Investigations on the occurrence of wheat bugs (Scutelleridae, Pentatomidae; Heteroptera) in organic farming of Eastern Austria

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Key words: wheat bugs, landscape elements, spatial distribution, seasonal occurrence, winter quarters

Abstract

Wheat bugs, an umbrella term for a set of different species, damage wheat by sucking on semi-ripe grains. The proteolytic enzyme inserted with the saliva destroys the gluten. If more than 1.5 – 2% of the grains are infected, the ground wheat looses its baking quality. In 2003, for the first time since the fifties, a significant occurrence of wheat bugs was recorded in Eastern Austria. Since in organic farming no insecticides are available for direct control, the farmers were advised to grow quality wheat at the greatest possible distance to fallows, windbreaks and other uncultivated areas. To clarify their significance for the wheat bug occurrence, a diploma thesis was performed in the year 2004. The sampling sites were situated in Burgenland, Eastern Austria. The spatial and temporal distribution of the bugs (Scutelleridae, Pentatomidae) was evaluated by hand-searching the ground litter and by sampling with enclosures, sweep net and visual observations in windbreaks, forest edges, field margins, grasslands, fallows and winter–wheat fields (1, 10 and 60 meters from the field edge) and sporadically also in other crops (lucerne, barley, rye and spelt). As a total, 368 individuals from 22 species of bugs were collected. 316 individuals belonged to potentially harmful 10 wheat bug species, Eurygaster maura (67%), Aelia acuminata (16%) and E. austriaca (4%) being most abundant. The sweep net was the most efficient sampling method. The earliest wheat bugs occurred directly in the wheat fields. During the growing season, the species E. maura, A. acuminata und E. austriaca were found almost entirely in winter-wheat fields, whereas in the uncultivated habitats other species occurred. Our data do not suggest that landscape elements as well as fallows enhance wheat bug infestations. The wheat bug infestation of wheat fields might be influenced mainly by the weather conditions in spring and summer. After having compared the climatic conditions of 2003 with the "wheat bug years" 1953 and 1954, we suggest that the recent outbreak of wheat bugs might have been due to the significantly above average temperatures in the years 2000 to 2003.

Introduction

Wheat bugs, an umbrella term for a set of different species of Scutelleridae and Pentatomidae, damage wheat by sucking on semi-ripe grains. The proteolytic enzyme inserted with the saliva destroys the gluten. If more than 1.5 – 2% of the grains are infected, the ground wheat looses its baking quality (Schöggl et al. 2005). Wheat bugs, mainly the climatically dry and warm-adapted *Eurygaster integriceps*, are well-

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known as important cereal pests in the Near and Middle East as well as in parts of the former USSR (Critchley 1998). During years of mass-occurrence, economically significant wheat bug damages by other *Eurygaster* and *Aelia* species also can occur regionally in Eastern Europe. In 2003, for the first time since the early fifties (Bullmann & Faber 1958) a significant occurrence of wheat bugs was recorded in Eastern Austria. Since in organic farming no insecticides are available for direct control of wheat bugs, the farmers were advised to grow baking wheat at greatest possible distances to fallows, windbreaks and other uncultivated areas because they were considered as potential wheat bug winter quarters and sources of infestation.

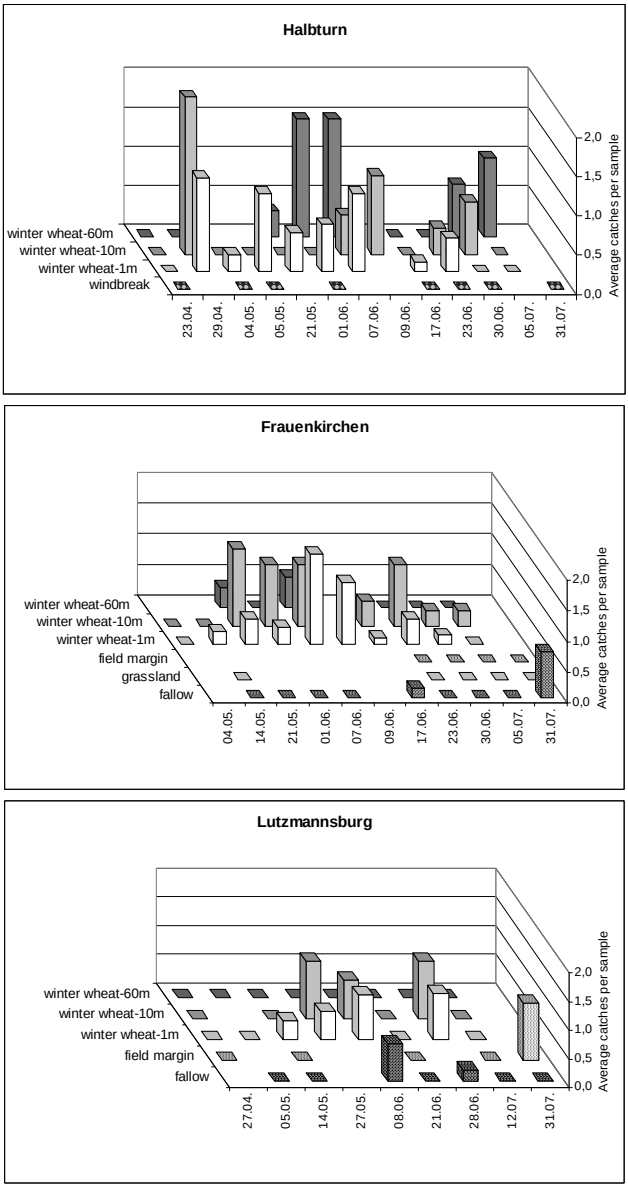
To clarify this assumption, a diploma thesis (Grünbacher 2005) was performed in the year 2004 to find out species and dominance distribution of the wheat bug assemblage (Scutelleridae, Pentatomidae; Heteroptera) in Eastern Austria as well as their seasonal and spatial occurrence in dependence of landscape elements as potential winter quarters.

