Research Institute
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Costumer: Omya AG, Engelhard Corporation, FiBL

Efficacy of different insecticides against the European pear sucker (*Psylla pyri*)

Questions: Efficacy of Neem, kaolin, pyrethrin, spinosad, and rotenone to control *Psylla pyri*

Experimental site: Christophe Suter, Roveray, CH-1170 Aubonne

Treatments:

(1) Control
(2) NeemAzal-T/S (0.3%), 1 application at stage **52**-53 BBCH
(3) NeemAzal-T/S (0.3%), 2 applications at stage **52**-53 & **54**-56 BBCH
(4) Surround® WP (active matter: kaolin; 30kg/1000l), 2 applications at stage **51**-53 & **54**-56 BBCH
(5) Surround® WP (30kg/1000l), 3 applications from stage **51**-53 onwards at a 7 days interval
(6) Surround® WP (30kg/1000l), 6 applications: 3 appl. from stage **51**-53 onwards at a 7 days interval & 3 appl. from stage **66**-69 onwards at 7 days interval
(7) Pyrethrum FS (active matter: pyrethrin; 0.05%), 1 application at stage **66**-67 BBCH
(8) Pyrethrum FS (0.05%), 2 applications at stage **66**-67 & 68-**69** BBCH
(9) Sicid (active matter: rotenone; 0.5%), 2 applications at stage **66**-67 & 68-**69** BBCH
(10) Audienz (active matter: spinosad; 0.03%), 2 applications at stage **66**-67 & 68-**69** BBCH
(11) Audienz +Telmion (active matter of Telmion: rape oil; 0.03%+1%), 2 applications at stage **66**-67 & 68-**69** BBCH

Varieties:

- Conference
- Harrows

Experimental design:
- 7 replications per treatment with 4 trees per replication (3 replications on variety Conference, 4 replications on variety Harrows; Neem treatments only on Harrows 4 replications)

Application technique:
- High-pressure hand gun application to drip coverage

Dates of Applications:
- 26th Feb 03, stage 51: Surround (treatments 4,5,6)
- 05th Mar 03, stage 52: Neem (2,3), Surround (5,6)
- 12th Mar 03, stage 53: Surround (5,6)
- 20th Mar 03, stage 54-56: Neem (3), Surround (4)
- 23rd Apr 03, stage 66-67: Pyrethrum (7,8), Rotenone (9), Audienz (10), Audienz/Telmion (11), Surround (6)
- 29th Apr 03, stage 68-69: Pyrethrum (8), Rotenone (9), Audienz (10), Audienz/Telmion (11), Surround (6)
- 06th May 03, stage 69: Surround (6)

Method of control:
- Beating tray samples (3 to 4 samples per date)
- Visual controls on blossoms or young shoots

Dates of control:
- 26th Feb 03: Beating tray sample
- 05th Mar 03: Beating tray sample
- 12th Mar 03: Beating tray sample
- 20th Mar 03: Beating tray sample
- 23rd Apr 03: Visual control on flowering buds
- 06th May 03: Visual control on flowering buds
- 21st May 03: Visual control on young shoots
- 28th May 03: Visual control on young shoots

Statistical analysis:
- JMP, Version 4.0.2
- Student's t-Test

Results and Discussion

To monitor the adults, beating tray samples were taken in the rows in the neighbourhood of the experimental site (Tab. 1). The flying period of the over-wintering adults declined after mid-March and stopped at the end of March.

Table 1: Mean number of adult European pear sucker (*Psylla pyri*) during the first flying period in early spring. Beating tray samples were taken in the neighbourhood of the experimental site in Aubonne.

Dates of sampling	Mean number of adult psyllids/sample
26th Feb 03	56.5
05th Mar 03	94.0
12th Mar 03	32.0
20th Mar 03	2.5

At the beginning of the flying period of the over-wintering adult pear suckers (stage 51-52 BBCH = bud swelling) the Neem treatments were applied with the idea to kill the adults and/or to reduce the females' fertility. Surround applied at the same time should have hindered the female pear suckers to lay their eggs on the unattractive, kaolin coated leaves and shoots.
All other insecticide treatments were focussed on killing the larvae of the first generation at stage 66-69 BBCH (petal fall).
Therefore, during the first visual control (23rd April) only the Neem treatments with one and two applications ("Neem 1x", "Neem 2x") and Surround treatments with two and three applications ("Surround 2x", "Surround 3x") could be assessed. The results are shown in Figure 1. The number of larvae on 50 blossoms or young fruits, respectively, was counted. Compared to the untreated control both Surround treatments significantly reduced the number of larvae, whereas Neem had no effect.

