EKOLOGIA POLSKA (Ekol. pol.)	36	3 – 4	531 – 543	1988

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DENSITY AND BIOMASS OF APHID COMMUNITIES (HOMOPTERA, APHIDIDAE) IN WINTER WHEAT CROP AND SUGAR BEET CROP IN THE VICINITY OF TUREW (POZNAŃ REGION, POLAND)*

ABSTRACT: The paper presents results of two years of investigations on aphid communities in winter wheat crop and aftercrop and in sugar beet crop (species composition, numbers, density, biomass and morph-age structure of the populations of dominant species *Sitobion avenae* (F.) and *Aphis fabae* Scop.). In 1979, there was an outbreak of *S. avenae*. The average density of the community was: 1648 indiv. $\cdot$ m^{-2}, biomass 237.8 mg d. wt. $\cdot$ m^{-2}. But in 1980 density and biomass of *A. fabae* were exceptionally low; mean density of the community was 36.1 indiv. $\cdot$ m^{-2} and biomass was 3.7 mg d. wt. $\cdot$ m^{-2}.

KEY WORDS: Aphids, species composition, density, biomass, morph-age structure, cultivated fields.

1. INTRODUCTION

Within complex studies on energy flow in ecosystems of agricultural landscape conducted by the Department of Agrobiology and Forestry, Polish Academy of Sciences in Poznań (R y s z k o w s k i 1975, 1979, 1981) studies on aphids were conducted in 1979 in the vicinity of Turew near Kościan.

The aim of the present paper was to determine the species composition, dynamics of numbers and biomass and also the morph-age structure of agricultural aphid communities – at the first stage of investigations in cultures of winter wheat and aftercrop (1979) and also sugar beet (1980).

*This study was financially supported under project MR II/23.

2. AREA OF INVESTIGATIONS

The studies were conducted on a field of an area 13.4 ha at the Plant Breeding Station at Rogaczewo near Turew.

The experimental field borders on one side with a moist meadow above Wyskocki Ditch (drainage canal), near by there are two big mid-fields shelterbelts, and then meadows and cultivated fields. The soil is typical of the Kościan Plain – sandy-loam, pseudopodzolic, mainly grey-brown, podzolic formed from sands on boulder-clays (pH 6.1 – 6.5)); at present they are considered as averagely fertile soils and their relatively high productivity depends first of all on activities of man (M a r g o w s k i et al. 1976). Detailed data on the soil, water relations and microclimate can be found in the above-mentioned paper and also in those by M a r g o w s k i et al. (1968), M a d a n y et al. (1972a, 1972b), M a r g o w s k i (1972, 1977), M a r g ow s k i and B a r t o s z e w i c z (1976).

Between 1974 and 1980 the crop rotation included alfalfa (4 years), winter rape, winter wheat and sugar beet, and in 1981 again alfalfa with oats as companion crop initiated the three-year cultivation of alfalfa as fodder.

3. MATERIAL AND METHODS

M e t h o d o f d e n s i t y e s t i m a t i o n. Samples for quantitative investigations were taken at random by the method of 100 plants or 100 shoots, depending on the kind of culture, along 4 perpendicular transects (of a total length about 600 m). The plants were chosen at random from the right and left side of transect, 25 samples from each transect in each series. A population or community of aphids from one plant or part of it, e.g., a shoot, was a sample.

Samples were taken regularly at about 14 – day intervals from the beginning to the end of aphid appearance on the crop, i.e., from April to end of October, taking the samples more frequently at number peaks.

Aphids were collected live, in situ, directly from plants, fixing the material in 80% denatured ethyl alcohol (methylated), separately for each plant (e.g. on wheat separately for leaves, stalks and ears), and pre-segregating then the material into particular species.

The density of plants per m^2 was estimated using the same method as in studies on primary production. The estimates were repeated several times during the vegetation season, each time calculating a mean of 100 samples taken at random along the field diagonal by means of a frame or hoop of an area 0.1 m^2 or 1 m^2 depending on the kind of crop.

