

Project leader: Claudia Daniel and Dr. Eric Wyss

Department: Plant protection Entomology

Costumer: Neudorff, Engelhard Corp., FiBL

Efficacy of different insecticides against the woolly apple aphid (*Eriosoma lanigerum*)

- Questions: Efficacy of different Insecticides against the woolly apple aphid (*Eriosoma lanigerum*)
- Experimental site:
 - FiBL, Ackerstrasse, CH-5070 Frick
 - Christophe Suter, Roveray, CH-1170 Aubonne
- Treatments/Dates of application:

Frick:

 - Control
 - Alcohol (80%; 2 applications: 23rd May & 2nd June 2003)
 - Neu 11611 (1%; 3 applications: 23rd, 26th, 29th May 03)
 - Surround® WP (3kg/100l; 1 application: 23rd May 2003)

Aubonne/trial 1:

 - Control
 - Mineral oil (2%; 2 applications: 6th & 28th May 2003)
 - Surround® WP on trunk and main branches (3kg/100l; 2 applications: 6th & 28th May 2003)
 - Surround® WP on total tree (3kg/100l; 2 applications: 6th & 28th May 2003)

Aubonne/trial 2:

 - Control
 - Neu 11611 on trunk and main branches (1%; 3 applications: 17th, 20th, 23rd June 2003)
- Variety:
 - Glockenapfel (Frick), Pinova (Aubonne)
- Experimental design:
 - Frick: 4 replications with each one tree per treatment
 - Aubonne/trial 1: 6 replications with 3 trees per treatment
 - Aubonne/trial 2: 5 replications with 16 treated trees and 5 untreated trees

- Application technique:
- Frick: 5l hand gun, (alcohol with small hand sprayer)
 - Aubonne: high-pressure hand gun until drip coverage, Surround until near-drip coverage
- Method of control:
- Visual control on trunk and main branches and estimation of infestation in categories (1 = single aphid or one colony of $\leq 2.5\text{mm}$ diameter; 2 = colony $\leq 5\text{mm}$; 3 = colony $\leq 7.5\text{mm}$; 4 = colony $\leq 10\text{mm}$; 5 = colony $\leq 15\text{mm}$; 6 = colony $\leq 20\text{mm}$; 7 = colony $\leq 25\text{mm}$; 8 = colony $\leq 30\text{mm}$; 9 = colony $\leq 40\text{mm}$; 10 = colony $\leq 50\text{mm}$)
- Dates of control:
- Frick: 23rd May (start of the trial), 2nd & 18th June 2003
 - Aubonne/trial 1: 29th April, 6th May (before start of the trial), 21st May, 28th May and 17th June 2003
 - Aubonne/trial 2: 17th June (start of the trial); 25th June, 1st July 2003
- Statistical analysis:
- JMP Version 4.0.2
 - Student's t-Test
 - Wilcoxon Chi-Square-Test

Results and Discussion

The infestation with the woolly apple aphid in Frick as well as in Aubonne was irregular and differed from tree to tree.

In Frick, the initial population was determined on 23rd May 2003. Concerning the colonies, the initial number did not show any differences between treatments, whereas differences occurred in the size of the colonies at the beginning of the trial. Colonies were significantly larger in the alcohol treated plots than in the control plot, while the trees in the plots Neu 11611 and Surround were in between. Due to the inhomogeneous infestation no significant differences in size and number of colonies were found during the visual controls of 2nd June and 18th July 2003. However, results of the calculated alteration of population (i.e. actually observed population minus initial population) showed significant differences. The percentage alteration in size and number of colonies is given in Figure 1 and 2. Figure 1 shows the results of the first visual control on 2nd June 2003: the number of colonies in the **untreated control** remained constant but the size of the colonies increased by more than 130%. On the **alcohol** treated trees the size of colonies remained constant, whereas the number of colonies increased by 140%. This means that the alcohol treatment caused a migration of the woolly apple aphids which created new colonies. The treatments **Surround** and **Neu 11611** reduced the size of colonies by approximately 55%. Reduction of the number of colonies was more important with Neu 11611 (50%) than with Surround (30%).