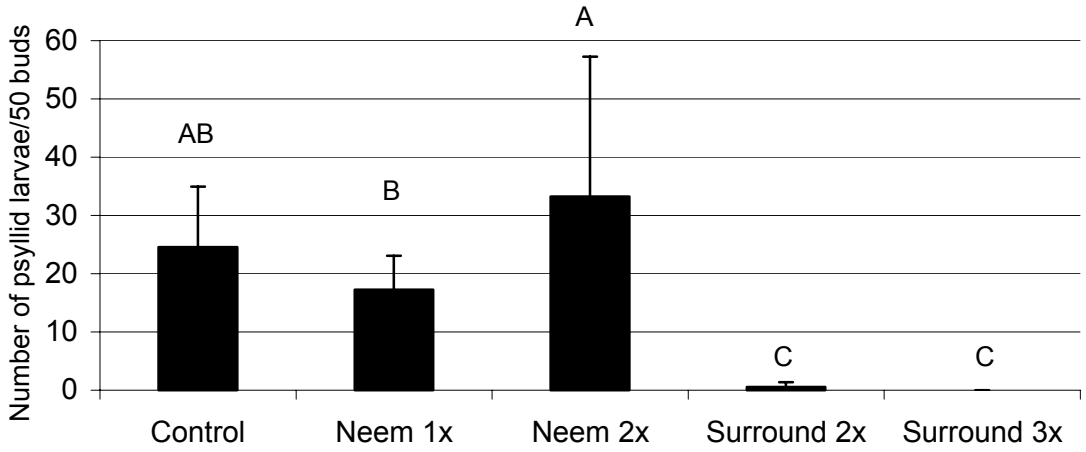

Figure 1: Effects of differently repeated Neem and Surround treatments before bud burst on the mean number of European pear sucker larvae of the first generation on 23rd April 2003 (Student's t-Test with α<0.05); treatments with different letters are significantly different.

At the date of the second visual control (6th May 2003) all treatments could be evaluated but the treatment Surround with 6 applications ("Surround 6x") was only treated five times at this moment. The results are presented in Table 2. Again, all Surround treatments showed the best results, whereas no differences could be detected between the differently repeated Surround treatments. The treatments "Audienz/Telmion 2x" and "Rotenone 2x" also had lasting and significant efficacy. Rotenone is already officially indicated against the European pear sucker in Switzerland. However, both treatments showed slightly more pear sucker larvae than the trees treated with Surround. The treatment "Audienz 2x" (without additive) was less efficient than the combined "Audienz/Telmion 2x" but differences were statistically not significant. No differences in efficacy could be detected between the two Neem treatments as well as between the two Pyrethrum treatments.

Two weeks later (21st May), visual controls of the pear shoots showed different results: both Neem treatments, both Audienz treatments, and the single Pyrethrum treatment did not show a significant effect on the larvae of pear sucker (Table 2). However, Pyrethrum 2x and Rotenone had a significant efficacy. Again the best results were found in the different Surround treatments.

Table 2: Effects of different insecticide and kaolin treatments on the mean number of European pear sucker larvae on 6th May 2003 and on 21st May 2003; Student's t-Test with α<0.05, treatments with different letters are significantly different.

	6th May 2003		**21st May 2003**	
Treatments	Larvae/50 blossoms		Larvae/20 shoots	
Control	48.29	A	35.29	B
Pyrethrum 1x	33.86	AB	11.29	BCD
Pyrethrum 2x	35.00	AB	7.00	CD
Neem 1x	18.00	BC	35.00	BC
Neem 2x	17.25	BC	76.50	A
Rotenone 2x	15.14	C	6.86	CD
Audienz 2x	16.57	BC	29.29	BC
Audienz/Telmion 2x	7.00	C	9.57	BCD
Surround 2x	0.71	C	5.57	CD
Surround 3x	0.00	C	0.71	D
Surround 6x	0.14	C	6.71	CD

However, the results of the visual control on 21st May should be treated with care, since many adults were noticed during the visual control. This could indicate on the one hand that egg laying and in consequence larval development of the 1st generation was not completed. On the other hand the 1st and 2nd generation could already have started to overlap.

During the last visual control (28th May 2003) the treatment Surround 6x could still be recognised by the white coated trees. An other fact was, that the young leaves at the top of the shoot were not protected by the Surround coating. Thus, on these parts of the tree most of the eggs were found. At this date the 1st and 2nd generation of the pear sucker were clearly mixed: adults, different larval stages, and eggs were observed on the leaves and on the top of the shoots. For this reason it was difficult to collect representative data. Moreover, the mobile adults probably moved between the different treatments. Therefore, the results of this visual control are not shown.

At the beginning of May the rows next to the trial were treated twice with Surround in a bigger, more practice like experiment. The results are given in Figure 2. In the treated area clearly less pear sucker eggs were laid and as a result also less larvae were counted. However, this type of experiment without replicates does not allow statistical analysis.

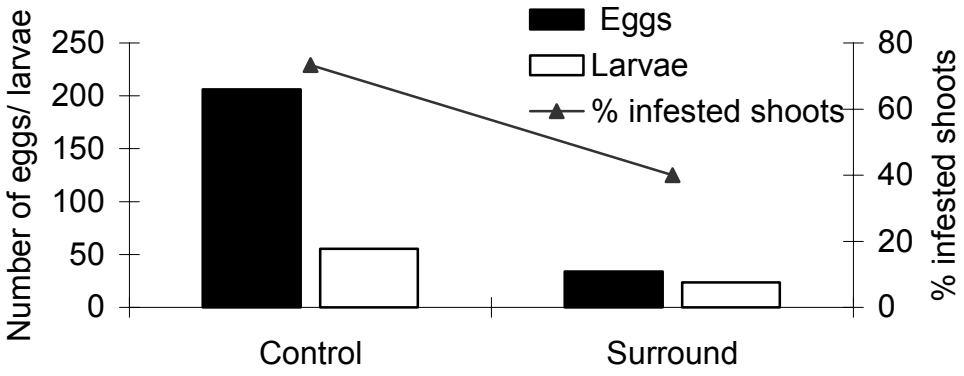

Figure 2: Number of larvae and eggs of the European pear sucker and infestation rate (%) of shoots on 28th May 2003; differences are statistically not significant.

