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Resistance status of pollen beetles and testing results from strawberry blossom weevil in Finland

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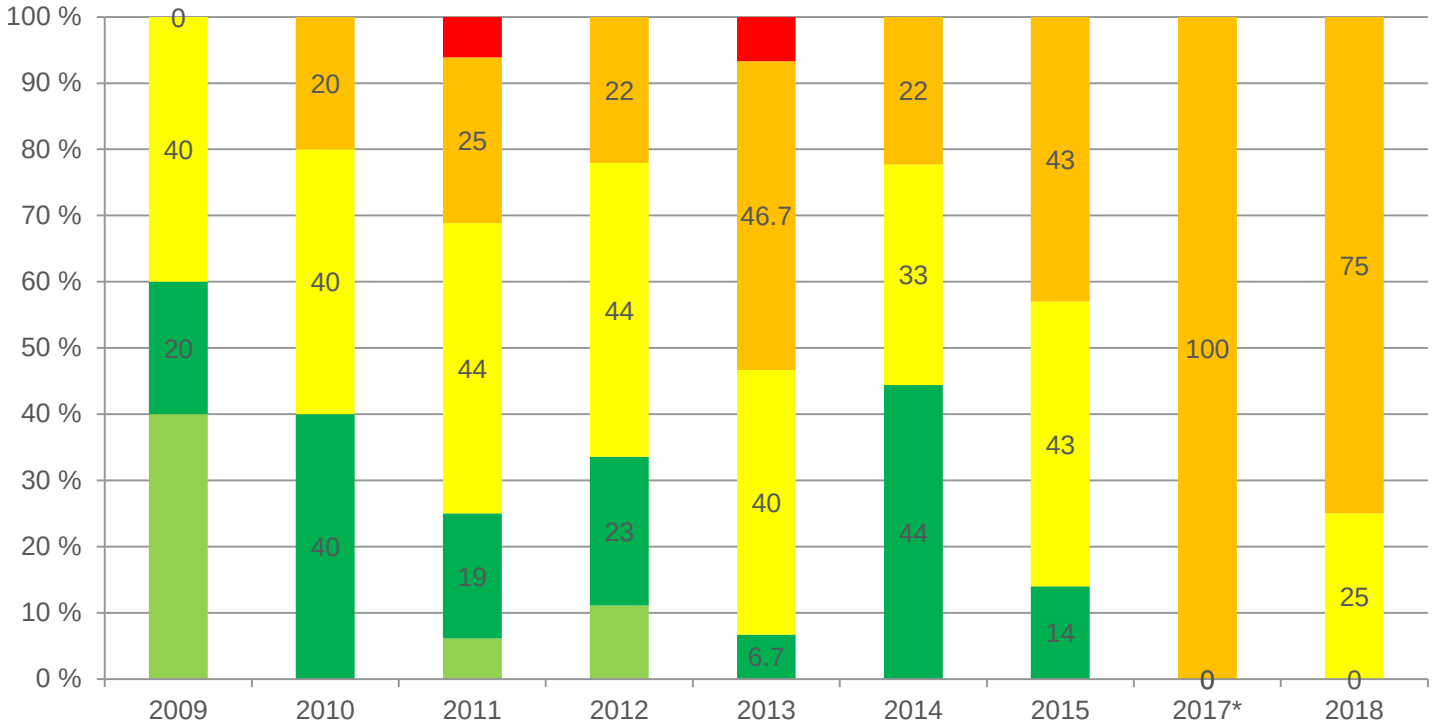
Resistance status of pollen beetles in Finland. Sensitivity against lambda-cyhalothrin.



Resistance of pollen beetles MELIAE against lambda-cyhalothrin 2009-2018. No. of tested samples 8-15 per year. Exception was (y.) 2017 when two samples of the 2nd generation were tested.