The material was fixed in alcohol and then elaborated determining and dividing into particular species, morphs and developmental stages under the binocular microscope (sometimes it was necessary to make slides to check the determinations under a microscope of a higher magnifying power). Thus for each series of samples

Table 1. Mean body weight of aphids (Aphididae) (on the basis of own investigations and data of other authors)

Mean weight of an individual (mg)		Morphs and developmental stages					Author
		$L_1 + L_2$	$L_3 + L_4$	$L_3 + L_4$	adults		
			apt.	al.	apt.	al.	
Rhopalosiphum padi	w. wt.	0.075	0.55	0.65	0.49		own data
		–	–	–	0.5 – 1.2 0.3 – 1.2 0.2 – 1.2	0.5 – 0.8 0.2 – 0.6	Wellings et al. (1980)
	d. wt.	0.026	0.18	0.23	0.16 – 0.27	0.26 0.16	own data
Sitobion avenae	w. wt.	0.16	0.82	0.92	1.41	0.78	own data
					0.2 – 2.0		Watt (1979)
	d. wt	0.05	0.27	0.32	0.46	0.31	own data
Metopolophium dirhodum	w. wt.	–	–	–	0.3 – 0.6 0.2 – 0.7 0.2 – 0.8	0.5 – 1.1 0.3 – 0.5	Wellings et al. (1980)
	d. wt.	–	–	–	–	–	
Aphis fabae	w. wt.	0.09	0.63	0.51	1.13	0.60	own data
	d. wt.	0.04	0.17	0.13	0.31	0.21	
Myzus persicae	w. wt.	0.09	0.27	0.37	0.64	0.43	Gałecka and Ryszkowski (1975)
	d. wt.	–	–	–	–	–	

precise numerical data were obtained. Knowing the mean density of plants per m^2 and mean numbers of aphids per plant it was easy to calculate the mean density of population (community) of aphids per m^2.

M e t h o d o f b i o m a s s e s t i m a t i o n. Individual weights of species were determined for biomass estimation including all available morphs and developmental stages, dividing them into several classes of size corresponding with following developmental stages and morphs: $L_1 + L_2$, $L_3 + L_4$ apterae, $L_3 + L_4$ alatae, apterae adults and alatae adults.

The material for determining individual weights was collected separately. Frequently it was necessary to breed them for a short time.

Live individuals were weighed, slightly anaesthetized by ethyl ether on laboratory balance, with an accuracy to 0.01 mg. Then they were dried in a drier at 60°C to constant weight and weighed again. Thus the mean wet and dry weight of individuals of a given class of size were obtained.

For easier calculations the data on the mean weight of aphid body are in Table 1 and as the samples are heterogeneous, mean weighed biomass of one individual at particular dates (samples) is also given in Tables 3 and 5, making it easier to present data on density and numbers in the form of biomass and vice versa.

M a t e r i a l. Altogether 22 series of quantitative samples were taken (from 100 plants or 100 shoots) – about 8500 specimens altogether and 2200 specimens collected separately for examining the individual weight of particular species, their morphs and developmental stages reduced to constant weight.

4. RESULTS

4.1. ESTIMATION OF DENSITY AND BIOMASS OF APHID COMMUNITIES IN WHEAT CROP

Winter wheat "Begra" was sown on the experimental field after winter rape – October 14, 1978. Inorganic fertilizers used before ploughing and sowing were N – 36 $kg \cdot ha^{-1}$, P – 92 $kg \cdot ha^{-1}$ and K – 120 $kg \cdot ha^{-1}$; second dose of N – 94 $kg \cdot ha^{-1}$ was applied in spring, and during harrowing – Gesaran 2079 – 3 $kg \cdot ha^{-1}$ (herbicide). Germination was observed first at the beginning of November. The density of wheat during the appearance of aphids on June 7, 1979 was 374.0 shoots $\cdot m^{-2}$ and on July 25, 1979 – 368.4 shoots $\cdot m^{-2}$. The wheat was cut on August 7–8 and at the end of August aftercrop was sown (lupine, perko, white mustard). Density of after-crop compound was 61.4 plants $\cdot m^{-2}$ (lupine), 20.6 plants $\cdot m^{-2}$ (perko and white mustard), 21.4 shoots $\cdot m^{-2}$ (self sown wheat plants). At the end of November the field was ploughed.

S p e c i e s c o m p o s i t i o n a n d s t r u c t u r e. In 1979, in wheat at Rogaczewo there were 3 species of aphids considered as pests of cereals: *Sitobion avenae* and to a small extent *Rhopalosiphum padi* (L.) and *Metopolophium dirhodum* (Walker). On aftercrop, apart from *Rh. padi* and *S. avenae* occurring on self sown wheat, two other species were found: cabbage aphid, *Brevicoryne brassicae* (L.) dominating on

Table 2. Species structure of aphid community in wheat crop at Rogaczewo near Turew in 1979 (density per m^2, percentage in the whole community in brackets)

Crop	Date*	*S. avenae*	*Rh. padi*	*M. dirhodum*	*M. persicae*	*B. brassicae*
Winter wheat	7 June	175 (100)	0	0	–	
	19 June	1574 (100)	0	0	–	–
	27 June	5817 (99.0)	26 (0.4)	33 (0.6)	–	–
	13 July	427 (86.5)	33 (6.8)	33 (6.8)	–	–
	26 July	82 (66.7)	41 (33.3)	0	–	–
After-crop	5 Oct.	0.6 (1.8)	11.3 (31.4)	0	0.6 (1.7)	4.9 (13.7)
	17 Oct.	1.1 (6.4)	7.3 (43.3)	0	0	0.2 (1.3)

*In spring – April 2 and 17 and in autumn – September 18, the samples were blank.

perko and white mustard and peach-potato aphid, *Myzus persicae* (Sulzer) occurring to a small extent on perko and white mustard.

