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Seasonal occurrence of *Lygus* bugs on field crops in Finland

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A long term survey of *Lygus* populations (Heteroptera, Miridae) was carried out on eight arable crops in southern Finland. Sweep net samples were taken weekly during the growing season in 16 successive years. The hibernated adults first appeared in May on overwintered crops: winter rye, red clover-timothy ley and winter turnip rape. Turnip rape and ley harbored the most *Lygus* adults until the end of June even if some of them started to move to spring cereals (wheat, oats and barley), potato and sugarbeet after the emergence of these plants. The numbers of adults on cereals remained small until the crops reached the heading stage. The peak occurred in the first half of August. The adult numbers on potato and sugarbeet were also highest in August. The total number of adults was highest on wheat. Nymphs were found on all the studied crops. They were first captured in the second half of June and reached a peak between mid-July and mid-August. Numbers were highest on wheat. The most common species on all crops was *L. rugulipennis* Poppius, constituting 92% of the adults. The other *Lygus* species were *L. gemellatus* (Herrich-Schaeffer), *L. pratensis* (L.) and *L. punctatus* (Zetterstedt). A few specimens of *L. wagneri* Remane were also found.

Key words: cultivated plants, growing seasons, Heteroptera, *Lygus rugulipennis*, Miridae

Introduction

Lygus bugs occur on numerous crop and weed plants throughout the world (Graham et al. 1984). In many European countries the most common *Lygus* species is the European tarnished plant bug, *L. rugulipennis* Poppius (e.g. Bilewicz 1958, Varis 1959, Boness 1963). It has been found on 437 host plants in 57 families (Holopainen and Varis 1991). In Finland the population of *Lygus* bugs is usually low, and their abundance varies considerably from year to year (Varis 1995). They may cause damage early in the summer when the plants are beginning their development. The species is univoltine in Finland and hibernates as adults. This study describes the seasonal occurrence of *Lygus* bugs on eight arable crops in southern Finland.

Material and methods

Seasonal occurrence of *Lygus* species was determined from sweep net samples taken in 16 successive years (from 1955 to 1970) from eight

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crops: barley, *Hordeum vulgare* L.; oats, *Avena sativa* L.; spring wheat, *Triticum aestivum* L.; winter rye, *Secale cereale* L.; potato, *Solanum tuberosum* L.; sugarbeet, *Beta vulgaris* L. v. *altissima* Doell.; ley: red clover-timothy, *Trifolium pratense* L. – *Phleum pratense* L. mixture; and winter turnip rape, *Brassica rapa* ssp. *oleifera* DC. All the fields were located on the experimental farm of the Agricultural Research Centre, near Helsinki (60°17' N, 25°04' E). The fields were managed according to normal agricultural practices.

Of the crops, the perennial ley was usually kept for 3–4 years. It was cut yearly at the full heading stage of timothy at the end of June or in the beginning of July. Rye and winter turnip rape were sown in the previous year in August, the other crops were spring sown in May. Cereals, potato, and turnip rape were harvested in August–September and sugarbeet was harvested in October. Samples were collected weekly with a sweep net, diameter 34 cm, and they consisted of 30 double sweeps. *Lygus* nymphs could not be identified to species. Crops and details of sampling are the same as in Varis (1995), where the yearly variations and the possibilities of forecasting the abundance of *Lygus* populations are discussed. More information about the climatological data, the use of insecticides, etc. is given in connection with that publication.

Results and discussion

The hibernated adults appeared on cultivated fields in May (Fig. 1), at the sowing time of the spring-sown plants. The first bugs were found in the first half of May on overwintered crops: rye, turnip rape and ley. They started to move to spring cereals in the second half of May or at the beginning of June after the emergence of these crops. From sugarbeet, the first adults were captured at the beginning of June and from potato in the second half of June. There were some difficulties in getting sweep samples on newly-emerged crops in the spring without doing any harm to plants. For that reason samples were taken by sweeping the net above them as low as possible. – From June onwards all the studied crops were colonized. The overwintered adults reached their peak in May–June, the numbers being highest on turnip rape and ley. On the other crops the numbers were rather small and no distinct peak in the occurrence of overwintered adults was observed. These *Lygus* species are highly mobile, and may easily move from one plant species to another.