Resistance status of pollen beetles in Finland. Sensitivity against thiacloprid 2018. Means affected [%]

Conc.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
200% FA 98 +/- 3%	85	75	65	100	70
100% FA 93 +/- 6%	92.5	80	57.5	75	70
20% FA 50 +/- 10%	42.5	32.5	40	40	25
Control	0	2.5	0	0	0

Resistance status of pollen beetles in Finland 2018

- Tested samples were resistant or moderately resistant against lambda-cyhalothrin (75 / 25 %)
- Thiacloprid showed a lower efficacy than earlier
- However, several osr fields were scouted without managed to have enough beetles for the test – in controlling pollen beetles some good results were achieved
- Positive is that products from 4 MoA's are registered for MELIAE

INSEKTISIDIRESISTENSSI

Lähde: IRAC ja Tukes, helmikuu 2019
https://tukes.fi/kasvinsuojeluaineet

Metabolinen resistenssi
Metabolinen resistenssi on yleisin resistenssimekanismi hyönteisillä ja suurin haaste. Kestävät eli resistentit hyönteiskannat hajoittavat insektisidejä nopeammin kuin ei-resistentit hyönteiset. Hyönteisten entsyymitoiminta hajoittaa insektisidejä. Resistenteillä hyönteisillä on tehokkaampi näiden entsyymien muodostumiskyky. (Nämä entsyymit voivat hajoittaa monia erilaisia insektisidejä)

Target-site resistenssi
Hyönteisessä on tapahtunut geneettinen muuntautuminen, joka hidastaa insektisidin kiinnittymistä tai vaikutusta kohteessa. Siten insektisidin teho vähenee tai loppuu kokonaan.

Karbamaatit
Asetyylikoliini-esteraasin estäjä (AChE) inhibitors
1A

Pyretroidit, pyretriini
Natrium-kanavien toimintaan vaikuttaja
3A

Neonikotinoidit
Nikotiiniasetyyli-koliini reseptorien vastavaikuttaja (nAChR) antagonists
4A

Spinosyn
Nikotiiniasetyyl i-koliini reseptorien aktivaattorit (nAChR)
5

Pymetrosiini
Valikoivat yhtäläissiipisten syönninestäjät
9B

Indoksakarbi
Natrium-kanavien tukkijat
22A

Laji	Tehoaineryhmä	Resistenssityyppi	Käytettävissä vaihtoehtoja
Rapsikuoriainen, Rapsbagge (S) (*Meligethes aenus*) (L)	Useimmat pyretroidit	Metabolinen	Kyllä

Muista! Sinä itse voit tehdä paljon: ●Torju kun torjunta-kynnys ylittyy ● Käytä ja vaihtele valmisteita joilla on erilainen vaikutustapa!

IRAC ryhmä	Ryhmä	Vaikutustapa	Esimerkkejä tehoaineista	Esimerkkejä valmisteista
3A	**Pyretroidit, pyretriini**	Natriumkanavien toimintaan vaikuttaja	Luonnon pyretriini	Bioruiskute S
			Alpha-sypermetriini	Fastac , Kestac
			Sypermetriini	Cyperkill 500 EC
			Deltametriini	Decis Mega EW 50
			Esfenvaleraatti	Sumi Alpha 5 FW
			Lambda-syhalotriini	Karate Zeon
			Tau-fluvalinaatti	Mavrik
4A	**Neonikotinoidit**	Nikotiini – asetyleenikoliini – reseptorien vastavaikuttaja	Asetamipridi	Mospilan
			Tiaklopridi	Biscaya OD 240
9B	**Pymetrosiini**	Valikoiva yhtäläisiipisten ravinnonoton estäjä	Pymetrosiini	Plenum 50 WG
22A	**Indoksakarbi**	Natriumkanavien tukkija	Indoksikarbi	Avaunt

