Integrated Control in Viticulture
IOBC wprs Bulletin 24 (7) 2001
pp. 199 - 202

Actual distribution of *Hyalesthes obsoletus* Signoret (Auchenorrhyncha: Cixiidae) in German viticulture and its significance as a vector of Bois noir

H. Darimont and M. Maixner
BBA, Institute for Plant Protection in Viticulture, D-54470 Bernkastel-Kues, Germany - m.maixner.bba@t-online.de

Abstract: The Cixiid planthopper *Hyalesthes obsoletus* is the vector of the phytoplasma causing 'Vergilbungskrankheit' (Bois noir) in Germany. A survey of its distribution revealed a good correlation with the occurrence of the disease. Within experimental plots, the numbers of planthoppers per trap were influenced by the density of host plants of the vector. The flight of adult *H. obsoletus* started in the first half of June and lasted about six to seven weeks. The average rates of infestation of field populations of the vector varied between 2% and 58% within the different viticultural regions. Since the proportion of infected insects did not change significantly during the flight period, acquisition of the phytoplasma from weeds by the larval stages is the predominant path of infection, while infected grapevine has no significance as source of inoculum. It is concluded from the results, that *H. obsoletus* is the principal vector of Vergilbungskrankheit.

Key words: Planthopper, vector, phytoplasma, grapevine yellows, epidemiology

Introduction

Vergilbungskrankheit (Bois noir; BN) is the most important grapevine yellows in Germany. The disease is present in most viticultural areas, but phytosanitary and economic problems are mainly restricted to vineyards on the steep slopes of the river valleys. These sites provide favorable environmental and trophic conditions for *Hyalesthes obsoletus* Signoret, a xerothermic Cixiid. This insect has been identified as the vector of the Bois noir phytoplasma in Germany (Maixner et al, 1995) and France (Sforza et al., 1998). Since this insect was believed to be rare in Germany, we studied its recent distribution with regard to the occurrence of BN. The flight of adult planthoppers was observed in different viticultural areas with regard its start and duration. Furthermore, we assessed the infestation of vector populations with the BN phytoplasma and its temporal change as a measure of infection pressure on grapevine. These data are required for the development of monitoring and control procedures for BN.

Methods

The flight of adult insects was monitored with yellow sticky traps that were exposed in vineyards and fallow fields just above the soil. Traps were changed weekly from May to August. In addition, planthoppers were collected alive from stands of host plants with a sweep net or a motorized leaf-blower. These insects were used for PCR test to evaluate infestation levels. At three locations, at least fifty insects were captured and tested separately each week in order to observe probable changes of the infestation during the flight period. Separate collections from different plants should provide information about the preferred host plants in different regions. In addition, the degree of ground cover by *Convolvulus arvensis*, the most important host plant of the vector, was estimated and a possible correlation with the infestation of *H. obsoletus* was checked.

Results and discussion

Occurrence of H. obsoletus

We were able to catch *H. obsoletus* in the viticultural areas of Baden, Franken, Hessische Bergstraße, Mittelrhein, Mosel-Saar-Ruwer, Nahe, Pfalz, Rheingau, and Rheinhessen. The planthopper could be collected in all the vineyards affected by Bois noir that we checked, although at some locations only with a few specimens. It was not possible to estimate standardized population densities due to the clustered distribution of the insects on patches of herbaceous hosts, but exceptionally high numbers of *H. obsoletus* were caught on the slopes of Mittelrhein, Mosel-Saar-Ruwer and Nahe, where both biotic (host plants) and abiotic (temperature, insolation, soil structure) factors are most favorable for this insect. Consequently, these are the sites which are most severely affected by BN.

Influence of host plants on the abundance of H. obsoletus

Trapping the planthoppers by sticky traps was considerably less effective than the active collecting methods. During the season of 1999 and 2000, we caught at eleven experimental plots a total of 1072 planthoppers by sticky traps, but 5928 insects by net or vac.

