

Electronic Journal of Polish Agricultural Universities is the very first Polish scientific journal published exclusively on the Internet, founded on January 1, 1998 by the following agricultural universities and higher schools of agriculture: University of Technology and Agriculture of Bydgoszcz, Agricultural University of Cracow, Agricultural University of Lublin, Agricultural University of Poznan, Higher School of Agriculture and Teacher Training Siedlce, Agricultural University of Szczecin, and Agricultural University of Wrocław.



**ELECTRONIC
JOURNAL
OF POLISH
AGRICULTURAL
UNIVERSITIES**

**2000
Volume 3
Issue 2
Series
HORTICULTURE**

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JAŚKIEWICZ B. 2000. OBSERVATIONS OF THE POPULATION DYNAMICS OF *APHIS SPIRAEPHAGA* MÜLL. (*HOMOPTERA*,
APHIDIDAE) ON THE SHRUBS OF *SPIRAEA VANHOUTTEI* ZABEL., *S. ARGUTA* ZABEL., AND *S. SALICIFOLIA* L. **Electronic Journal of
Polish Agricultural Universities**, Horticulture, Volume 3, Issue 2.
Available Online <http://www.ejpau.media.pl>

OBSERVATIONS OF THE POPULATION DYNAMICS OF *APHIS SPIRAEPHAGA* MÜLL. (*HOMOPTERA*, *APHIDIDAE*) ON THE SHRUBS OF *SPIRAEA VANHOUTTEI* ZABEL., *S. ARGUTA* ZABEL., AND *S. SALICIFOLIA* L.

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ABSTRACT

The subject of studies conducted in the years 1994-1996 were observations on the occurrence of *Aphis spiraeophaga* Müll. on three spirea species: *Spiraea vanhouttei* Zabel., *S. arguta* Zabel. and *S. salicifolia* L. Aphids were most numerous on the examined shrubs in 1995, while their lowest numbers were observed in 1994. It was also found out that these aphids colonised the shrubs of *S. vanhouttei* in the highest degree, being rare on *S. salicifolia*. The effect of weather (heat, drought, showers of rain) on the number and dynamics of the

aphid population concerning the place and period of feeding was greater on *S. vanhouttei* and *S. arguta* as compared with *S. salicifolia*. The damage caused by the feeding of that aphid was often reduced by the plant itself, because those shrubs grew intensively, after the aphids flew away. Newly appearing leaves were not deformed. Another factor which significantly lowered the ornamental value of the shrubs was honey-dew, on which the dark saprophytic fungi appeared and marred the plants.

Key words: *Aphis spiraephaga*, spireas: *Spiraea vanhouttei* Zabel., *S. arguta* Zabel. and *S. salicifolia* L.

INTRODUCTION

Spireas as a valued element of green areas are highly ornamental shrubs, which have very small requirements concerning the soil and which are characterised by high resistance to urban and industrial pollution and dry periods. A big role in the functioning of green areas in cities is played by herbivorous insects, for example aphids, which are dangerous pests lowering the ornamental value of these shrubs.

Aphis spiraephaga Müll. is a foreign species colonising the plants of *Spiraea* genus in parks, housing estates and squares. This aphid came to Poland by way of expansive migration from central Asia. Achremowicz [1], Barczak [2], Starý [13], Szelegiewicz [14], Vereshchagin, Vereshchagin [16] remark on its presence in most European countries, while Halbert, Voegtlin [3] in Canada and North America. In Poland it is found in few regions [14], and since 1973 it has also been observed in Lublin [1, 4].

The purpose of the present studies was to establish the dynamics of the number of *A. spiraephaga* Müll. on three species of shrubs from the genus of *Spiraea*.

MATERIALS AND METHODS

Observations were carried out in the years 1994-1996 in Lublin in the area of a housing estate called "Czechów". The following shrub species were included in the observations: [*Spiraea vanhouttei* Zabel.](#), *Spiraea arguta* Zabel. and [*Spiraea salicifolia* L.](#)

Five shrubs from each examined species growing near each other were chosen for analysis. Monitoring was performed from early spring to late autumn with 10-days' intervals. When the weather conditions were unfavourable the observations were postponed onto the following days. Attention was paid to different injuries on the examined shrubs.