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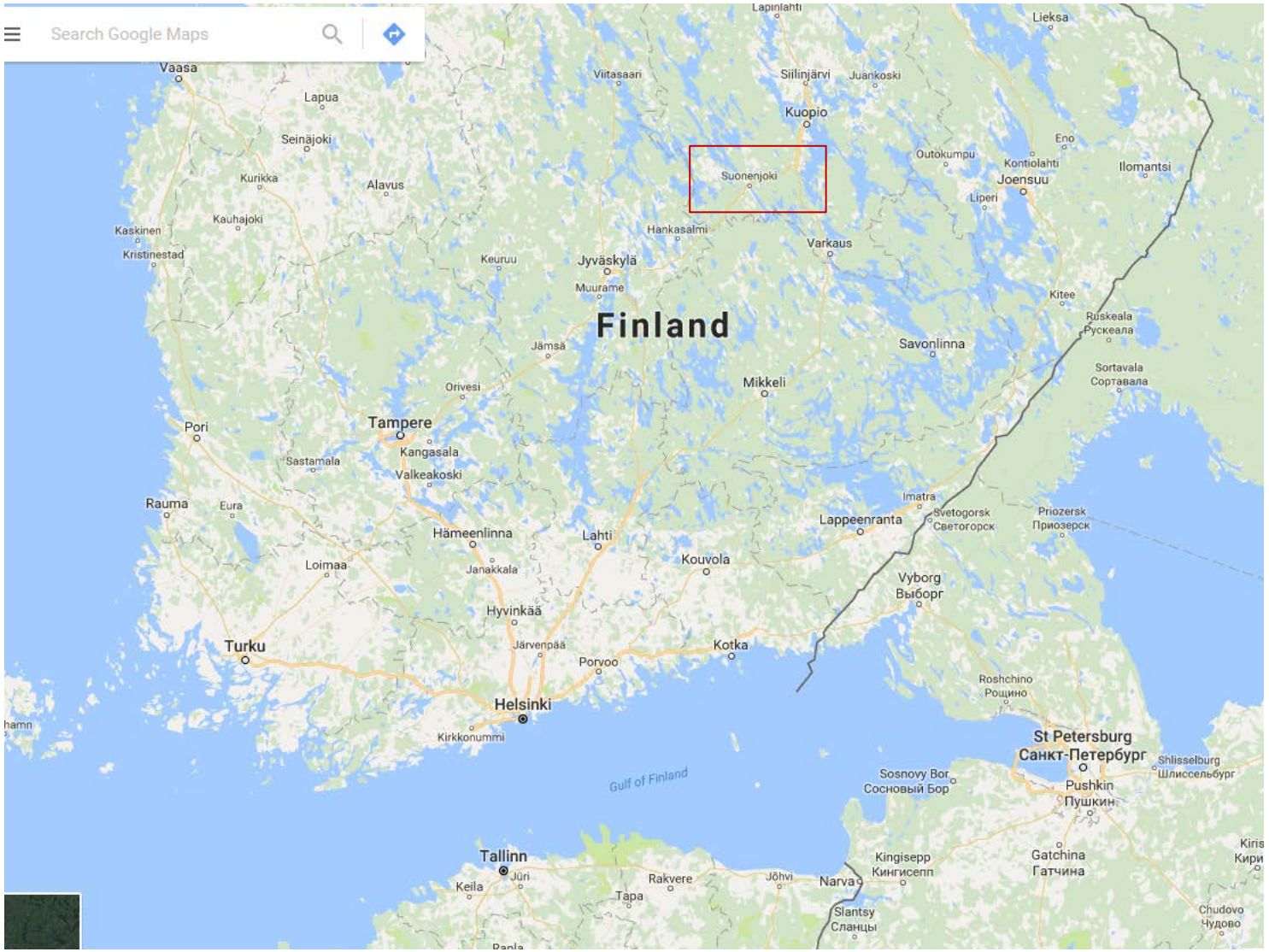
Insecticide resistance in the Strawberry blossom weevil (*Anthonomus rubi*) in Finland.

Insecticide resistance in the Strawberry blossom weevil in Finland.

- Strawberry blossom weevil has been a severe problem during this decade in the eastern part of country in North Savo.
- Many specialized strawberry farms have been concentrated in the same area but also other berries, particularly raspberry, are grown here.
- The cultivated area of strawberry has been about 900 ha in 2010's in North Savo area. In Suonenjoki community for instance strawberry area of about 50 farms has been around 300 ha (>5 ha/farm). In the whole country total area for strawberry was about 3600 ha and the average yield was around 3.3 tn/ha.
- Pyrethroids were for many years the only insecticides allowed in Finland for control of strawberry blossom weevil until Calypso (thiacloprid) was accepted for use against *A. rubi* in 2015



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Insecticide resistance in the Strawberry blossom weevil in Finland.