Table 2 shows the percentage of particular species in relation to the whole community of aphids in wheat and aftercrop. Grain aphid, *Sitobion avenae*, dominant on wheat had the highest percentage. It occurred in different biotypes and colour forms with an outbreak at the peak of its occurrence (about 1583 indiv. · 100 plants $^{-1}$, density 5817 indiv. · m $^{-2}$) and decided about the biomass of the whole aphid community in the crop examined.

Density of aphids in aftercrop was small with a small number peak at the beginning of October. *Rhopalosiphum padi* had the highest percentage on self sown wheat. The community of aftercrop aphids in relation to that of wheat crop was hardly 0.64%.

M o r p h - a g e s t r u c t u r e o f *S i t o b i o n a v e n a e* p o p u l a t i o n. Population of *S. avenae* aphids in wheat crop was characterized by a short 2-month period of occurrence closely connected with crop phenology. The population varied in age, having a polymorphic structure, characterized by overlapping of successive generations. Particular age stages did not have a constant share (%), population did not have a permanent structure (Fig. 1).

The percentage of particular components of morph-age structure were determined for four periods.

All through the period of appearance, larvae of the first and second developmental stage (L_1 and L_2) dominate, initially 88.43% and then gradually decreasing (for the whole population the percentage was 56 – 87%). During the rapid population growth the percentage of prenymphs and nymphs (L_3 and L_4 al.) increases constantly attaining 30.79% (0 – 40% for the whole population). Higher percentage of apterous viviparous