The keys of Müller [10], Šapošnikov [12] and Rupajs [11] were used while marking the aphids. Meteorological data were obtained from the Institute of Agrometeorology of the University of Agriculture in Lublin.

Fot. 1. *Aphis spireaphaga* Müll. on *Spiraea vanhouttei* Zabel.



Fot. 2. *Aphis spireaphaga* Müll. on *Spiraea salicifolia* L.



RESULTS

The observations found out that the aphid *Aphis spiraephaga* Müll. was most numerous on the shrubs of *Spiraea vanhouttei* Zabel., while its lowest numbers were noticed on the shrubs of *Spiraea salicifolia* L. The weather course in the studied years is presented in figures 1, 2, 3, and the dynamics of the aphid population is shown in figures 4, 5, 6. Table 1 presents information on the numbers of aphids on the examined shrub species.

Fig. 1. General information about the weather in 1994

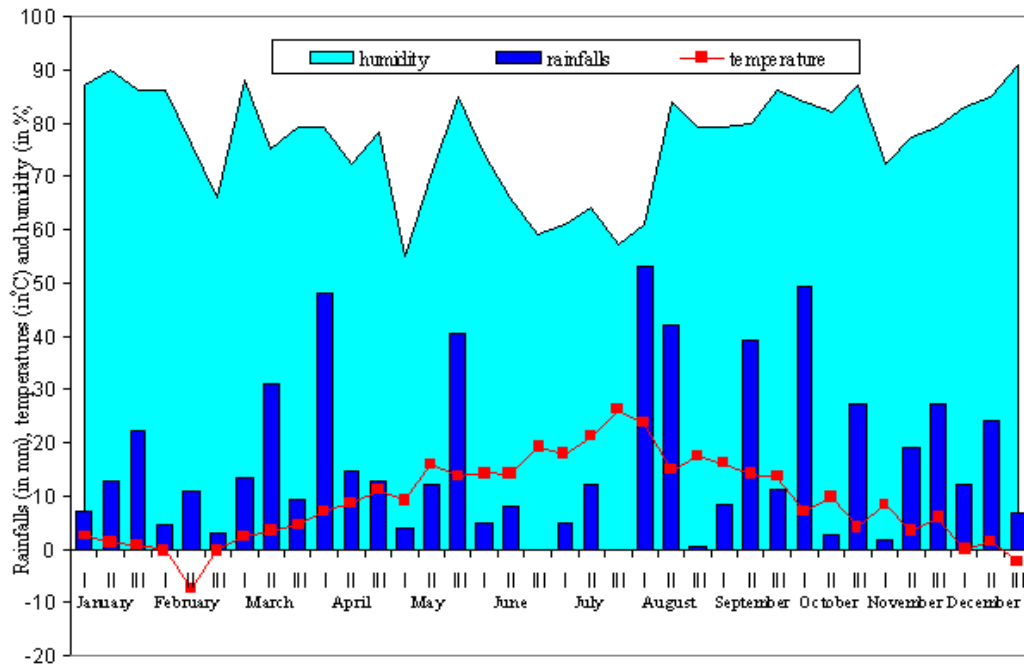


Fig. 2. General information about the weather in 1995

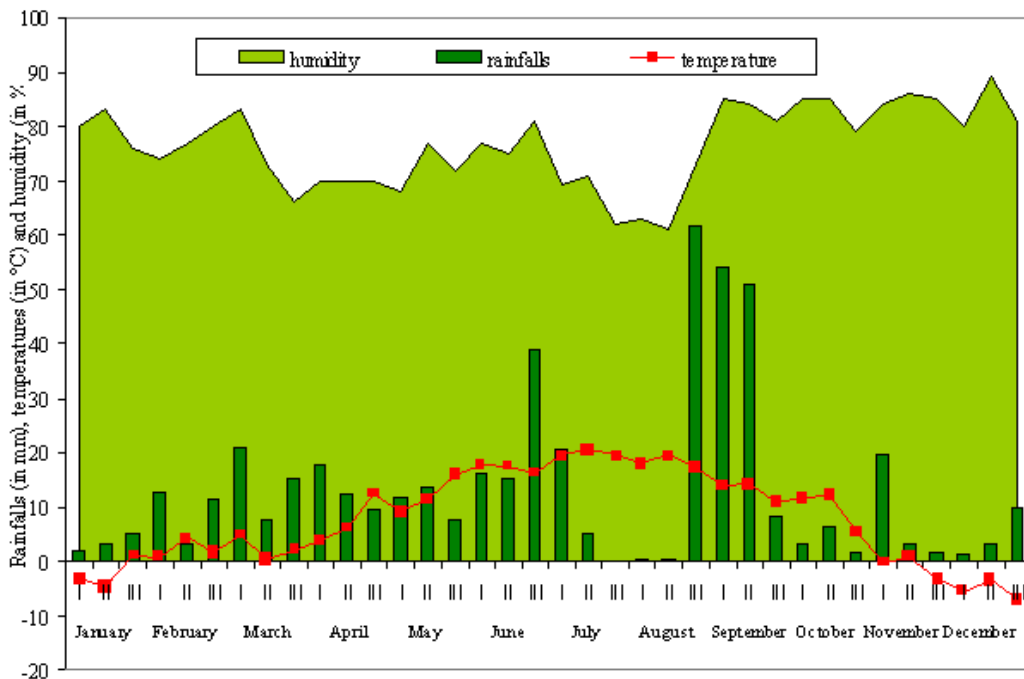


Fig. 3. General information about the weather in 1996

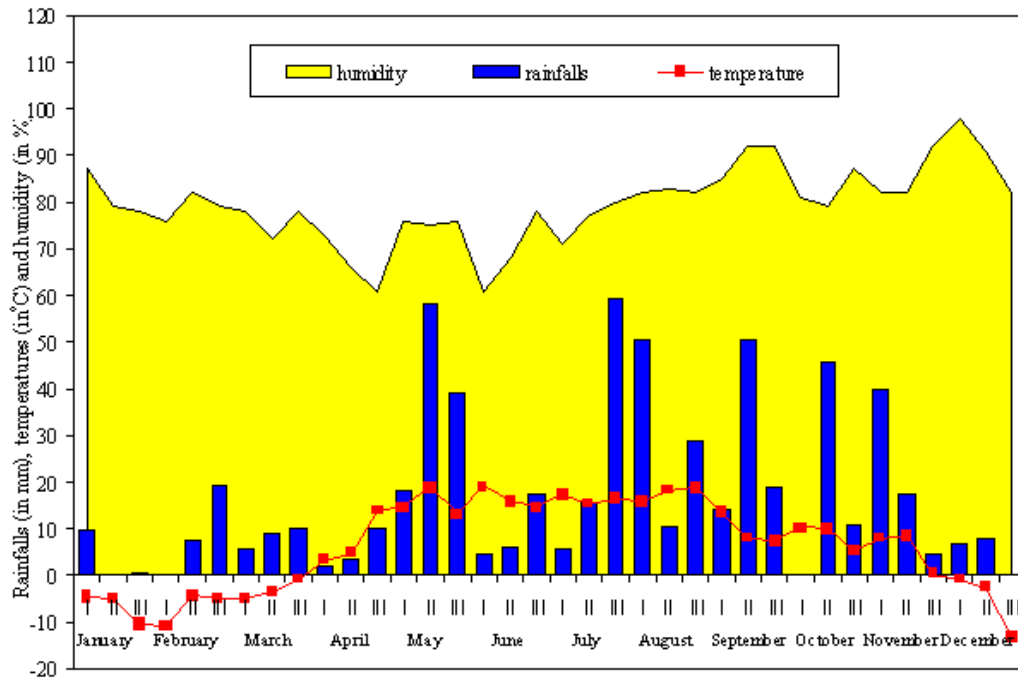


Fig. 4. Dynamics of the population of *A. spiraeaphaga* on *S. vanhouttei*, *S. arguta* and *S. salicifolia* in 1994