About the life cycle of *A. rubi*

- Egg laying of *A. rubi* begins when the strawberry flower buds emerge (BBCH 57)
- Normally it is in the beginning of June, but may continue until end of July particularly in cool weather
- Larvae of *A. rubi* live and pupate in the severed buds
- Emerging adults of *A. rubi* are feeding on strawberry leaves and petals without harming the plants.
- After some weeks adults of the new generation migrate to the hibernation sites in or near to the field
- The following spring the overwintering weevils feed on leaves before egg laying starts.

Insecticide resistance in the Strawberry blossom weevil in Finland

- How to confirm or not suspicions of resistance of the weevils against most pyrethroids in the growing area?
- Sensitivity tests based on the same method that has been used for the pollen beetle (IRAC 11)
- The registered pesticides used were Karate Zeon (lambda-cyhalothrin 100 g ai/l) and Calypso SC 480 (thiacloprid 480 g ai/l) with the approval dose rates of 75-150 ml/ha and 250 ml/ha, respectively.
- The used concentrations were lambda-cyhalothrin 0%, 20% (2 g ai/ha),100% (10 g ai/ha) and 200% (20 g ai/ha) and thiacloprid 0%, 20% (24 g ai/ha),100% (120 g ai/ha) and 200% (240 g ai/ha)
- The co-operating laboratories preparing the test vials have been LAMMC and Bayer Germany

Sensitivity testing 2016 -2018

- We aimed at taking samples from the same farms every year but only 3 out of 10 participated all years and most two years. One farm was organic, the other conventional
- The tests were performed at Luke's laboratory in Suonenjoki and started the same day after sampling was finished
- 10 weevils/vial were kept at room temperature and checked after 24 h
- Weather and temperature differences occurred every year:

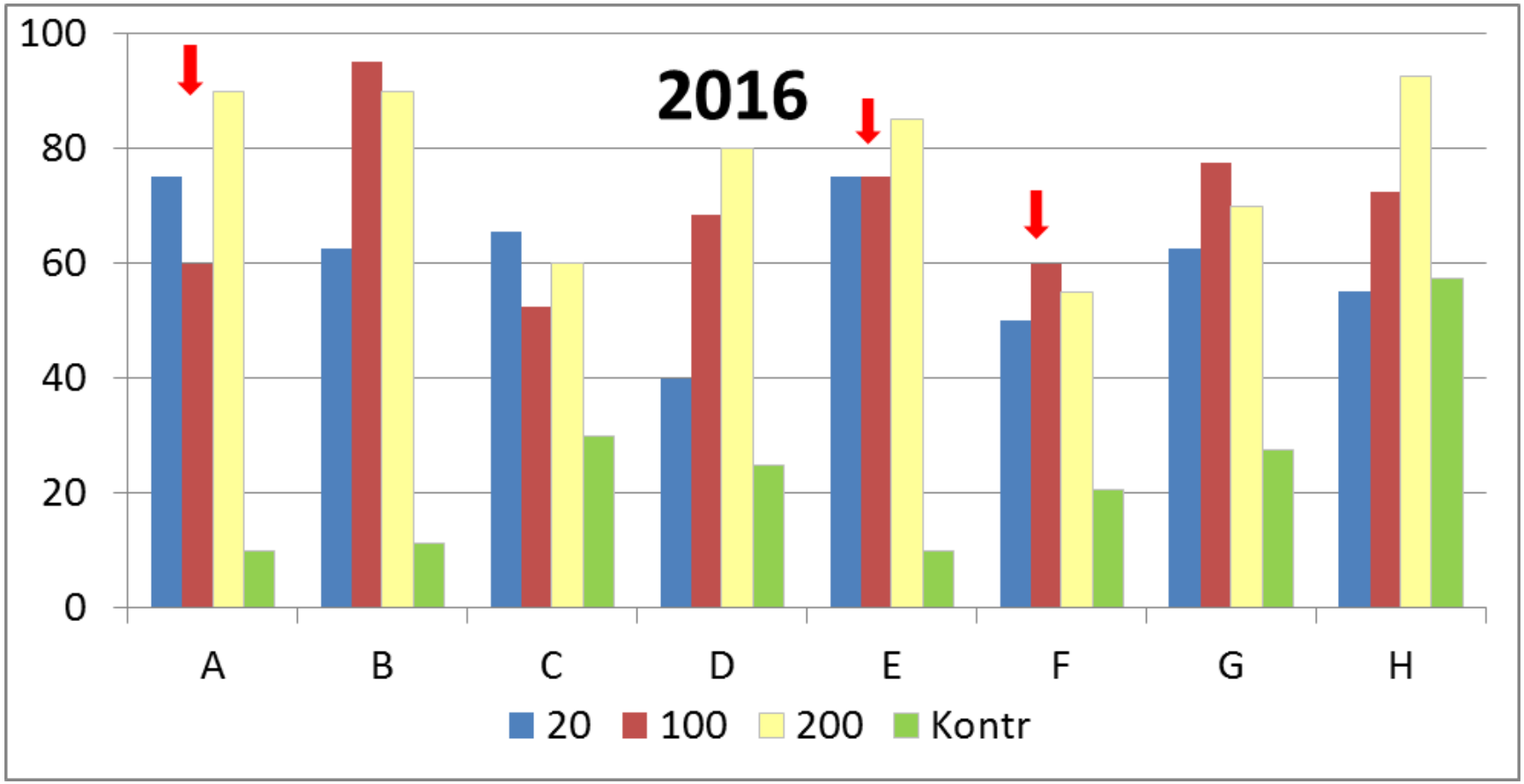
Date	DD	Date	DD	Date	DD
31.5.2016	259	14.6.2017	170	31.5.2018	269
6.6.2016	311	19.6.2017	226	6.6.2018	315