The numbers of adult planthoppers per sticky-trap were influenced by the degree of ground coverage of *C. arvensis* as long as other parameters – soil structure and microclimate in particular – were suitable for the vector. In two vineyards with an average coverage of 19% and 28% respectively, we caught 19 (7) insects/trap compared to only 1 insect/trap in a nearby plot with only 5% coverage of the soil by bindweed.

Flight of adult planthoppers

The emergence of adult *H. obsoletus* and the duration of their flight period (Fig. 1) did not differ considerably between the experimental plots at Mosel and Rhine. The first adults were caught in June 19th in 1995, June 6th in 1999 and June 4th in 2000. The flight reached a

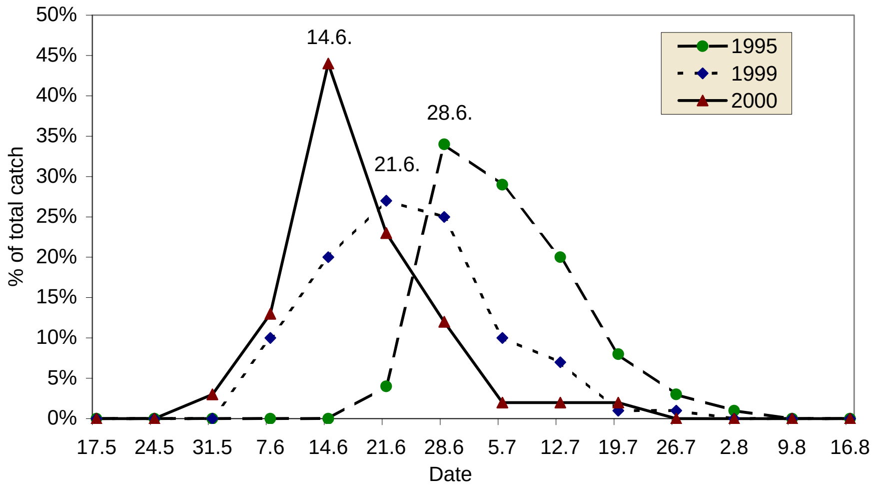

Figure 1. Flight of adult *Hyalesthes obsoletus.*

maximum within two to three weeks after the beginning and then dropped rapidly. The last insects were caught in August 20th, 8th and 6th, respectively. The influence of climatic conditions on the begin and duration of the flight of *H. obsoletus* is obvious. Weather data are currently fit to the observed flight data from 1993 to 2000 with the objective to forecast the flight activity of the vector.

Regional levels of infestation
The infestation of *H. obsoletus* caught on bindweed was very high. On average 58% of the planthoppers from different vineyards of the Mosel region were PCR positive compared to 48% from the Nahe and 35 % from the Rhine valley. The corresponding rates for the Hessische Bergstraße and Baden were 18% and 23%, respectively, while only 2% of the vectors from the Palatinate region were found to carry the phytoplasma. In fields where *Ranunculus bulbosus* was the predominant host plant of the insect at the Mosel area, only 5% of the tested individuals were positive compared to 68% with *C. arvensis* as the main host. Unlike *C. arvensis*, *R. bulbosus* is no source of infection for the vector. The high levels of infestation of the field populations of *H. obsoletus* are only compensated by the nutritional preference of this planthopper that feeds on grapevine only occasionally. In spite of these high proportion of infected vectors the incidence of Bois noir is usually fluctuating only moderately compared to Flavescence dorée, for example.

Temporal change of infestation
Separate PCR tests of the weekly collections throughout the flight of adult *H. obsoletus* provide information about the acquisition of phytoplasmas by nymphs or adults, respectively. The data obtained from three different vineyards made evident, that the proportion of infected vectors did not change considerably during the 5 weeks of flight. This implies that the acquisition of phytoplasma by larval stages during their development on the roots of *C. arvensis* is the predominant path of infection. Furthermore, this observation supports the proposition that infected grapevine is not a source of inoculum for Bois noir and has no significance for the epidemiology of Bois noir.