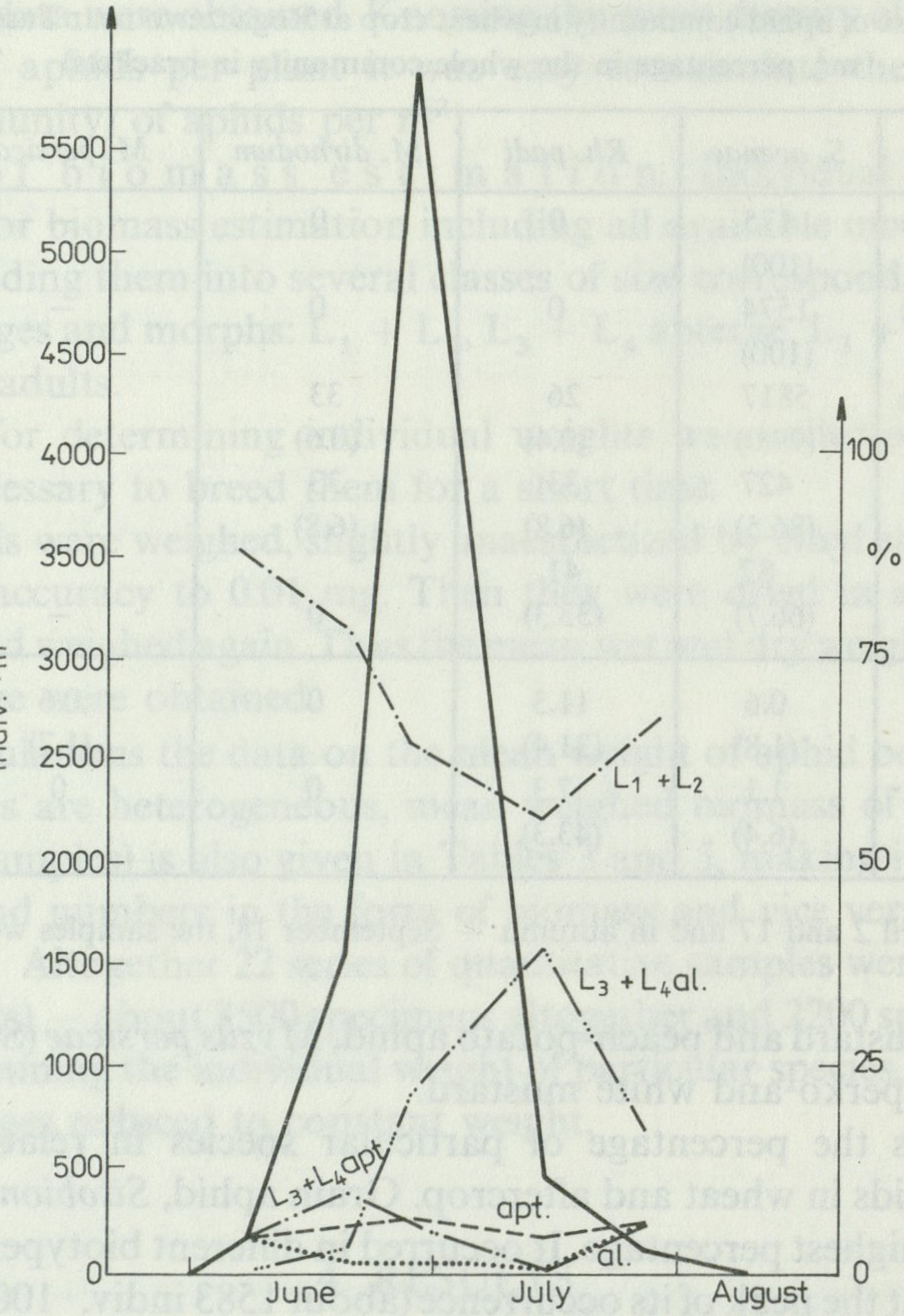

Fig. 1. Density dynamics of aphid community (Aphididae) and morph-age structure of *Sitobion avenae* population in winter wheat crop at Rogaczewo near Turew in 1979
apt. – apterae, al. – alatae, $L_1 + L_2$ – 1st and 2nd instar nymphs, $L_3 + L_4$ apt. – 3rd and 4th instar nymphs of apterae, $L_3 + L_4$ al. – 3rd and 4th instar of alatae. Percentage of particular morph-age components on the scale on the right side

females (larvae L_3 and L_4 apt.) is observed at the beginning of the appearance peak and has a decreasing tendency (0 – 10% for the whole population). Apterous morphs have constantly almost the same low percentage (4 – 7% for the whole population). The percentage of alate viviparous females (0 – 6% for the whole population) is the lowest; during summer dispersion alate morphs tend to fly and leave the host plants shortly after the last moulting (K r z y w i e c 1968), and thus they are not represented abundantly in colonies.

N u m b e r s a n d b i o m a s s. The curve of number dynamics (Fig. 1) is a single peak curve characteristic of many aphid species. A short period of slow growth (June 7 – 13) is followed by rapid growth in numbers (June 14 – 27). This is connected with great food abundance (wheat at maximum of flowering and in milk ripeness stage) and a great reproductive potential of aphids. After the peak (June 27) the numbers decrease fast as the food source diminishes (for *S. avenae* – ears, stems and wheat leaves at proper physiological state) and alate individuals migrate.

Dynamics of numbers and biomass depend closely on climatic-meteorological conditions affecting directly or indirectly (by plant) the fecundity, reproduction, body weight and survival of aphids (W a t t 1979). The favourable conditions for *S. avenae* probably caused its dominance and relatively very high numbers and biomass, but it could have been to some extent due to lack at Rogaczewo, in 1979, of constant component of cereal aphid community – the bird cherry-oat aphid, *Rhopalosiphum padi*. The mass appearance of *Sitobion avenae* probably did not have a local character. This is indicated by results obtained by the Laboratory of Entomology, Plant Protection Institute in Poznań: the density of alate viviparous females caught by Johnson's suction trap (Z ł o t k o w s k i 1982) was exceptionally high in 1979.

Table 3. Mean density and biomass of aphid community in winter wheat crop at Rogaczewo near Turew in 1979

Date*	Density indiv. $\cdot$ m^{-2}	Biomass mg $\cdot$ m^{-2}		Biomass of an individual mg (weighed average)	
		w. wt.	d. wt.	w. wt.	d. wt.
7 June	175	47.3	15.4	0.27	0.09
19 June	1574	698.5	170.5	0.44	0.11
27 June	5876	2696.4	898.0	0.46	0.15
13 July	494	258.0	87.2	0.52	0.18
26 July	123	52.8	17.8	0.43	0.15
Mean	1648	750.6	237.8	0.42	0.14

*In spring – April 2 and 17 and in autumn – September 18 the samples were blank.

Table 3 shows changes in mean density and mean biomass of aphids during their appearance in the crop. At the end of June the density was 5876 indiv. $\cdot$ m^{-2}, which calculated into biomass was 898 mg d. wt. $\cdot$ m^{-2}, which under Polish conditions can be considered as a serious outbreak of *Sitobion avenae* (dangerous pest of cereals).