Results

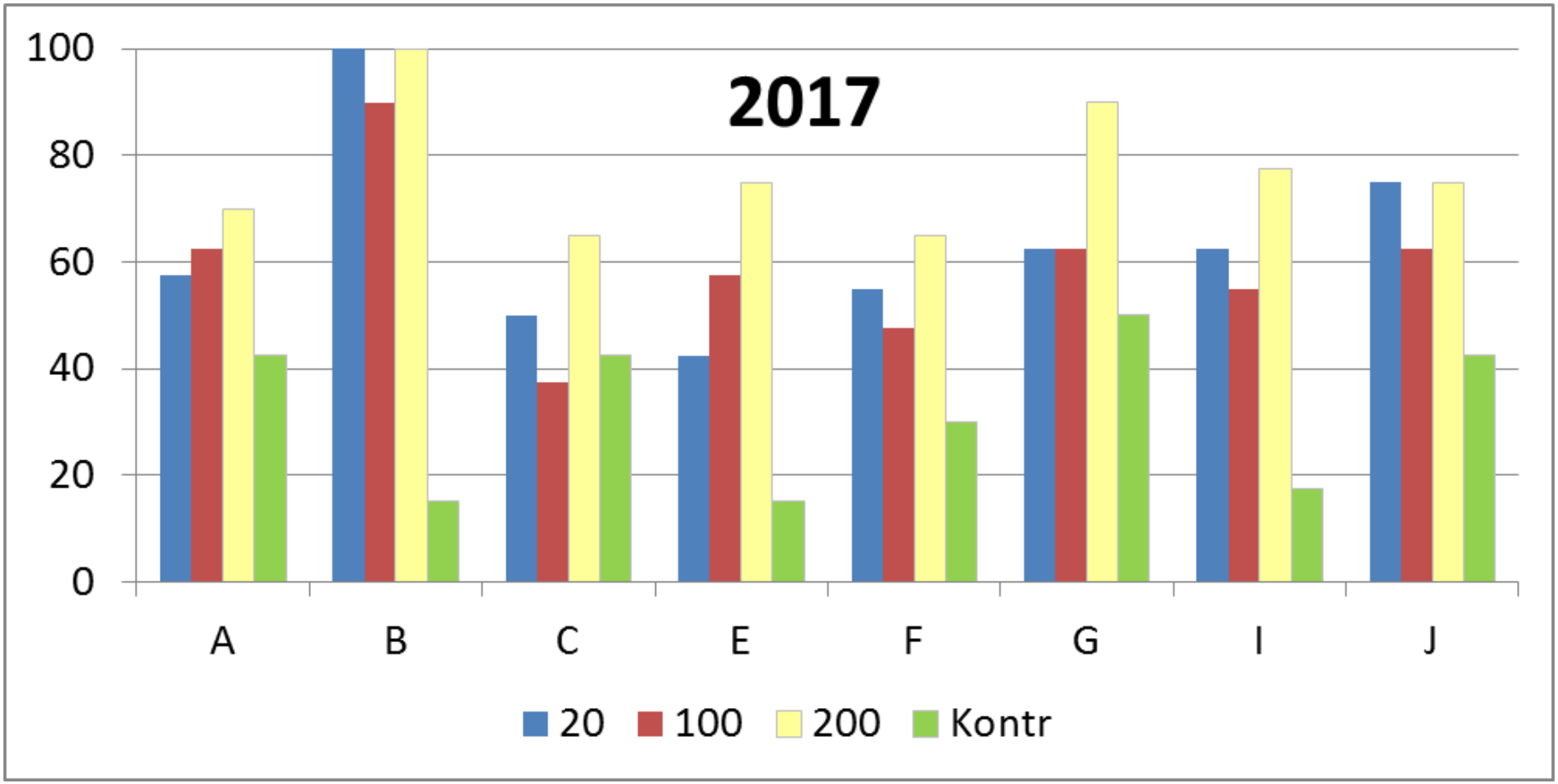
Lambda-cyhalothrin: 2016-2017

- Only 200 % gave a good result and differed significantly from the other treatments
- Differences between 100 % and 20 % treatments were small
- Some differences could be seen between the farms: can depend on locations, surroundings, treatment-time etc.
- Based on the results we cannot prove resistance but there are strong indications of decreased susceptibility against the pyrethroid in most fields
- In spite of some adjustments due to experiences from the preliminary test in 2015 some problems occurred
- The weevils behave strange in the test which can be seen in the high mortality in the control vials

➢ This may cause difficulties in counting effectivity



The effect of lambda-cyhalothrin on strawberry blossom weevils (mortality %). B= contr./organic farm. ⬇ = sampled only once