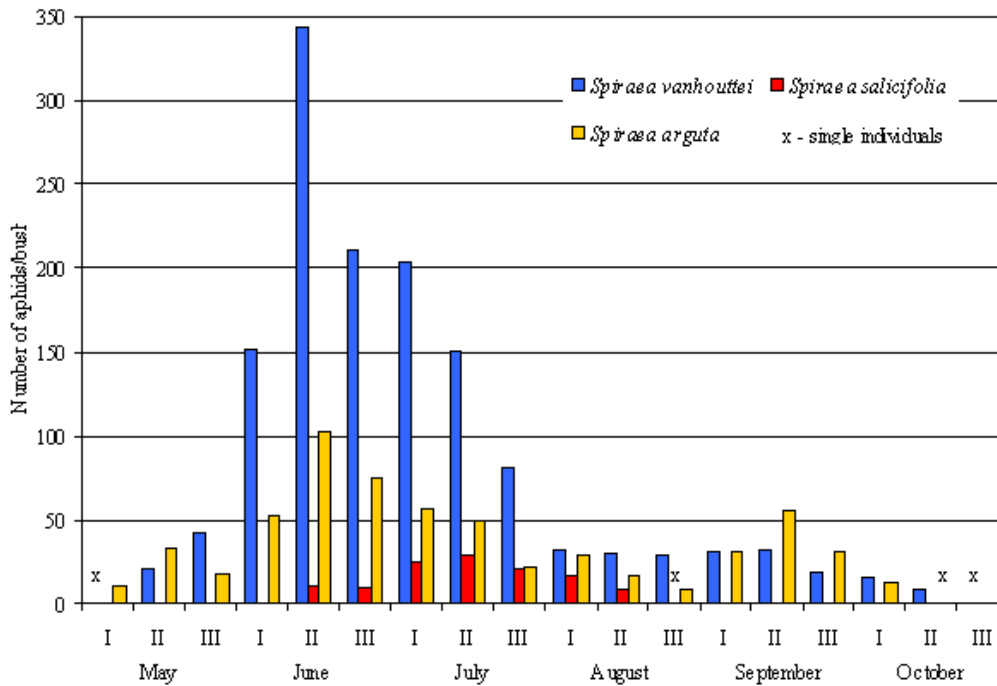


Fig. 5. Dynamics of the population of *A. spiraephaga* on *S. vanhouttei*, *S. arguta* and *S. salicifolia* in 1995