The biomass was calculated according to values in Table 1, which presents the results of own investigations on body weight of *Rhopalosiphum padi*, *Sitobion avenae* and *Aphis fabae*, and of other authors on the body weight of *Rh. padi*, *Metopolophium dirhodum* and *Myzus persicae*.

4.2. ESTIMATION OF DENSITY AND BIOMASS OF APHID COMMUNITIES IN SUGAR BEET CROP

As a simplified crop rotation, winter wheat on experimental field was followed by a sugar beet (one-germ form, sown on April 17, 1980). In November 1979 the aftercrop was ploughed and inorganic fertilization was applied: N — 46 $kg \cdot ha^{-1}$, P — 115 $kg \cdot ha^{-1}$, K — 144 $kg \cdot ha^{-1}$ and manure 300 $q \cdot ha^{-1}$. After deep winter ploughing the soil was limed in spring, Ca — 37 $q \cdot ha^{-1}$. Then nitrogen doses were applied in spring: before sowing N — 56 $kg \cdot ha^{-1}$ (nitro-chalk) on April 11, 1980 and N — 68 $kg \cdot ha^{-1}$ (granulated ammonium nitrate) — June 10, 1980. On April 18, 1980 the field was sprayed with herbicide (Merpelan — 4 $kg \cdot ha^{-1}$). Other agrotechnical treatments were: mechanical weeding (weeder on June 3, 1980), thinning on June 6–10, round blind cultivation on June 28, and in July and also in August additional weeding by hand. The density of beet during the appearance of aphids was: on June 10, 1980 — 9.9 plants $\cdot m^{-2}$, on June 24, 1980 — 8.5 plants $\cdot m^{-2}$, on July 7, 1983 to harvest 3.6 plants $\cdot m^{-2}$.

Species composition and structure. In 1980, in sugar beet crop appeared two polyphagous species of aphids: *Aphis fabae* — the black bean aphid and *Myzus persicae* — the peach potato aphid — serious pests of root plants. The black bean aphid dominated. The percentage of the peach-potato aphid was low.

Table 4. Species structure of aphid community in sugar beet crop at Rogaczewo near Turew in 1980 (density per m^2, percentage in the whole community in brackets)

Date*	*A. fabae*	*M. persicae*
10 June	5.6 (100)	0
24 June	4.9 (100)	0
7 July	7.1 (92.5)	0.6 (7.5)
6 Aug.	190.1 (99.4)	1.2 (0.6)
18 Aug.	3.9 (76.1)	1.2 (23.9)
3 Sept.	2.0 (96.7)	0.1 (3.3)

*In spring — May 7 and 23 and in autumn — September 16 and October 7 the samples were blank.

In table 4 the percentage of species is related to the whole community of sugar beet aphids. *Aphis fabae* dominated — 98.6% of the whole population. *Myzus persicae* occurred only as 1.39% of the whole population.

The morph-age structure of *Aphis fabae* population. The aphids occurred for 3 months. The population had a polymorphic character and varied in age by overlapping of successive generations. There were no periods having a constant structure, particular age classes usually varied as to their percentage (Fig. 2).