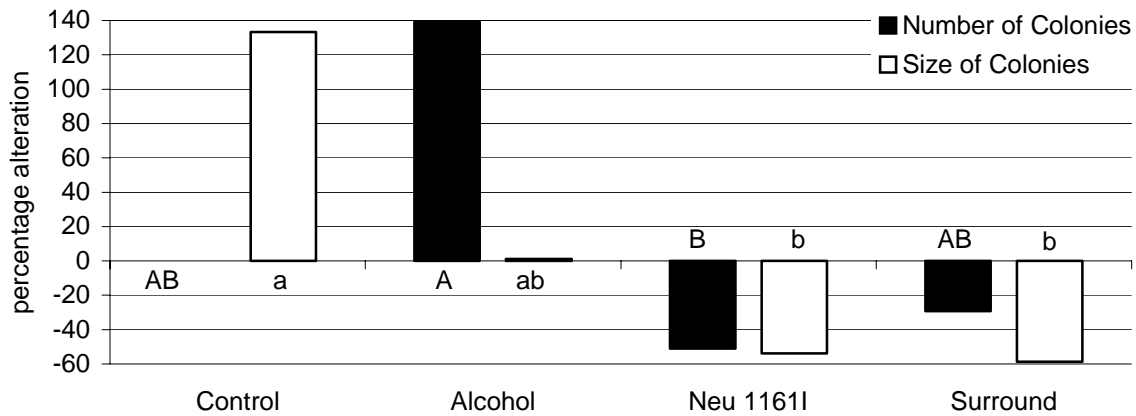


Figure 1: Percentage alteration in size and number of colonies in Frick in the period of 23rd May to 2nd June 2003 (Student's t-Test with $\alpha < 0.05$; treatments with different letters are significantly different).

Figure 2 shows the percentage alteration between the initial infestation and the last visual control on 18th June 2003: on one hand the number of colonies declined in the **control** but on the other hand the increase in colony size was about 50%. In contrast to the visual control on 23rd May, number of colonies (50%) and size (65%) dropped in the **alcohol** treatment may be due to the second application of alcohol or to the general decline of the population. The treatment with **Neu 11611** had the best efficacy against the woolly apple aphid. On 23rd May all colonies had vanished. With this result of 100% reduction Neu 11611 was the best product in this trial. The strategy to repeat three applications in a three days interval seems to be very effective against the woolly apple aphid. But the trial in Frick does not permit general statements, since the trees were pruned just before the first application. Thus the trees barely had any leaves and therefore application was clearly better than on trees with normal foliage.

On 23rd May **Surround** did not show a significant effect compared to the control. Since the number of colonies increased during the trial by 50%, we might assume that Surround can not sufficiently prevent the migration of the aphids within a tree. It might be that repeated applications of Surround would show better results.

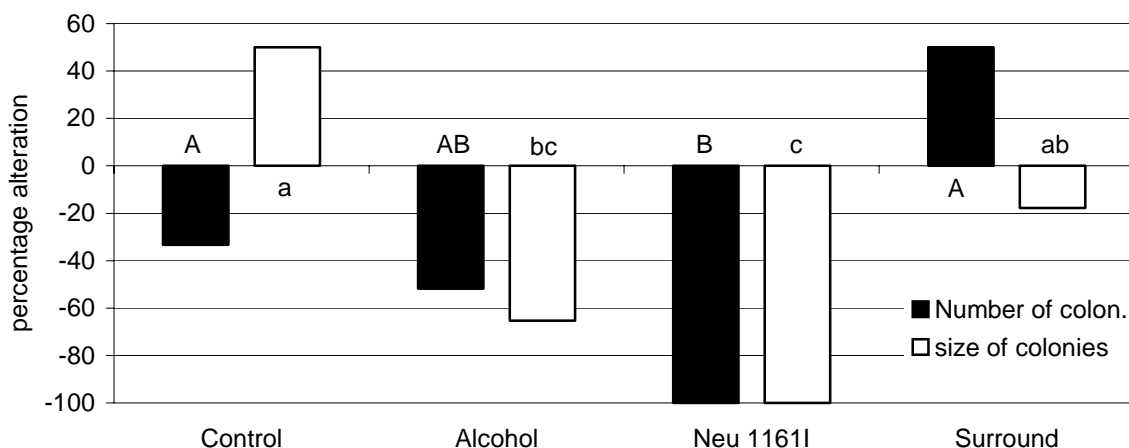


Figure 2: Percentage alteration in size and number of colonies in Frick in the period 23rd May to 18th June 2003 (Student's t-Test with $\alpha < 0.05$, treatments with different letters are significantly different).

In Aubonne the initial infestation was not systematically evaluated. No significant differences were observed between the different plots for the presence of the woolly apple aphid on trees (Wilcoxon Chi-Square-Test). However, there are no data on the number and size of colonies for the period before the trial started. Therefore, the alteration of the population could not be estimated. Three visual controls were made in Aubonne, but only at the first one (21st May 2003) significant differences between the treatments were found. At this time, only the impact of the first application could be assessed, since the second application took place on 28th May 2003. For the later controls no differences were found. The results of the first visual control are shown in Figure 3: only the treatments with **mineral oil** differed significantly from the control. The **Surround**-treatments had no effect.