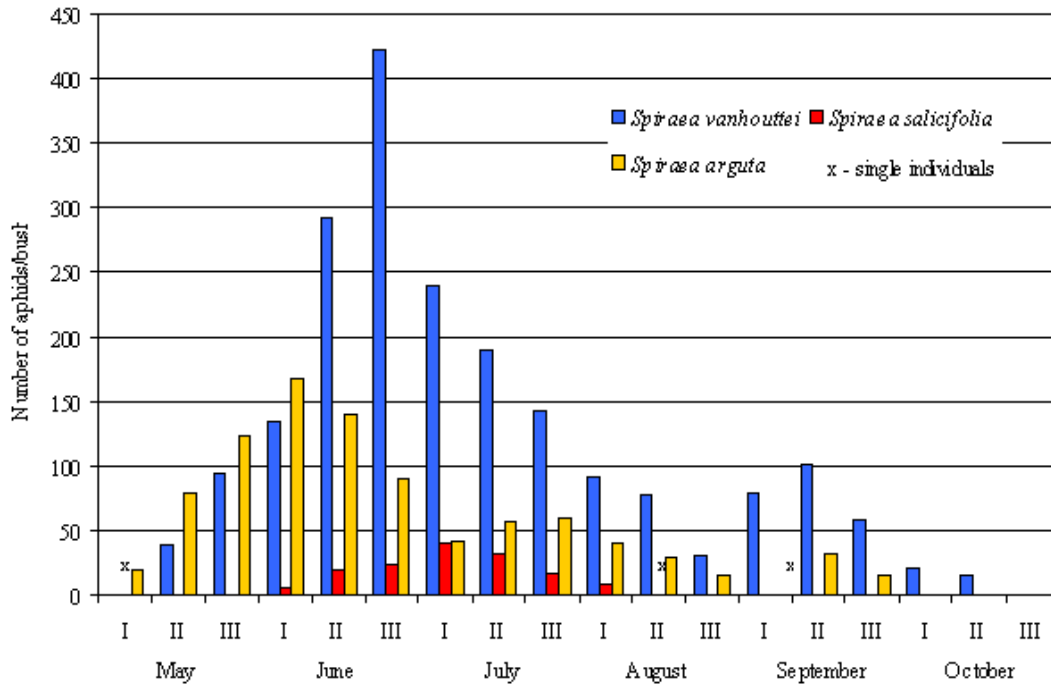


Fig. 6. Dynamics of the population of *A. spiraephaga* on *S. vanhouttei*, *S. arguta* and *S. salicifolia* in 1996

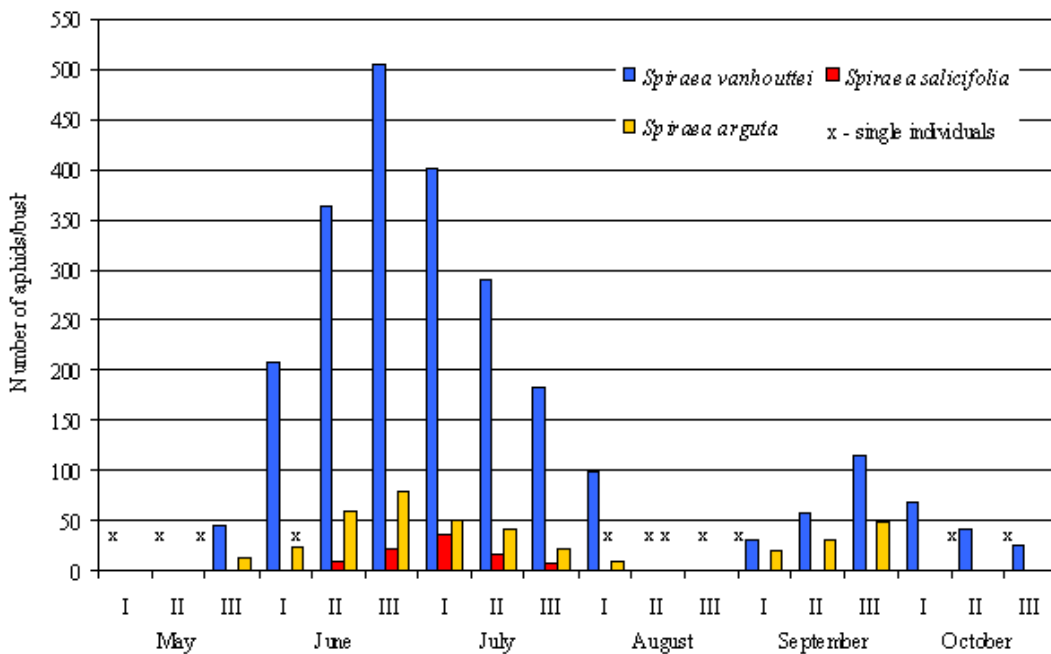


Table 1. Number of *Aphis spiraephaga* Müll. on spirea shrubs in the years 1994-1996

