

True bug community on strawberry fields of Latvia

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Abstract

Sweep netting and pitfall trapping were used to collect plant bugs in strawberry fields. The plant bug fauna (Heteroptera) of strawberries in Latvia was represented by 21 species from seven families (Miridae, Lygaeidae, Rhopalidae, Berytidae, Pentatomidae, Anthocoridae, Nabidae). In total, 92.7 % of all collected species were phytophagous bugs. Miridae with 11 species was the biggest phytophagous family with the greatest species richness. The most abundant and widespread species on strawberry plantings were *Lygus rugulipennis* (47.3% of all Miridae species), *Plagiognathus chrysanthemi* (26.6%), *Lygus pratensis* (7.5%) and *Orthotylus flavosparsus* (6.8%). Species from the families Lygaeidae, Rhopalidae, Berytidae and Pentatomidae were collected in relatively small numbers. The zoophagous bugs were represented by two families, Anthocoridae and Nabidae, and by five species (*Anthocoris nemorum*, *Orius niger*, *Nabis ferus*, *N. pseudoferus*, *N. flavomarginatus*). The predatory bug *Orius niger* was the dominant zoophagous species (73.3% of all zoophagous species).

Key words: bug community, distribution, Heteroptera, strawberry.

Introduction

About 400 species of Heteroptera are found in Latvia (Spuris 1950). The most abundant and widespread family of bugs in both agrocenoses and native biocenoses is Miridae. Miridae have been observed to represent 27 to 52% of all bug species in the agrocenoses of Latvia: most dominant on orchard grass (52.3%), followed by winter wheat (43.3%), oats (27.9%), and spring barley (26.8%) (Varzinska 1975). Varzinska (1977) considered that the most widespread and abundant bug species of Miridae were *Lygus rugulipennis* Popp., *Lygus pratensis* L., *Plagiognathus chrysanthemi* Wolff., *Orthotylus flavosparsus* C. Sahbl., *Trigonotylus ruficornis* Geoffr., *Adelphocoris lineolatus* Gz., *Stenodema calcaratum* Fall. Four of these seven species (*L. rugulipennis* L., *P. chrysanthemi* L., *T. ruficornis* Geoffr. and *O. flavosparsus* C. Sahbl.) are serious and injurious pests of many crops and weeds, and are the stable inhabitants of 20 agrocenoses and native biocenoses of Latvia (Varzinska 1977).

Strawberry is one of the perspective and important cultures in Latvia, especially in recent. It is necessary to improve knowledge on communities of pests and predators associated with strawberries. The main aim of the present study was to describe the bug communities in strawberry fields, determine abundance of bug species, including known strawberry pest species, and to compare their distribution to those in other agrocenoses.

Materials and methods

The study was generally conducted during the vegetation

seasons 1999 – 2001, mainly in the Pure Horticultural Research Station (Tukums District, Northwest Latvia). The Station is located on calcareous podsolc sandy loam soil on dolomite bedrock. Strawberries were planted in rows with 30-cm distance between plants and 100-cm distance between rows. The material was collected from plants by sweep netting and pitfall trapping in cultivated strawberry fields. Sweep netting was performed in 1999 (monthly from 31 May to 20 September) and pitfall trapping in 2001 (twice a month from 9 April to 26 October with an interval of two weeks).

Results

The plant bug (Heteroptera) fauna in strawberry plantings was represented by 21 species from seven families (Table 1).

In total, 789 Heteroptera specimens (imago and larvae) were caught by sweep netting in 1999. The relative abundance of bugs was 7.9% of all collected specimens on 31 May, 3.3% on 8 June, 31.7% on 6 July, 39.8% on 20 August, and 13.0% on 20 September. The number of collected bug specimens varied during the season. The highest number of bugs was observed on 20 August, then it decreased significantly until early October (Fig. 1).