In addition to the pear sucker infestation the number of pear bedstraw aphids (*Dysaphis pyri*) was quantified. Because of the uneven infestation with *D. pyri* in the orchard and since the initial population was not determined, data can only indicate the potential of the different products against this aphid. The results of the visual control on 21st May 2003 are given in Figure 3. The second visual control (28th May 2003, data not shown) gave similar results, but the differences between the different treatments were less distinctive.
As expected, the typical aphicides (Neem, Pyrethrum, Rotenone) showed a certain efficacy on *D. pyri*. However, Surround and Audienz also led to a significant reduction of the aphid colonies. But, for more precise results a separate trial should be arranged.

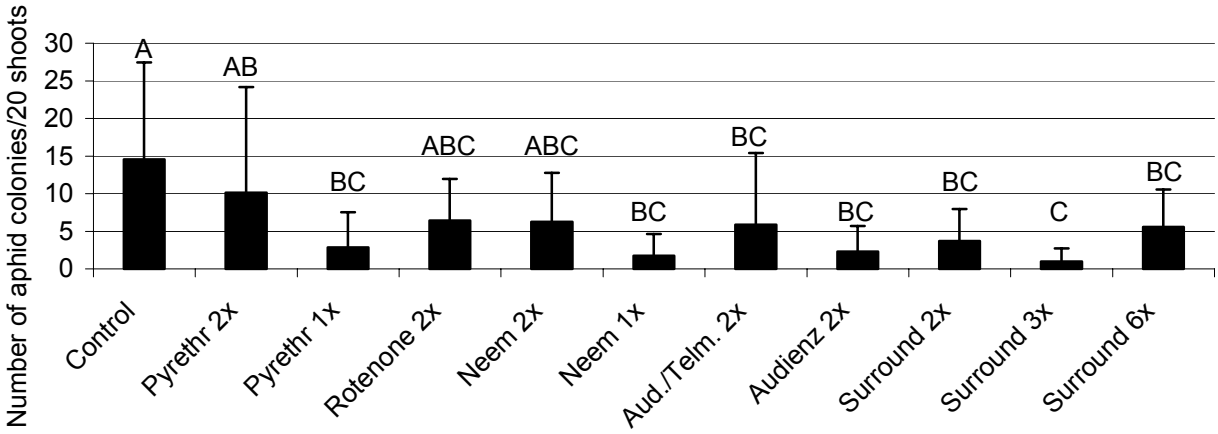

Figure 3: Effects of the different treatments on the number of colonies of the pear bedstraw aphid (*Dysaphis pyri*) observed on the 21st May 2003 (Student's t-Test with $\alpha < 0.05$); treatments with different letters are significantly different.

Side effects on predatory bugs (*Anthocoris ssp*.) could not be registered because they only occurred in very low numbers.

Summary

- Rotenone, the only registered product against pear suckers in Swiss organic agriculture, showed good effects. Thus, a suitable product to control the European pear sucker is available. Since Rotenone is toxic to beneficials an alternative for this product is desirable.
- Neem had no or a very low impact on the pear sucker populations. Since Neem was applied against the adults in order to kill them or to reduce females' fertility, it is possible that new, fertile insects migrated from the untreated rows aside into the treated plots. To get more meaningful data for this slowly working insecticide, trials should be done on bigger plots.
- Audienz (active matter: spinosad) in combination with Telmion (rape oil) showed a slightly better efficacy than Audienz without additive. The efficacy of Audienz/Telmion is similar to the efficacy of the registered Rotenone and should be registered for the control of the European pear sucker. Since the young fruits of some Telmion treated trees showed russeting, the concentration of this additive should be re-evaluated in separate tests.
- Pyrethrum was applied at two dates: 23rd April and 29th April. During the visual control of the 6th May no effect could be seen, whereas two weeks later an efficacy comparable to the efficacy of Rotenone was observed. This retarded effect of this contact insecticide cannot be explained.
- Surround showed the best efficacy against the European pear sucker in this trial. No significant differences were found between the differently repeated treatments with Surround. It might be concluded that the triple application before blossom had the best efficacy. An increased efficacy with additional applications after blossom could not be proven. Since the adults are quite mobile and since the plots were small, it could not be verified if the reduction of the population in spring is sufficient to keep the pear sucker under the economic threshold during the whole year. This question should be clarified in a more practice like experiment on a bigger surface. Since Surround is not toxic for beneficials this product might be an alternative to Rotenone.

Acknowledgement

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