Year	Aphids morphs	Shrub species			Totally
		<i>Spiraea vanhouttei</i>	<i>Spiraea arguta</i>	<i>Spiraea salicifolia</i>	
1994	Wingless	1370.2	618.8	120.8	2109.8
	Winged	22.4	24.4	18.2	65.0
	Totally	1392.6	643.2	139.0	2174.8
1995	Wingless	2049.4	908.2	144.4	3102.0
	Winged	42.8	29.8	14.0	86.6
	Totally	2092.2	938.0	158.4	3188.6
1996	Wingless	2421.4	418.2	88.2	2927.8
	Winged	37.8	15.4	9.2	62.4
	Totally	2459.2	433.6	97.4	2990.2
Totally	Wingless	5841.0	1945.2	353.4	8139.6
	Winged	103.0	69.6	41.4	214.0
	Totally	5944.0	2014.8	394.8	8353.6

After a mild winter of 1994 ([fig.4](#)) the beginning of the vegetative period began on the first days of April. The first larvae of mothers on *S. vanhouttei* and *S. arguta* appeared in the third 10-days' period of April. Their small colonies on *S. arguta* were observed on the first 10 days of May, and a week later they appeared on *S. vanhouttei*. Subsequent observations found a more than double increase of the number of aphids on both shrub species. May showers (May 25 and 26) caused a short-lasting inhibition of the dynamic development of aphids, a part of which were washed away from the young shoots on which they were feeding. Beginning with June another increase of the numbers took place, and the maximum was found out in the second 10-days' period. There were 343.2 aphids/shrub on *S. vanhouttei*, and 103.2 aphids/shrub on *S. arguta*. At the same time rare specimens of aphids were observed on *S. salicifolia*, and their number grew, reaching the maximum in the second 10-days' period of July; it was 29.8 aphids/shrub. The heat waves in July had a smaller influence on the reduction of the aphid population on *S. salicifolia*, since they most frequently stayed on the bottom part of the leaves, while on the two other species of spirea the number of aphids clearly decreased, and the winged females leaving the shrubs appeared more often.

After the showers of rain in August there was a rapid decrease of the aphid population, and on *S. salicifolia* the aphid colonies disappeared. Only singular individuals were observed till the end of August. Beginning with September, the studies found out an increase of the number of aphids in colonies on all the shrub species, especially in the second 10-days' period of the month. Ground frosts, which occurred on October 19 probably, caused a complete disappearance of aphids.

After an average winter of 1995 ([fig. 5](#)), the vegetative season began about April 10. The first scarce colonies on *S. arguta* appeared in the first 10-days' period, and on *S. vanhouttei* in the second 10-days' period of May. In subsequent observations, when the weather conditions were favourable, the number of aphids grew. A month after aphids appeared on the shrubs of

S. arguta the maximum was observed, which was 141.2 aphids/shrub, and on *S. vanhouttei* the maximum, which was 421.8 aphids/shrub was established in the third 10-days' period of June. On four shrubs of *S. salicifolia* the aphids of *A. spiraephaga* appeared in very small numbers in the first 10-days' period of June, and their maximum, 40.2 aphids/shrub, was noted on the first 10 days of July. In July and August the number of aphids on all shrubs was low, and winged individuals were observed more often. They flew away to other shaded spireas, which was probably due to the dry period. Disappearance of aphids on *S. salicifolia* took place on the first 10 days of August. After a storm (August 21) *S. arguta* shrubs were also free from aphids. Their small colonies occurred on three shrubs again between the second and third 10-days' periods of September. With varying intensities, aphids stayed on *S. vanhouttei* from the second to the third 10-days' periods of September.