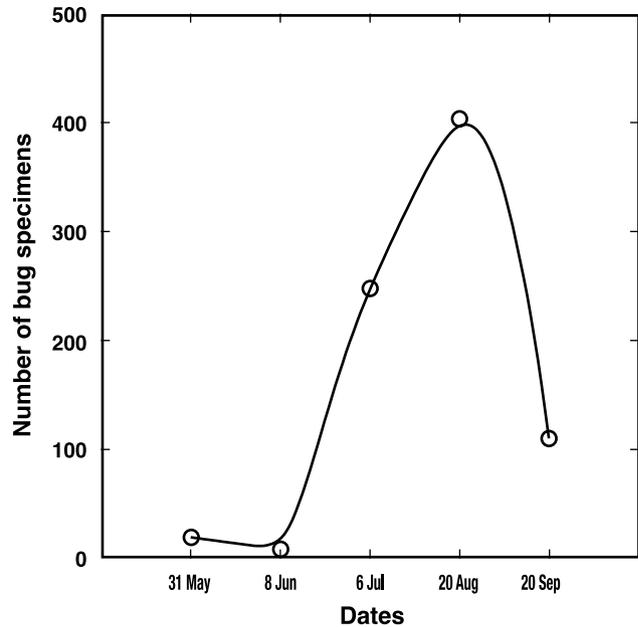
In total 360 bug specimens were found in the pitfall traps in 2001. In particular, the number of bugs was low in April and May. The plant bug population reached an initial peak of 10.8 ± 2.5 bugs in early July. The second peak was observed in early September. The population was decreasing from 19 September to early October (2.1 ± 1.6 bugs per pitfall trap) (Fig. 2).

Table 1. List of Heteroptera species collected on strawberry in Latvia

Family	Species	Relative abundance (%)
Miridae	<i>Apolygus (Lygocoris) lucorum</i> M.-D.	0.6
	<i>Halticus apterus</i> L.	0.6
	<i>Lygus pratensis</i> L.	12.7
	<i>Lygus rugulipennis</i> Popp.	44.6
	<i>Megaloceraea rocticornis</i> Geoffr.	0.6
	<i>Notostira erratica</i> L.	2.6
	<i>Orthops kalmi</i> L.	0.4
	<i>Orthotylus flavosparsus</i> C. Sahlb.	5.7
	<i>Plagiognathus arbustorum</i> F.	0.2
	<i>Plagiognathus chrysanthemi</i> Wolff	22.5
	<i>Adelphocoris quadripunctatus</i> F.	0.6
Lygaeidae	<i>Nysius ericae</i> Schill.	0.6
Rhopalidae	<i>Stictopleurus crassicornis</i> L.	0.2
	<i>Stictopleurus punctatonervosus</i> Gz.	0.2
Berytidae	<i>Neides tipularius</i> L.	0.6
Pentatomidae	<i>Dolycoris baccarum</i> L.	0.4
Nabidae	<i>Nabis flavomarginatus</i> Scholtz.	0.2
	<i>Nabis pseudoferus</i> Rem.	0.9
	<i>Nabis ferus</i> L.	0.6
Anthocoridae	<i>Orius niger</i> Wolff	5.3
	<i>Anthocoris nemorum</i> L.	0.4

Phytophagous bugs represented 92.7% of all collected Heteroptera species. The Miridae family with 11 species had the greatest species richness. In total, 97.5% of Miridae specimens recorded on strawberry plants were phytophagous. The most frequently captured species was the European tarnished plant bug *Lygus rugulipennis*, which is the most widespread on strawberry, and on other crops, weeds and in natural Latvian habitats. The polyphagous *L. rugulipennis* constituted 47.3% of all phytophagous bugs collected on strawberry in 1999, and 52.8% of all Miridae species. The highest number of *L. rugulipennis* were observed in 1999 on 20 August (78% of all captured bugs) and on 20 September (56.8%).

The next four more abundant species (*Plagiognathus chrysanthemi*, *Orthotylus flavosparsus*, *Lygus pratensis* and *Notostira erratica*) collectively constituted 44% of all Miridae species from strawberry. The bug *P. chrysanthemi* is the most widespread polyphagous species in Latvia and constituted 21.2% of all phytophagous bugs collected on strawberry and 26.6% of all Miridae species. The polyphagous bug *L. pratensis* constituted 14.8% of all phytophagous bugs collected on strawberry and represented 7.5% of all Miridae species. The bug *O. flavosparsus* frequently occurred on strawberries and constituted 6.8% of all collected species of the Miridae family. The oligophagous bug *N. erratica*

**Fig. 1.** Number of bug specimens (imago and larvae) collected by sweepnetting during 1999.

was a relatively dominant species and constituted 3% of all Miridae. Species from the families Lygaeidae, Rhopalidae, Berytidae and Pentatomidae were collected in a very low number (with a relative abundance less than 0.7%) (Table 1).