The first nymphs were caught in the second half of June, the peak occurring from mid-July to mid-August (Fig. 2). As earlier stated by Varis (1995) the mean temperature in June, when most eggs are being laid and hatching of nymphs starts, highly affects the total numbers of nymphs during the summer. The numbers of nymphs were by far the highest on wheat and second highest on potato. The numbers were lowest on rye. All plants were oviposition hosts, based on the fact that nymphs were collected from all of them. Ackording to Bilewicz-Pawińska (1965) the movement of the main species *L. rugulipennis* from one crop to another was always observed at the adult stage. Most of the crops in this study have also earlier been identified with oviposition or nymphal growth for *L. rugulipennis* (Varis 1972, Holopainen and Varis 1991). Nymphs were found until mid-September.

The peak of new adults occurred at the end of July and at the beginning of August (Fig. 1). The numbers were considerably higher than those of the overwintered adults, and highest on wheat, where the bugs were concentrated on developing grains. Also, other spring cereals and potato harbored considerable amounts of bugs. On these crops the bugs stayed until harvest, even if some of them started to move to their overwintering habitats earlier. Although *Lygus* bugs are capable of living on a great number of plants, these late season crops are valuable hosts offering plenty of nourishment and shelter for bugs before their hibernation.

The total numbers of nymphs were considerably lower than those of adults (Fig. 3). This may

Vol. 6 (1997): 409–413.

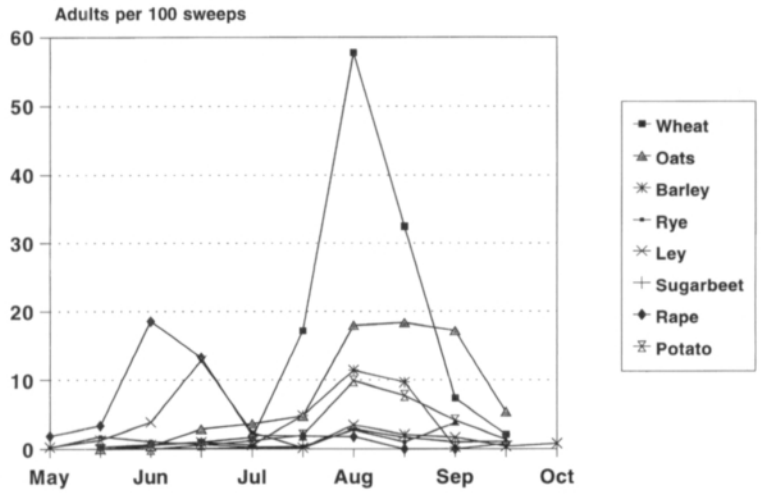

Fig. 1. Numbers of *Lygus* adults collected with a sweep net in 1955–1970 from eight crops in southern Finland. Numbers averaged over different years.

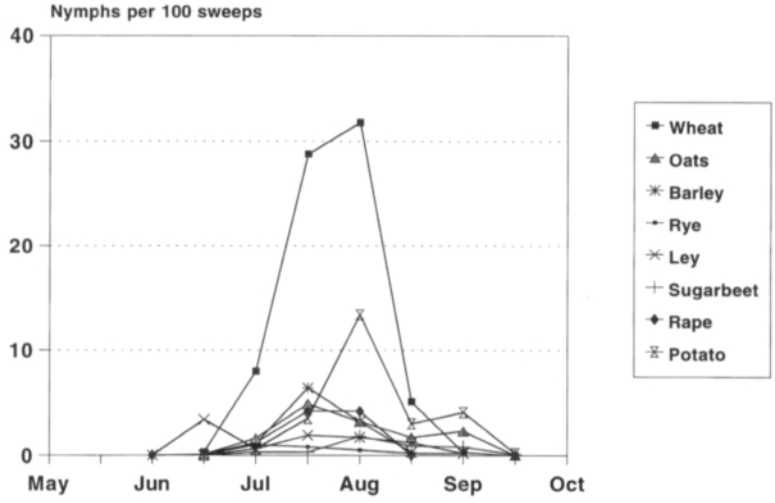

Fig. 2. Numbers of *Lygus* nymphs collected with a sweep net in 1955–1970 from eight crops in southern Finland. Numbers averaged over different years.

partly be due to the sampling method, because the nymphs often stay in the lower stratum of vegetation and thus avoid sweeping. Schotzko and O´Keeffe (1986) compared sweep net accuracy with that of D-Vac and absolute sampling for determining *Lygus hesperus* Knight densities in lentils and found that the estimates were similar, although sweep net sampling consistently gave a lower estimate of nymph numbers. Racz and Bernath (1993) found the sweeping method to be more successful than an inspection of individual plants in ten years of surveys of maize stands.