The effect of lambda-cyhalothrin on strawberry blossom weevils (mortality %).
B= contr./organic farm.

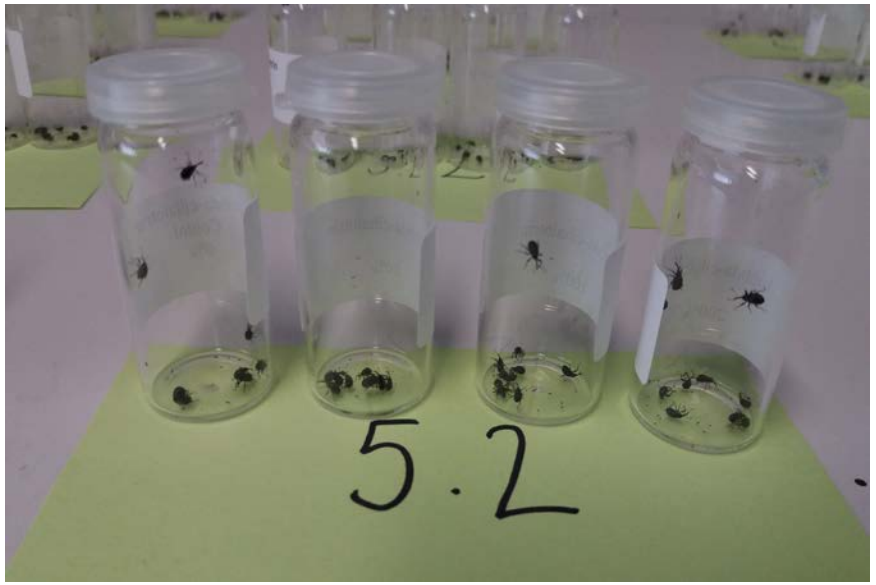
Results – Thiacloprid 2018

- The purpose was to compare thiacloprid to lambda-cyhalothrin but unfortunately we got some problems there
- Consequently, we collected weevils only from four farms instead of seven: three conventional and on organic (all farms took part also in 2017)
- According to the results it is impossible to say something about the effect of thiacloprid on the weevils except of the organic farm where the treatment have affected the weevils

Conc.	Farm 1	Farm 2	Farm 3	Farm 4
200% FA 98 +/- 3%	70	57.5	87.5	95
100% FA 93 +/- 6%	70	72.5	80	90
20% FA 50 +/- 10%	52.5	50	50	82.5
Control	27.5	42.5	15	15

Insecticide resistance of the Strawberry blossom weevil in Finland.