Zoophagous bugs were represented by five species: *Anthocoris nemorum* and *Orius niger* from the family Anthocoridae, and *Nabis ferus*, *N. pseudoferus*, and *N. flavomarginatus* from the family Nabidae. The zoophagous community was dominated by the predatory bug *Orius niger* (73.3% of all zoophagous species). Three relatively dominant bug species, *A. nemorum*, *N. ferus* and *N. pseudoferus*, collectively constituted 23.5% of all zoophagous species.

Discussion

Several bugs of the Miridae of strawberry community mostly represent common species, which have been collected in almost all of the plant communities in Latvia. Six species of Miridae (*L. rugulipennis*, *L. pratensis*, *P. chrysanthemi*, *O. flavosparsus*, *H. apterus*, *N. erratica*) were observed in strawberry fields earlier by Varzinska (1975). Previous studies show that *L. rugulipennis* is a frequent and widespread pest in Latvia, especially on potato, winter and spring wheat, foxtail clover, lucerne and sugar beet (Varzinska 1977; Turka 2001). It was found on strawberry, grain and leguminous crops, also on these crops mixtures, corn, dill, carrot, sugar beet, timothy meadow, cultivated and natural meadows, apple tree, and weeds (Varzinska 1977; Prieditis 1985). *L. rugulipennis* is found throughout the Palearctic Region on about 500 plants from 57 families (Holopainen,

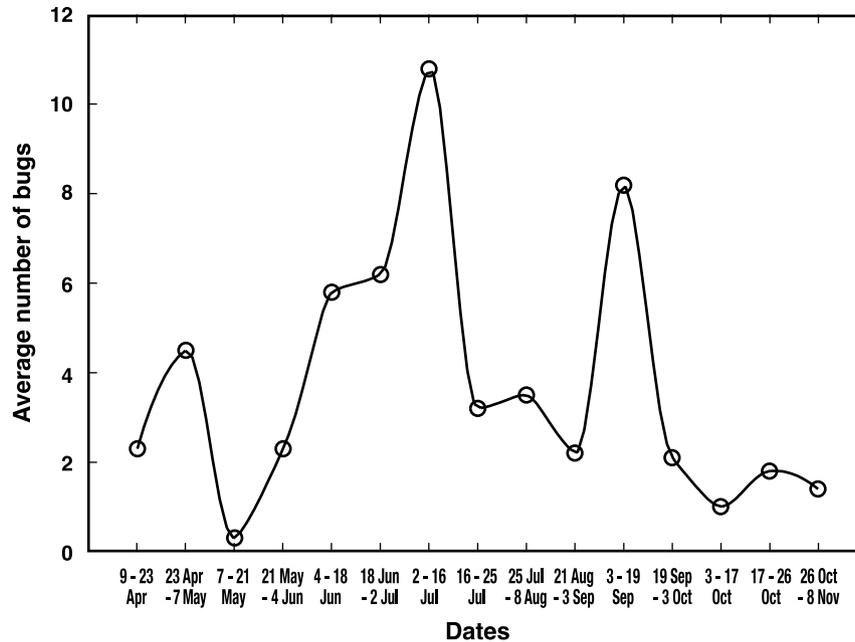


Fig. 1. Dynamics of bug population density during 2001 (mean number of specimens per pitfall trap).

Varis 1989). A moderate proportion of strawberry fruits were observed to be damaged by this bug (10 to 20% yearly) in Poland in 1995 to 1997 (Łabanowska, Bielenin 2002). The bug *P. chrysanthemi* was considered dominant in cultivated meadows in 1970 to 1973 (Varzinska 1975). It has been found on grain and leguminous crops, also on these crops mixtures, potato, corn, carrot, sugar beet, timothy meadows, natural meadows, and weeds (Varzinska 1977; Turka 2001). This bug species is predominantly associated with *Trifolium pratense* L., *T. repens* L., *Medicago sativa* L., *Vicia sativa* L., and *Chenopodium album* L. (Varzinska 1977). Jay and Cross (2004) considered *P. chrysanthemi* to be a stable habitant on strawberry in England.

L. pratensis was found to be dominating in most (about 20) Latvian agrocenoses, especially on leguminous crops. It is frequently found in fields with strawberry, grain and leguminous crops, also on these crops mixtures, corn, timothy meadow, fescue meadow, potato, sugar beet, cultivated and natural meadows, dill, carrot, root parsley, apple tree, common pear tree, ornamental flowers and shrubs (Varzinska 1977; Prieditis 1985). In USA this bug species is known as a pest of generative organs (the newly formed flower buds and flowers) on *Lotus corniculatus* L. (Guppy 1963). It is a dangerous pest of strawberry in Ukraine (Vasiljev 1975) and Turka (1978) found that *L. pratensis* and *L. rugulipennis* were the vectors of the potato virus diseases. Our investigation confirmed that the bugs *L. pratensis*, *L. rugulipennis* and *P. chrysanthemi* are significant pests, and are dominant species in strawberry fields.

