

## **Alternative methods for the protection of white horse chestnut trees against the leaf miner *Cameraria ohridella***

M Dzięgielewska, G Kaup

*Akademia Rolnicza, Katedra Entomologii, Słowackiego 17, 71-434 Szczecin, Poland*

*Email: entomology@agro.ar.szczecin.pl*

### **INTRODUCTION**

In Poland, the large-scale occurrence of horse chestnut leaf miner (*Cameraria ohridella*) on white horse chestnut (*Aesculus hippocastanum*) has been observed for several years. The pest is a cause of premature leaf-fall (Gilbert & Gregoire 2002), and the aim of the current research was to assess the effectiveness of different methods for protecting trees.

### **MATERIALS AND METHODS**

The research was done from autumn 2003 to autumn 2004, in selected green areas of Szczecin (West Pomerania, Poland), where a high incidence of leaf miner damage (25–70%) had previously been observed. Four transects, each with a different control method, were employed as follows:

- Transect A (8 trees): leaf raking (= mechanical method);
- Transect B (10 trees): leaf raking + use of sticky bands on tree trunks;
- Transect C (42 trees): leaf raking + use of a bio-preparation (= biological method);
- Transect D (9 trees): leaf raking + spraying of tree crowns (= chemical method).

Transects A and B were located near transport routes with considerable traffic congestion, and C and D in the centre of green areas (and thereby isolated from the direct impact of traffic pollution). In all transects (in autumn 2003), all fallen leaves were raked off and sent for composting. In transect B (in March 2004), colourless sticky bands (1 m wide) were placed around tree trunks at a height of 1.5 m from the ground. In transect C (in April 2004), the effectiveness of the biological preparation “Larvanem” (see Copping, 2004) was tested against leaf miner pupae that remained after autumn leaf raking and had then overwintered near the soil surface (1,000 million juveniles of the entomopathogenic nematode *Heterorhabditis bacteriophora* being applied to a ground surface of 2,000 m<sup>2</sup>, in order to limit the number of moths eventually emerging). In transect D, the tree crowns were sprayed with a preparation of diflubenzuron (as “Dimilin 25 WP”), at a rate of 0.9 kg/ha; the chemical was applied twice (on 10 May 2004 and on 24 July 2004), to coincide with the start of emergence of first- and second-generation moths respectively.

### **RESULTS AND DISCUSSION**

The effectiveness of the tested control methods was assessed in the various transects on the basis of the degree of leaf damage caused, according to the scale adopted by Baranowski *et al.* (2002) (see Table 1). At the beginning of vegetative growth, during the leafless period, first-generation moths emerging from pupae became stuck in large numbers on the sticky bands (transect B), which could explain the differences in the degree of leaf damage caused

by the pest larvae at the beginning of their development in comparison with transect A. The first signs of leaf mining were observed in June. Biological treatment against overwintered pupae in the early spring (transect C) effectively reduced feeding by first-generation larvae, which was of importance for host trees during the further period of their development. Least leaf damage was observed where chemical treatment was applied twice (transect D). Although the degree of leaf damage caused by the pest varied according to the type of control method used, the greatest amount of damage also occurred in the two transects (A and B) located near transport routes, which were a source of pollution, and this may have compounded differences between treatments. The condition of white horse chestnut trees may be affected by many biotic factors (e.g. pests and pathogenic fungi) and abiotic factors (e.g. low temperatures, water shortages, high soil salinity and pollution connected with road traffic) (Baranowski, 2002). Pollution, for example, may influence host tree condition and lessen their resistance to pest attack. Leaf raking alone appears insufficiently effective to reduce the population of horse chestnut leaf miner. Therefore, protection of host trees needs to be done comprehensively, and to include more effective methods: e.g. the use of bio-preparations with entomopathogenic nematodes against the first generation of the pest, followed by conventional chemical treatment against the second and third generations.

Table 1. The incidence of leaf damage, on white horse chestnut trees, caused by larvae of horse chestnut leaf miner: damage scale according to Baranowski *et al.* (2002).\*

Week of observation*	1–8	9–11	12–13	14	15–17	18–20	21	22	23–29	30–31
Transect A:	0	1	2	3	3	3	3	4	4	4
Transect B:	0	1	1	2	3	3	3	3	4	4
Transect C:	0	1	1	1	1	2	3	3	3	4
Transect D:	0	1	1	1	1	1	1	1	1	1

\* 0 = undamaged; 1 = slight damage [up to 10% of leaf surface]; 2 = medium damage [10 to 25% of leaf surface]; 3 = heavy damage [25% to 70% of leaf surface]; 4 = very serious damage [> 70% of leaf surface].

\*\* Week 1 = 30 April 2004; week 31 = 10 November 2004.

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