Strawberry blossom weevils from the organic field were clearly susceptible to the lambda-cyhalothrin and thiacloprid

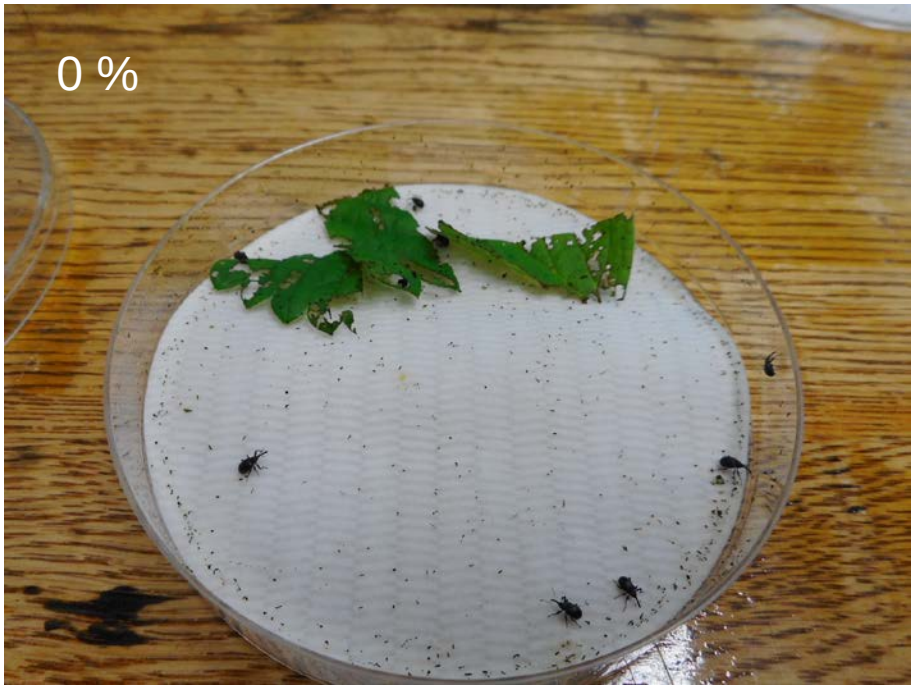


Weevils from the conventional farms could better stand the chemical.

Results

As thiacloprid is a long-acting preparation we decided to follow the weevils on petri dishes for some days

- After counting the affected weevils (24 h) in each vial, they were moved on petri dishes, with pieces of clean strawberry leaves
- Petri dishes were kept in room temperature and checked after three days
- There were differences between the treatments but also within the treatments
- The feeding pattern of leaves showed best the difference between the treatments: in 0 % weevils fed eagerly, a bit less in 20 % but in the higher concentrations leaves were mostly intact

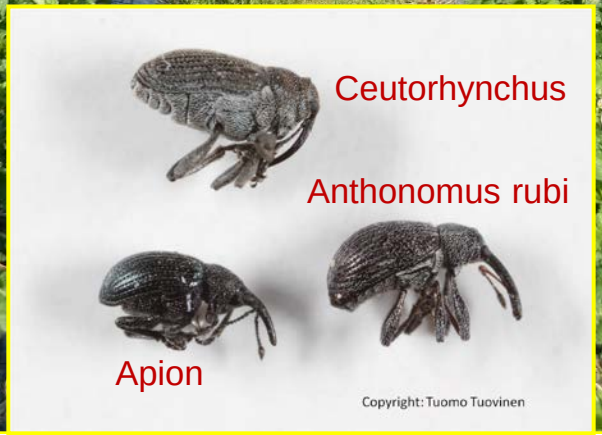

0 %


20 %


100 %


200 %

Monitoring



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Pesticides allowed in strawberry in Finland

Pyretroids:
Decis Mega EW 50
Envidor 240 SC
Floramite 240 SC
Karate Zeon
Maatilan Deltametriini
Maatilan Syhalotriini 2
Nissorun
Vertimec 018 EC

Neonicotinoids:
Calypso SC 480

Others:
Agrimec
Movento

Thank you!

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