 | 0 | 0 |
| 23.5.2018 | 21.26 | 11.26 | 343.81 | 73.15 | 67.22 | 51.68 | 0 | 0 |
| 24.5.2018 | 20.79 | 10.79 | 354.6 | 75.45 | 69.52 | 53.98 | 0 | 0 |
| 25.5.2018 | 19.29 | 9.29 | 363.89 | 77.42 | 71.49 | 55.95 | 0 | 0 |
| 26.5.2018 | 20.55 | 10.55 | 374.44 | 79.67 | 73.74 | 58.2 | 0 | 0 |
| 27.5.2018 | 21.97 | 11.97 | 386.41 | 82.21 | 76.29 | 60.74 | 0 | 0 |
| 28.5.2018 | 22.87 | 12.87 | 399.28 | 84.95 | 79.02 | 63.48 | 0 | 0 |
| 29.5.2018 | 22.33 | 12.33 | 411.61 | 87.58 | 81.65 | 66.11 | 0 | 0 |
| 30.5.2018 | 21.86 | 11.86 | 423.47 | 90.1 | 84.17 | 68.63 | 0 | 0 |
| 31.5.2018 | 22.64 | 12.64 | 436.11 | 92.79 | 86.86 | 71.32 | 0 | 0 |
| 1.6.2018 | 23.6 | 13.6 | 449.71 | 95.68 | 89.75 | 74.21 | 0 | 0 |
| 2.6.2018 | 23.2 | 13.2 | 462.91 | 98.49 | 92.56 | 77.02 | 0 | 0 |
| 3.6.2018 | 22.74 | 12.74 | 475.65 | 100 | 95.27 | 79.73 | 2.71 | 0 |
| 4.6.2018 | 22.92 | 12.92 | 488.57 | 100 | 98.02 | 82.48 | 5.46 | 0 |
| 5.6.2018 | 23.23 | 13.23 | 501.8 | 100 | 100 | 85.3 | 8.27 | 2.81 |
| 6.6.2018 | 22.9 | 12.9 | 514.7 | 100 | 100 | 88.04 | 11.02 | 5.56 |
| 7.6.2018 | 23.55 | 13.55 | 528.25 | 100 | 100 | 90.92 | 13.9 | 8.44 |

# ANNUAL MONITORING SETTING (2018)

| | |
|---|---|
| 1 | Observation points: 2000 |
| 2 | Different host plants: 36<br>Different harmful organisms: 150 |
| 3 | Pheromone traps for different host plants: 45<br>Light traps: 150<br>Spore catchers: 5<br>Automatic Weather Stations : 120 (+ 53 new) |

# ANNUAL MONITORING SETTING (2018)

| | |
|---|---|
| 4 | Visual exemination of pathogens: 4000<br>Visual exemination of pests: 7000<br>Visual exemination of host plant: 3600 |
| 5 | Trials: 90 |
| 6 | Laboratory analyzes: 4000 |
| 7 | Recommendations: over 1000 |

# RECOMMENDATION PRINCIPLES

A — Every measure is a segment of the plant protection model based on principles of biologically justified pesticide application, and

B — an anti-resistant strategy in their application, and

C — respecting the maximum number of treatments and prescribed withdrawals.

# RECOMMENDATION USERS

| | |
|---|---|
| A | Agricultural producers |
| B | Agronomists |
| C | All interested participants in agricultural production |

# DISSEMINATION OF DATA

| | |
|---|---|
| A | www.pisvojvodina.com or<br>www.pissrbija.com |
| B | SMS messages |
| C | Regular TV broadcast |

# PIS – from low cost to big savings

# PIS - ROI

| | |
|---|---|
| A | Established rational and justified use of pesticides in the territory of Serbia |
| B | Integrated management of harmful organisms |
| C | Integrated agricultural production |