The phytophagous bug *O. flavosparsus* frequently causes injury to generative organs of sugar beet, corn and potato in Latvia (Varzinska 1975; 1977; Turka 2001). In Latvia, *O. flavosparsus* has been recorded on winter and spring wheat,

spring barley, oats, field pear, field pear and oats mixture, hybrid lucerne, foxtail clover, cultivated meadow, weeds, and found to be frequently associated with white goosefoot *Chenopodium album* L. (Varzinska 1977). The bug *N. erratica* can cause damage to grain crops and weeds in Latvia, has been found on grain and leguminous crops, potato, corn, sugar beet, white clover, timothy meadow, cultivated and natural meadows, and weeds (Varzinska 1977). In the United Kingdom *P. arbustotum* and *P. chrysanthemi* are common on strawberries (Jay, Cross 2004), but *P. arbustotum* was less widespread in Latvia. In Latvia this bug has been found on red clover, hybrid lucerne, potato, sugar beet, spring and winter wheat, and is frequently associated with *Anthriscus silvestris* L. (Turka 2001).

In Latvia, Varzinska (1977) recorded *Halticus apterus* on wild strawberry, hybrid lucerne, foxtail clover, *Vicia sativa* L., in cultivated and natural meadows; and it was trophically associated with *Trifolium pratense* L., *Lotus corniculatus* L., *Fragaria vesca* L. and *Gallium* sp. (Varzinska 1977). Varzinska (1975) considered that *H. apterus* and *N. erratica* are injurious pests of cereals and legumes in Latvia.

The four other Miridae species *Apolygus lucorum*, *Megaloceraea rectinicornis*, *Orthops kalmi* and *Adelphocoris quadripunctatus*, according to the records of Varzinska (1977), are frequent in Latvia on cultivated grain and leguminous crops, corn, potato, sugar beet, cultivated and natural meadows. *O. kalmi* in Latvia is frequently associated with *Anethum graveolens* L., and Umbelliferae family crops and weeds.

Dolycoris baccarum is known as a serious pest of strawberry in Russia and the Ukraine (Križanovsky, Dancing 1972; Vasiljev 1975). In Latvia, it is also known as a dangerous pest of most berries, and has been found on potato, sugar

beet, oats, *Malus domestica* L., *Pinus* L., *Populus* L., *Syringa* L., and *Sorbus* L. (Spuris 1950; Ozols 1963; Turka 2001). *Nysius ericae* is very common, and widely distributed in dunes and meadows in the western part of Latvia (Spungis 2009). The bugs *Stictopleurus crassicornis*, *Stictopleurus punctatonevrosus*, *Neides tipularius* are considered as rare species and are not pests. They have been found to be common in natural habitats (Spuris 1950; Spuris, Varzinska 1979).

The bugs *L. rugulipennis*, *L. pratensis*, and *D. baccarum* are known as strawberry pests in Latvia (Ozols 1963). They often cause considerable loss by feeding on flowers and developing fruits causing malformation of fruits at harvest (Ozols 1963; Easterbrook 2000). Also, *L. rugulipennis* has caused economical losses of strawberry in some European countries: United Kingdom, Finland, northwestern Italy, Poland, Ukraine (Vasiljev 1975; Easterbrook et al. 1997; Tuovinen, Parikka 1997; Łabanowska, Bielenin 2002; Pansa, Tavella 2009).

According to our data, the strawberry pests *L. rugulipennis*, *L. pratensis* and *D. baccarum* in Latvia were found on strawberry in very small numbers, especially in spring and beginning of summer, when fruits are small, and during the harvesting period. Damage to strawberry flowers and fruits, caused by these bugs, was sparse on Pure Horticultural Research Station fields, with using Integrated Pest Management and only on late-season strawberry cultivars.

All predatory bug species recorded during this study are common species in various agroecosystems (including strawberries) and natural biotopes in Latvia (Spuris 1950; Prieditis 1985; Turka 2001). Zoophagous bugs are known to be effective predators of the phytophagous mites, aphids, bugs (Miridae), white flies, thrips and cicadas, Psyllidae, the eggs of Lepidoptera, Tenthredinidae, larvae of Coleoptera (Ambrosov 1978).

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