It is possible that the insecticide treatments on sugarbeet and turnip rape in the spring (Varis 1995) may have had some effect on the catches

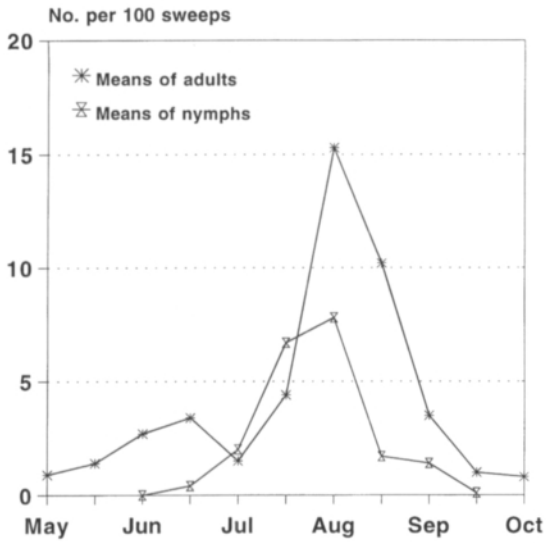

Fig. 3. Numbers of *Lygus* adults and nymphs collected with a sweep net in 1955–1970 from eight crops (wheat, oats, barley, rye, ley, sugarbeet, rape, potato) in southern Finland. Numbers averaged over different years and crops.

on these crops. Because of the high mobility of the bugs the effect was, however, most likely of short duration. Insecticides were not used at all on other crops, the only exception being the year 1959, when spring cereals were sprayed against bird cherry-oat aphid, *Rhopalosiphum padi* (L.).

Because *L. rugulipennis* constituted 92% of the adults the diagrams mainly reflect the abundance of this species. The other *Lygus* species were *L. gemellatus* (Herrich-Schaeffer) (4.8%), *L. pratensis* (L.) (2.2%), and *L. punctatus* (Zetterstedt) (0.8%). A few specimens of *L. wagneri* Remane were also found.

L. gemellatus occurred on all the crops. The first adults were caught from rye and turnip rape at the end of May and last adults from ley and cereals at the end of September. The numbers were highest on ley, the peak occurring at the end of June and at the beginning of July. The high numbers on ley derived from one year, 1962, when this species exceptionally comprised 42% of total numbers. In that year the stand was more weedy than in the other years, which may have affected the numbers. On the other crops the numbers were highest on wheat. The peak occurred in August.

The numbers of *L. pratensis* were highest on turnip rape, with the peak occurring at the end of June. Most adults from cereals were caught in August. The last adults were found in cereals and ley in the first half of September. The species occurred on all crops. The first *L. punctatus* adults were found in the first half of June on ley and turnip rape and the latest on potato in September. Most adults were obtained in the second half of August. The species was sampled from all the crops except rye.

The numbers of bugs during the different growing seasons varied considerably and were highly affected by weather conditions (Varis 1995). In warm springs they were first captured considerably earlier than in cold springs.

The results show that *Lygus* bugs are able to develop populations on all the studied crops. However, some of them harbor much more abundant populations than others. Their occurrence is synchronized with the developmental stage of the crops and their abundance is dependent on temperature.

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Vol. 6 (1997): 409–413.

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SELOSTUS

Niittyluteiden esiintyminen viljelykasveissa kasvukauden eri aikoina

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Tutkimuksessa selvitettiin niittyluteiden esiintymisrunsautta kahdeksalta viljelykasvilta kuutenatoista kasvukautena viikottain otettujen haavintanäytteiden avulla. Koekasvit olivat kaura, ohra, ruis, vehnä, peruna, sokerijuurikas, timotei-apilanurmi ja syysrypsi. Kasvustot sijaitsivat Maatalouden tutkimuskeskuksen viljelyksillä Tikkurilassa.

Talvehtineet ludeaikuiset ilmestyivät viljelyksille toukokuussa, ensin talvehtineisiin kasvustoihin: rukiiseen, nurmeen ja rypsiin. Kesäkuun loppuun saakka luteita oli eniten rypsissä ja nurmessa, joskin ne kevätviljojen orastuttua ja sokerijuurikkaan tultua taimelle alkoivat muuttaa myös näille. Viljoissa luteiden määrät pysyivät vähäisinä kasvien tähkälletuloon asti. Esiintymishuippu saavutettiin elokuun alkupuoliskolla. Myöskin perunassa ja sokerijuurikkaassa ludemäärät olivat suurimmillaan elokuussa.

Kaikissa tutkituissa kasvustoissa oli ludeaikuisten lisäksi myös näiden toukkia. Toukkien esiintyminen alkoi kesäkuun loppupuolella ja oli huipussaan heinäkuun puolivälistä elokuun puoliväliin. Sekä aikuisia että toukkia oli kasvukauden aikana eniten vehnäkasvustoissa.