Bulletin of Insectology ***64*** *(Supplement): S263-S264, 2011*
ISSN 1721-8861

Effects of possible repellents on feeding and survival of *Cacopsylla pruni* (Scopoli)

Monika RIEDLE-BAUER, Helmut BAUER, Judith MÖRTEL
Lehr– und Forschungszentrum für Wein- und Obstbau, Klosterneuburg, Austria

Abstract

During the last years *Cacopsylla pruni* has become a major concern in Austria because of its vectoring of Stone fruit yellows in apricots. Products based on kaolin, paraffin oil, orange oil and extract of fennel oil as active ingredients were tested for their ability to repel the disease vector *C. pruni* from landing and feeding on *Prunus armeniaca*. In free choice experiments all products showed significant repellency to adults 24 h after start of the tests. After 72 h, however, fennel extract oil and orange oil had lost their effect as compared with the untreated control, whereas plants treated with kaolin or paraffin oil were barely colonized.

In no choice experiments kaolin and paraffin oil significantly influenced feeding behaviour. All tested products significantly reduced the number of surviving insects in comparison to water treated controls.

Key words: *Cacopsylla pruni*, kaolin, paraffin oil, repellent.

Introduction

Wachau is one of the most important apricot growing areas in Austria. Apricot gardens dominate the banks of the river Danube. The river valley is adjoined by areas of higher altitude covered by forests. In European Union law the apricot produced there are designed as "Wachauer Qualitätsmarille" a product with protected designation of origin (PDO). Fruits are produced mainly of the local cultivar 'Klosterneuburger Marille' (a clone of 'Hungarian Best') and the rootstocks are apricot seedlings, myrobalans and other plums. In addition to its commercial value, apricot farming in the Wachau is very important for tourism. The Wachau was inscribed as "Wachau Cultural Landscape" in the UNESCO List of World Heritage Sites in recognition of its architectural and agricultural history. The spring landscape is characterized by wide expanses of flowering apricot trees.

During the last decade European stone fruit yellows caused by '*Candidatus* Phytoplasma prunorum' has become a major concern in the Wachau area. Due to the high susceptibility of the predominant cultivar, the small scale structured apricot gardens and the close vicinity of conifers as putative overwintering hosts for the vector *Cacopsylla pruni* (Carraro *et al.,* 1998) disease incidences are high. Tree losses are a daily occurrence. It is well established that apricot cultivars differ in regard to their disease sensitivity and disease incidence might also depend on a grower effect (Thébaud *et al.*, 2006). In the case of the 'Wachauer Qualitätsmarille', however, a switch to less sensitive cultivars is not in accordance with the PDO status. The small scale structured apricot gardens are a part of the protected landscape and should therefore be kept as they are. All these factors make the development of control strategies very difficult.

Previous studies point out that overwintered adult *C. pruni* returning to apricot orchards in spring are the most efficient disease vectors (Thébaud *et al.*, 2009). The aim of our present work is the development of strategies to repel the vector *Cacopsylla pruni* from landing and feeding on apricot plants. Therefore, we investigated the repellency to *C. pruni* of commercially available products (based on kaolin, mineral oil and plant extracts) under experimental conditions.

Materials and methods

Cacopsylla pruni adults used in this study were field collected on *Prunus spinosa* in March and April 2011. One year old *Prunus armeniaca* (cv. 'Klosterneuburger Marille') grafts in pots and excised *P. armeniaca* branches (cv. 'Klosterneuburger Marille') inserted into water were used for the experiments. The plants were maintained under outdoor conditions but protected from rain.

Concentrations and manufacturers of the products evaluated in this study are indicated in table 1. Deonized water was used for untreated controls. The apricot grafts and excised branches were sprayed to run off with the tested products and allowed to air dry before placement of insects.

In free choice assays excised branches treated with the mentioned products were simultaneously placed into insect proof cages (40x35x40 cm). 100 insects were introduced into the cages and allowed to freely move around in the cage. Numbers of adults present on each branch and on the cage surface were counted daily. Eggs present on 5 randomly selected leaves per treatment were also counted.

In no-choice assays insects were kept in cylindrical cages (diameter 9 cm, height 25 cm) on potted grafts and excised branches. 10 individuals were introduced into each cage. Numbers of feeding and surviving adults were counted daily. Numbers off eggs were also recorded.

All experiments were repeated four times. Statistical analyses (ANOVA, least significant difference test) were performed by aid of the statistics program SPSS 12.0 (SPSS, Chicago, Illinois, USA).