After a long and frosty winter of 1996 ([fig. 6](#)) the beginning of the vegetative period was delayed by about four weeks. Singular specimens were observed on the bottom part of the leaves beginning with the first 10-days' period of May, and first scarce colonies on *S. vanhouttei* and *S. arguta* were found in the third 10-days' period of May. Warm May and June favoured a dynamic growth of aphids, especially on the shrubs of *S. vanhouttei*. It was also found out that aphids moved to the top parts of the shoots. The maximum was achieved on both shrub species in the third 10-days' period of June; on *S. vanhouttei* it was 505.2 aphids/shrub, and on *S. arguta* 79.4 aphids/shrub. Beginning with July the number of aphids gradually decreased, which could have been caused by frequent showers of rain washing away the insects from plants. Additionally, the situation was made even worse by the heat waves on the first ten days of August. Between the first ten days of August and the middle of the first 10-days' period of September only singular specimens were observed. Aphid colonies were observed again in September, and they stayed till the third 10-days' period on *S. arguta*, and till the third 10-days' period of October on *S. vanhouttei*. The aphids of *A. spiraephaga* on *S. salicifolia* were very rare in that season, and they fed for a very short time. They appeared in the second 10-days' period of June and reached the maximum, 35.8 aphids/shrub, after three weeks. The first winged individuals appeared very soon, and they left the shrubs much earlier than in previous years, in the third 10-days' periods of July.

DISCUSSION

It was found out on the basis of observations that in the years 1994-1996 *A. spiraephaga* aphids were most numerous on *S. vanhouttei*, their numbers were almost three times lower on *S. arguta*, and the lowest on *S. salicifolia*. The presence of *A. spiraephaga* on plants belonging to the genus of *Spiraea* is confirmed by other authors [1, 2, 3, 9, 14]. Lampel [9] also mentions them on *Capsella bursapastoris*, while Vereshchagin, Vereshchagin [16] remarks on their appearance on *Valeriana officinalis*. Every year these aphids formed colonies made up of numerous individuals on the shoots, leaves and inflorescences. Those observations confirmed the data provided by other authors according to which this species often stays on spirea throughout the vegetative period [3, 5, 6, 8, 10, 16]. Especially numerous colonies consisting of many individuals occurred on *S. vanhouttei* between June 15 and July 15. The maximum numbers, but smaller colonies, were found in June. On *S. salicifolia* this aphid appeared much later, and a slight maximum of the population was observed in the first and second 10-days' period of July.

As follows from the numbers of the discussed aphid species, spirea shrubs of foreign origin (*S. vanhouttei* and *S. arguta*) are more popular, which is confirmed by the foreign origin of that aphid [1, 2, 13]. The numbers of *A. spiraephaga* were higher when the temperatures and

rainfalls were within the norm. On the other hand, lower numbers were influenced by dry periods and high temperatures (over 30°C), which caused a decrease of the plants' turgor. Then, winged females appeared more often in colonies. They left the shrubs, and probably colonised other spireas where the feeding conditions were better. Because these aphids usually feed on top shoots, heavy rainfalls caused that a considerable part of them were washed away and they died, which also negatively affected their numbers. It was observed [6, 7] that the numbers of those aphids have been lower in recent years; this especially concerns their appearance on *S. vanhouttei*. In summer months the shrubs were free from aphids more often and for longer periods of time, which might have been caused by the changing weather, especially by hot summers [15].

A. spiraephaga aphids on *S. vanhouttei* and *S. arguta* colonised the leaves on the top parts of young increments, but also the shoots themselves. Their feeding caused inhibition of the growth and a partial deformation of the shoots, as well as smaller leaves. However, because the shrubs grow intensively they did away with the results of injuries, and after the aphids flew away it was observed that the shoots continued to grow and the new leaves were not deformed any more. It was only big amounts of honey-dew that lowered the ornamental value of shrubs. A short period of stay and relatively small numbers of the aphids on *S. salicifolia* resulted in slight injuries (twisting of the leaves), which did not affect the aesthetic appearance.

CONCLUSIONS

1. A significant influence on the dynamics of *A. spiraephaga* population was exerted by weather conditions. In 1995, after a mild winter and cool spring with the rainfalls within the norm, aphids were most numerous, while in 1994 their numbers were the lowest probably due to frequent stormy rainfalls and earlier ground frosts.
2. Aphids were most numerous on the shrubs of *S. vanhouttei*, and least numerous on the shrubs of *S. salicifolia*.
3. Honey-dew, on which dark saprophytic fungi developed and marred the plants, was a factor considerably reducing the ornamental value of the shrubs.

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