Materials and methods

The 7 sampling sites were situated in the municipalities Halbturn, Frauenkirchen, Steinberg-Dörfl, Lutzmannsburg, Donnerskirchen, Oggau and Zillingtal, all in Burgenland, Eastern Austria. Each sampling site consisted of several fields and adjacent uncultivated areas, representing different biotopes of the regional agricultural landscape. Sampling was performed from April to July 2004. Early in spring, overwintering wheat bugs were sampled by enclosure traps (Lutzmannsburg: 5, Halbturn: 2) and hand-searching the ground litter of forest edges and windbreaks as well as grassy margins. Later in the season, the spatial and temporal distribution of wheat bugs was evaluated by sweep-netting (triangular-framed sweep-net with side length of 30 cm; 15 double-strokes per sample) in windbreaks, forest edges, field margins, grasslands, fallows and winter wheat fields in 1, 10 and 60 meters from the field edge and sporadically also in other crops (lucerne, barley, rye and spelt). For estimating the significance of sweep net catches with regard to area-related wheat bug abundances, comparative countings by sight were performed in wheat fields.

Results and Discussion

As a total, 368 individuals from 22 species of bugs were collected by sweep-net in the year 2004. 316 individuals belonged to 10 bug species, which had been defined as potentially harmful by Bullmann & Faber (1958), Eurygaster maura (67%), Aelia acuminata (16%) and E. austriaca (4%) being the most abundant ones. Compared to 2003, wheat bug incidence generally was low in 2004, possibly due to cold and wet weather periods in spring and early summer, very likely being unfavourable for population development of the warm and dry preferent wheat bug species. In comparison to counting by sight on the wheat vegetation, sweep-netting proved to be the more reliable and practicable sampling method for comparing different sampling sites as well as for providing material for later species determination, though the abundances might be only of limited area-related meaningfulness.



Figs. 1a – c: Sweep-net catches of the wheat bug *Eurygaster maura* from April until July 2004 in winter wheat fields and adjacent uncultivated habitats in 3 localities of Burgenland: a) Halbturn, b) Frauenkirchen, c) Lutzmannsburg.

Concerning the seasonal and spatial pattern of wheat bug distribution, the earliest specimens of *Eurygaster maura*, *Aelia acuminata* and *E. austriaca* were recorded directly in the winter wheat fields where they almost entirely occurred also later on during the growing season. In the adjacent field margins and fallows, the first wheat bugs appeared after harvest, as is shown for the most abundant species *E. maura* from three different sampling locations in figs. 1a – c. Probably, the bugs there continued their maturation feeding on wild grass species before moving on towards winter quarters. However, no specimens of *E. maura* and the other two dominant wheat bug species had been found in the investigated potential overwintering sites early in the season. In other crop fields as well as in the uncultivated habitats a different set of bug species were sampled like for example *Eurydema ornatum* and *Palomena prasina* in lucerne, *Eurydema oleraceum* in forest edges and *Dolycoris baccarum* in field margins and lucerne.

Conclusions

Our data do not suggest that landscape elements or fallows and other crops enhance wheat bug infestations in adjacent cereal fields by providing winter quarters. The wheat bug infestation of wheat fields might be influenced mainly by the weather conditions in spring and summer. After having compared the climatic conditions of 2003 with the “wheat bug years” 1953 and 1954, we suggest that the recent outbreak of wheat bugs in Eastern Austria might have been due to the significantly above average temperatures in the years 2000 to 2003 (Grünbacher et al. 2006).

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