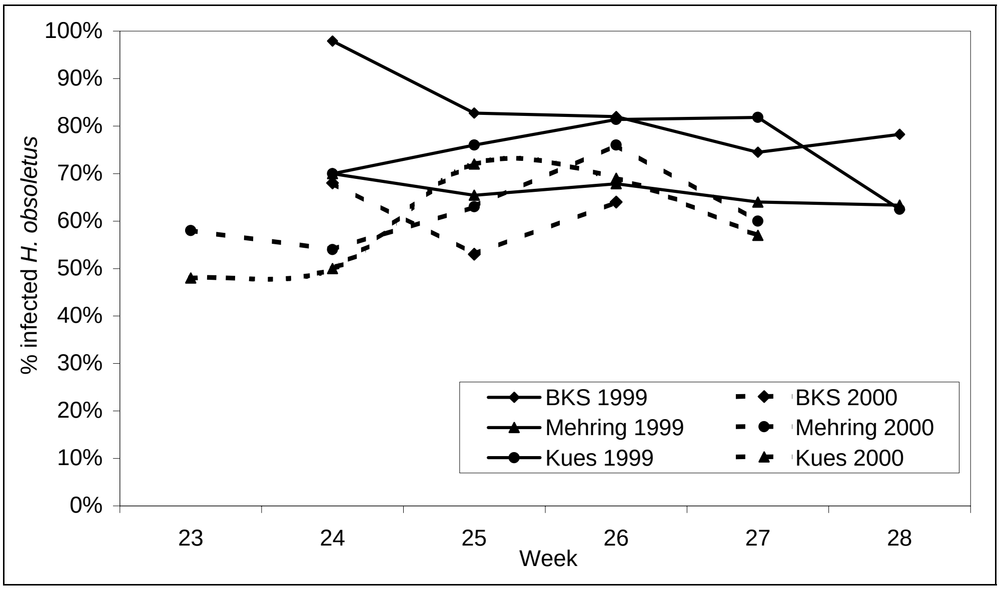

Figure 2. Course of infestation of adult *Hyalesthes obsoletus* during the flight period at three locations in 1999 and 2000.

We tested several thousand specimens of *H. obsoletus* and other Auchenorrhyncha which were collected from infected bindweed or from grapevine. Beside *H. obsoletus* only *Neoaliturus fenestratus* was found to carry the Bois noir phytoplasma so far, also with a low frequency. Other species than *H. obsoletus* cannot be excluded as potential vectors of this grapevine yellows, but it can be concluded from the distribution of this vector and the disease as well as from the degree of infestation of the vector populations that this planthopper is indeed the principal and probably exclusive vector of Bois noir (Vergilbungskrankheit) in Germany.

Acknowledgements

We thank the 'Forschungsring des Deutschen Weinbaues' for financial support of this work.

References

Maixner, M.; Ahrens, U. & Seemüller, E. 1995: Detection of the German grapevine yellows (Vergilbungskrankheit) MLO in grapevine, alternative hosts and a vector by a specific PCR procedure. *Europ. J. Phytopath*. 101: 241-250.

Sforza, R., Clair, D., Daire, X., Larrue, J. & Boudon-Padieu, E. 1998: The role of *Hyalesthes obsoletus* (Hemiptera: Cixiidae) on the occurrence of Bois noir of grapevines in France. *Journal of Phytopathology* 146: 549-556.

Weber, A. & Maixner, M. 1998a: Habitat requirements of *Hyalesthes obsoletus* (Auchenorrhyncha: Cixiidae) and approaches to control this planthopper in vineyards. *IOBC/wprs Bulletin* 21(2): 77-78.

Weber, A. & Maixner, M. 1998b: Survey of populations of the planthopper *Hyalesthes obsoletus* Sign. (Auchenorrhyncha: Cixiidae) for infection with the phytoplasma causing grapevine yellows in Germany. *Journal Applied Entomology* 122: 375-381.