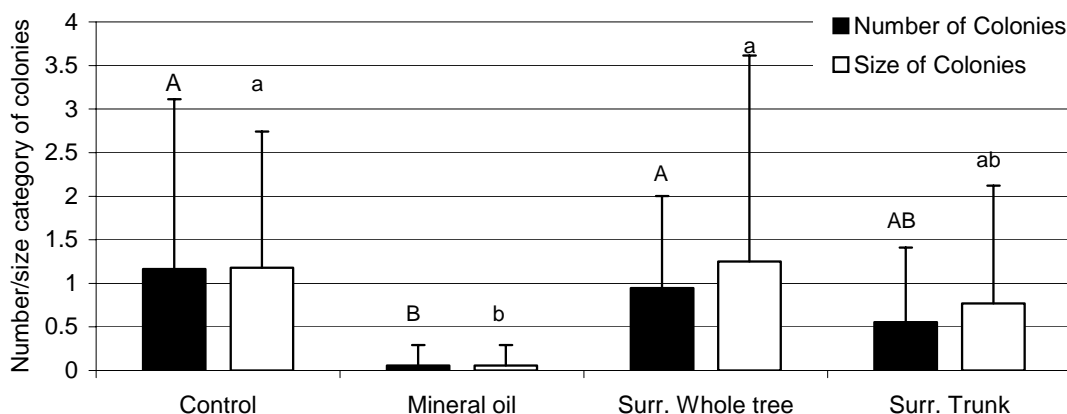


Figure 3: Number and size-categories (see above: method of control) of the woolly apple aphid in Aubonne on 21st May 2003 (Student's t-Test with $\alpha < 0.05$, treatments with different letters are significantly different).

Based on the promising results with **Neu 1161I** in Frick, we started a second, more practice-like trial with this product in Aubonne. Like in Frick, the Neu 1161I was applied three times in a three days interval. Application was done by the farmer. The result of this trial is given in Figure 4: the size of colonies declined in the untreated and treated plots and therefore, no differences between the treatments were found. However, the number of colonies in the control increased by 25%, while the number of colonies in the Neu 1161I plots declined by 55%. The resulting effect is significant but the efficacy of the Neu 1161I-treatment was not as evident as in the Frick trial (100%).

In summary, the product **Neu 1161I** is very promising and should be further tested. The strategy of three applications in a three days interval seems to be very effective against the woolly apple aphid and should also be tested for other products (e.g. mineral oil). The single **mineral oil** treatment was efficient but more information on population dynamic of the woolly apple aphid is needed to determine the exact date of application. The treatment with **Surround** gave very contradictory results. Obviously, Surround did not inhibit migration of the woolly apple aphid within the tree. Thus, this product will not be effective against the spring and summer forms of the woolly apple aphid.

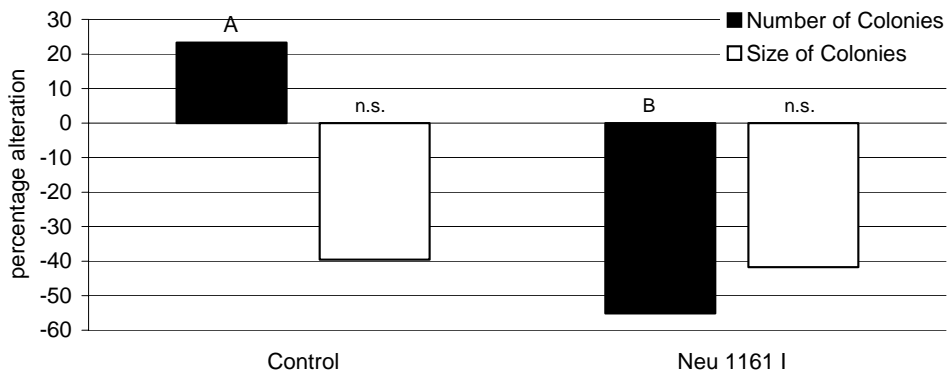


Figure 4: Percentage alteration in size and number of colonies in Aubonne in the period 17th June to 1st July 2003 (Student's t-Test with $\alpha < 0.05$, treatments with different letters are significantly different, n.s. = not significant).

Acknowledgement

We thank Engelhard Corporation (Iselin NJ, USA) and Neudorff for supplying the products. Special thanks to Christophe Sutter for permitting the trial to be conducted within his orchard in Aubonne (VD, Switzerland).