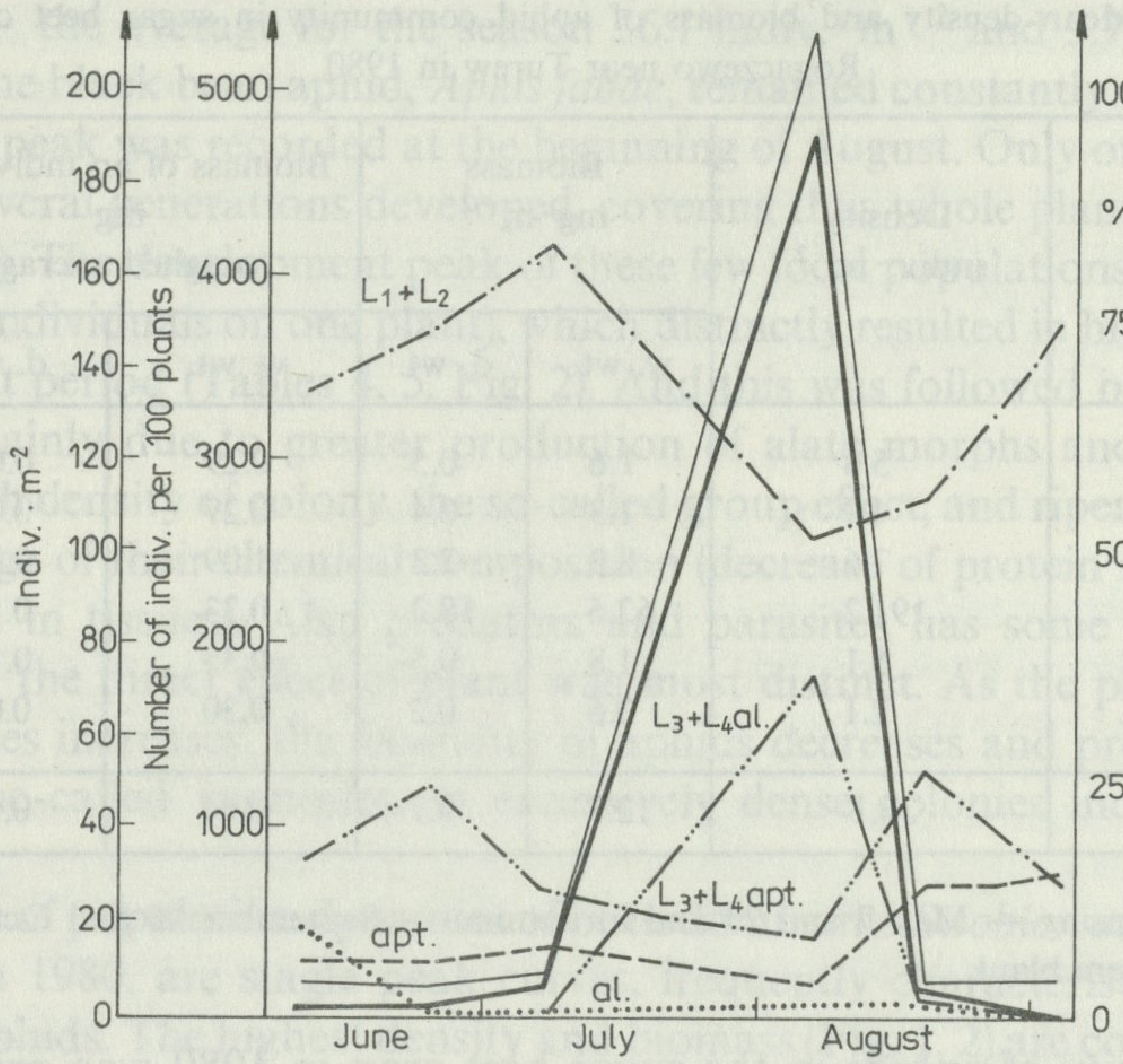

Fig. 2. Density dynamics of aphid community (Aphididae) and morph-age structure of *Aphis fabae* population in sugar beet crop at Rogaczewo near Turew in 1980
For explanations see Figure 1

During the entire period of appearance young larval stages dominated (L_1 and L_2), 69.9% at the initial period, increasing afterwards to 77.01% and decreasing at the peak of appearance to 54.09% (52 – 82% in the whole population). During the period of fast population growth the share of prenymphs and nymphs (L_3 and L_4 al.) increased greatly attaining the highest percentage at the peak appearance (17.23%) to decrease afterwards rapidly (0 – 34% in the whole population). The percentage of larval stages of apterous viviparous females (L_3 and L_4 apt.) increased distinctly at the end of the peak of appearance, attaining the highest percentage during population decrease (20.28%) (8 – 27% in the whole population). Adult individuals had a relatively low percentage during the whole period of appearance (alate viviparous females — 0 – 11% in the whole population, apterous viviparous females — 4 – 14%).

N u m b e r s a n d b i o m a s s. The curve of number dynamics (Fig. 2) is a single peak curve. After a slow growth (June 10 – July 7) there is a period of more intense growth (July 7 – August 6) with the number peak in the first decade of August followed by a rapid decrease in numbers mainly due to physiological changes of host plant (W e i s m a n n and V a l l o 1963). The numbers of aphids remain at a very low level till the first days of September.

Table 5 shows changes in mean density and biomass of aphids during their appearance in the crop. The density of aphids in sugar beet crop was very low in 1980 (at the peak of their occurrence in the first days of August — 191.2 indiv. $\cdot$ m^{-2} and calculated into biomass it was hardly 18.2 mg d. wt. $\cdot$ m^{-2}).