Table 1. Plant protection products and concentrations used in this study.

Product name	Active ingredient	Concentration	Manufacturer
Cutisan	Kaolin	5% (w/v)	Biofa, Münsingen, Germany
Prev-B2	Orange oil, fatty alcohol ethoxylate	0.4% (v/v)	Biofa, Münsingen, Germany
Nu Film 17*	Pine oil	0.15 (v/v)	Löffler, Leopoldsdorf, Austria
Promanal	Paraffin oil	2% (v/v)	Proagro, Abenberg, Germany
HF Pilzvorsorge	Extract of fennel oil	0.4% (v/v)	Biofa, Münsingen, Germany

*, only used in combination with Cutisan.

Results

In free choice experiments all tested products significantly influenced host plant choice of *C. pruni* adults 24 h after start of the experiment. On average of 72% of adults had landed on untreated controls, 8% on plants treated with fennel oil extract, 20% on plants treated with orange oil. No insects were observed on kaolin or paraffin oil treated plants. After 72 h, however, fennel extract oil and orange oil had lost their repellency as compared with the untreated control, whereas only few individuals were present on plants treated with kaolin or paraffin oil.

In no choice experiments the active ingredients kaolin and paraffin oil significantly influenced feeding behaviour. One day after treatment on average of 53% of insects fed on water treated control plants but only 10% on paraffin oil treated plants and 12.5% on kaolin treated plants. All tested products significantly reduced the number of surviving insects in comparison to water treated controls. In the control treatments on average of 83% of insects were still alive after an observation period of 6 days. On plants treated with kaolin in combination with pine oil 22.5% of insect were still alive after this period, on plants treated with kaolin alone 19%, on fennel oil extract treated plants 53%, on orange oil treated plants 57% and on paraffin oil treated plants 21%.

Discussion

In the present study especially kaolin (Cutisan with and without addition of Nu Film) and paraffin oil (Promanal) had a prominent repellent effect on *C. pruni* adults both in free-choice and in no-choice experiments. Therefore, they might have a great potential for the use in integrated pest management programs targeted against *C. pruni*. Our experiments, however, were conducted under experimental conditions excluding rainfall. Thus, the repellent effects of these products to *C. pruni* must be verified under field conditions. Kaolin was sucessfully used in laboratory and field experiments against the European pear sucker, *Cacopsylla pyri* (L.) significantly reducing the population density of this polyvoltine species (Daniel *et al.*, 2005; Erler and Cetin, 2007). These experiments show that the kaolin particle film is stable under field conditions. In the mentioned experiments with *C. pyri*, however, attention was mainly paid on the effects of kaolin on oviposition and development of nymphs. In case of the univoltine *C. pruni* repellency to incoming adults as the most effective vectors would be required. Thus, long term experiments proving the effect of these products not only on vector density but also on disease incidence are desirable. Besides this, more products should be screened for their ability to repel *C. pruni* from landing and feeding on apricot trees.

Acknowledgements

The present work has been carried out in the frame of COST action FA0807 “Integrated Management of Phytoplasma Epidemics in Different Crop Systems”.

References

CARRARO L., OSLER R., LOI N., ERMACORA P., REFATTI E., 1998.- Transmission of European Stone Fruit Yellows by *Cacopsylla pruni*.- *Journal of Plant Pathology*, 80: 233-239.

DANIEL C., PFAMMATTER W., KEHRLI P., WYSS E., 2005.- Processed kaolin as an alternative insecticide against the European pear sucker, *Cacopsylla pyri* (L.).- *Journal of Applied Entomology*, 129: 363-367.

ERLER F., CETIN H., 2007.- Effect of kaolin particle film on winterform oviposition of the pear psylla *Cacopsylla pyri*.- *Phytoparasitica*, 35: 466-473.

THÉBAUD G., SAUVION N., CHADOEF J., DUFILS A., LABONNE G., 2006.- Identifying risk factors for European Stone Fruit Yellows from a survey.- *Phytopathology*, 96: 890-899.

THÉBAUD G., YVON M., ALARY R., SAUVION N., LABONNE G., 2009.- Efficient transmission of ‘*Candidatus* Phytoplasma prunorum’ is delayed by eight months due to a long latency in its host-alternating vector.- *Phytopathology*, 99: 265-273.

Corresponding author: Monika RIEDLE-BAUER (e-mail: Monika.Riedle-Bauer@weinobst.at), Lehr- und Forschungszentrum für Wein- und Obstbau Klosterneuburg, Wiener Straße 74, 3400 Klosterneuburg, Austria.