Table 5. Mean density and biomass of aphid community in sugar beet crop at Rogaczewo near Turew in 1980

Date*	Density indiv. · m^{-2}	Biomass mg · m^{-2}		Biomass of an individual mg (weighed average)	
		w. wt.	d. wt.	w. wt.	d. wt.
10 June	5.6	1.6	0.5	0.29	0.09
24 June	4.9	1.3	0.4	0.27	0.08
7 July	7.6	8.3	2.3	1.09	0.30
6 Aug.	191.2	62.6	18.2	0.33	0.10
18 Aug.	5.1	1.8	0.5	0.35	0.11
3 Sept.	2.1	0.6	0.2	0.30	0.09
Mean	36.1	12.7	3.7	0.44	0.13

*In spring – May 7 and 23 and in autumn – September 16 and October 7 samples were blank.

The low density of aphids in the sugar beet crop in 1980 was probably due to unfavourable weather conditions for aphids – cold spring, cold and rainy summer (Weismann and Vallo 1963) and some agrotechnical treatments (e.g. granulated ammonium nitrate (direct contact) applied during the initial appearance of *Aphis fabae* – June 10, 1980).

5. FINAL REMARKS

Comparison of results of investigations on density and biomass, species composition and structure of aphid communities in winter wheat crop and aftercrop in 1979 with analogous investigations conducted on the same field, but in sugar beet crop in 1980, shows that in 1979 the density and biomass of aphids were relatively high (during the peak of appearance 5876 indiv. · m^{-2}, calculated into biomass 898.0 mg d. wt. · m^{-2}, the average for the season being 1648 indiv. · m^{-2} and 237.8 mg d. wt. · m^{-2}). The grain aphid *Sitobion avenae* absolutely dominated in 1979 in wheat (97.97% in the whole aphid community) – an outbreak (Tables 2, 3, Fig. 1). Among many factors causing such high numbers and biomass of this species the climatic-meteorological ones were probably the main ones. The favourable conditions for *S. avenae* resulted in its dominance and relatively high numbers and biomass. Also, the almost total lack at Rogaczewo in 1979 of the bird cherry-oat aphid, *Rhopalosiphum padi* (1.22% in the whole community of aphids in wheat) (Tables 2, 3), the second species dominant in Europe, constant component of the cereal aphid communities (they both graze in ears) (Vickerman and Wratten 1979), could respond for it.

However, the density and biomass of aphid community in sugar beet in 1980 were very low (at the peak of appearance 191.2 indiv. · m^{-2}, calculated into biomass 18.2 mg

d. wt. $\cdot$ m^{-2} — the average for the season 36.1 indiv. $\cdot$ m^{-2} and 3.7 mg d. wt. $\cdot$ m^{-2}). Numbers of the black bean aphid, *Aphis fabae*, remained constantly at a relatively low level. A small peak was recorded at the beginning of August. Only on few single sugar beet plants several generations developed, covering thus whole plants (in the phase of 12 – 15 leaves). The development peak of these few focal populations was on August 6 (2500 – 5000 individuals on one plant), which distinctly resulted in higher biomass and density in that period (Tables 4, 5, Fig. 2). And this was followed by fast decrease of population mainly due to greater production of alate morphs and their migration because of high density of colony, the so-called group effect, and ripening of plants and thus the change of their chemical composition (decrease of protein substances, lower water content in tissues). Also predators and parasites has some significance as a control. Here, the direct effect of plant was most distinct. As the plants ripen water deficit in tissues increases, the fecundity of aphids decreases and production of alate morphs, the so-called vagrantes, in excessively dense colonies increases (K r z y-w i e c 1968).

The curves of population dynamics of both dominants *Sitobion avenae* in 1979 and *Aphis fabae* in 1980, are single peak curves, frequently characteristic of population dynamics of aphids. The highest density and biomass (Fig. 1, 2) are connected with fast increment of plant mass being the right kind of food as regards chemical composition and water balance: for *S. avenae* — ears in stage of grain setting and of milk-ripeness and milky-wax ripeness, whereas for *A. fabae* — leaves and young shoots of sugar beet in a good physiological state at the stage of early ripeness (in phase of 2 – 12 leaves) (W e i s m a n n and V a l l o 1963).

There is no explicit answer for the cause of outbreak of *S. avenae* in 1979, as it is difficult to explain why the numbers and biomass of *A. fabae* were so low in 1980. Undoubtedly, climatic-meteorological factors, as well as many other conditioning directly or indirectly the mass appearance of aphids, are the most important. However, their mechanism has not been yet fully explained (V i c k e r m a n and W r a t-t e n 1979).

6. SUMMARY

Results of investigations between 1979 and 1980 on aphid communities in winter wheat and sugar beet crops on an experimental field of an area 13.4 ha in the vicinity of Turew near Kościan (central Poland, sandy-loam pseudopodzolic soils) are presented.

Quantitative samples — 100 plants or 100 shoots (depending on the kind of crop) were taken along 4 perpendicular transects of a total lenght 600 m. Individual weights (Table 1) were determined for *Sitobion avenae*, *Aphis fabae* and partly for *Rhopalosiphum padi*, whereas for other species according to results of other authors. Plant density was estimated by the method used in investigations of primary production (by means of a frame or hoop of an area 0.1 m^2 or 1 m^2).

Species composition and structure of aphid communities in winter wheat "Begra" crop and aftercrop (lupine, perko, white mustard) were investigated in 1979 (Table 2) and in sugar beet crop in 1980 (Table 4). Numbers and density per m^2 were estimated (Tables 3, 5). The morph-age structure of dominant species (*Sitobion avenae* and *Aphis fabae*) (Fig. 1, 2) are described in detail, the biomass of aphids is estimated (Tables 3, 5).

In 1979 there was an outbreak of *Sitobion avenae*. The density and biomass of aphids were relatively very high (at the peak of appearance round June 27 – 5876 indiv. · m^{-2}, calculated into biomass 898.0 mg d. wt. · m^{-2}; on the average 1648 indiv. · m^{-2} and 237.8 mg d. wt. · m^{-2}). *Sitobion avenae* was an absolute dominant – 97.97% in the whole aphid community in winter wheat. *Rhopalosiphum padi* almost did not occur at all – 1.22% of the whole comunity. In 1980, the density and biomass of aphids were very low. *Aphis fabae* occurred in small densities. At the peak of appearance, round August 6, the density of aphids was 191.2 indiv. · m^{-2}, calculated into biomass 18.2 mg d. wt. · m^{-2}; on the average 36.1 indiv. · m^{-2} and 3.7 mg d. wt. · m^{-2}.

7. POLISH SUMMARY

W pracy przedstawiono wyniki badań prowadzonych w latach 1979 – 1980 nad zgrupowaniami mszyc upraw pszenicy ozimej i buraka cukrowego na polu doświadczalnym o powierzchni 13,4 ha w okolicy Turwi pod Kościanem (Środkowa Wielkopolska, gleby piaszczysto-gliniaste pseudobielicowe).

Próby do badań ilościowych pobierano losowo – 100 roślin lub 100 pędów (w zależności od charakteru uprawy) wzdłuż 4 prostopadłych do siebie transektów o łącznej długości około 600 m. Ciężary osobnicze (tab. 1) wyznaczono dokładnie dla gatunków *Sitobion avenae*, *Aphis fabae* i częściowo *Rhopalosiphum padi* – dla pozostałych gatunków na podstawie wyników innych autorów. Zagęszczenie roślin oceniono metodą przyjętą w badaniach nad produkcją pierwotną (za pomocą ramy lub obręczy o powierzchni 0,1 m^2 lub 1 m^2).

Zbadano skład i strukturę gatunkową zgrupowań mszyc uprawy pszenicy ozimej odmiany Begra i poplonu (łubin, perko, gorczyca) w 1979 r. (tab. 2) oraz uprawy buraka cukrowego w 1980 r. (tab. 4). Oceniono liczebność, zagęszczenie na m^2 (tab. 3, 5). Szczegółowo opisano strukturę morfowiekową gatunków dominujących (*Sitobion avenae* i *Aphis fabae*) (rys. 1, 2) oraz oceniono biomasę mszyc (tab. 3, 5).

W roku 1979 wystąpiła gradacja *Sitobion avenae*. Zagęszczenie i biomasa mszyc osiągnęły stosunkowo bardzo wysoki poziom (w okresie szczytu pojawu około 27 VI – 5876 osobn. · m^{-2}, w przeliczeniu na biomasę 898,0 mg · m^{-2} s. m.; średnio 1648 osobn. · m^{-2} i 237,8 mg · m^{-2} s. m.). *Sitobion avenae* był absolutnym dominantem – 97,97% udziału w całości zgrupowania mszyc pszenicy. Zaznaczył się prawie zupełny brak udziału *Rhopalosiphum padi* – 1,22% udziału w całości zgrupowania. W roku 1980 zagęszczenie i biomasa mszyc były bardzo niskie. *Aphis fabae* występował w niewielkich zagęszczeniach. W okresie szczytu pojawu, ok. 6 VIII zagęszczenie zgrupowania mszyc wynosiło 191,2 osobn. · m^{-2}, w przeliczeniu na biomasę 18,2 mg · m^{-2}; średnio 36,1 osobn. · m^{-2} i 3,7 mg · m^{-2} s. m.

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(*Received 7 July 1983*)