THE BEHAVIOUR, LIFE CYCLE AND BIOMETRICAL MEASUREMENTS OF *MYZUS PERSICAE*

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Abstract: *This paper presents data referring to the colonization and dispersal behaviour, the life cycle of aphid species from potato cultivations for a period of three years 2005-2007, from Didactic Station Timisoara and Varfurile, Arad county, and biometrical measurements which point out the morphological caracteristics of Myzus persicae. For an estimation situations of attack can be useful to be known the most common places of colonization. Also, knowledge of potato aphid life cycle constitutes a basic element of the integrated potato pests control. Wingless adult aphids are green to pale yellow and measure about 1.9 to 2.3 mm in length. Winged (alate) aphids have a black head and thorax, and a yellowish green abdomen with a large dark patch dorsally. The smallest length of the body established for aphids captured in West Zone of Romania was 2.1 mm, while the biggest was 2.65 mm. The average body length was 2.44 ± 0.15 mm. Regarding the length of the head and thorax, it may be noticed that the maximum length of these parts was 1.25 mm and minimum length was 1.0 mm. The average value calculated for the length of these parts was 1.14 ± 0.06 mm.The minimum width of head was 0.40 mm and the maximum width of head was 0.45 mm. The average value calculated for head width was 0.41 ± 0.2 mm. As far as the thorax width is concerned, this was minimum 0.80 mm and maximum 1.0 mm. Mean thorax width was 0.89 ± 0.06 mm. The minimum length of the abdomen was 1.10 mm and minimum width was 0.85 mm, the maximum length of the abdomen was 1.50 mm and the maximum width was 1.15 mm. The mean length of the abdomen was 1.31 ± 0.11 mm; while the average value calculated for abdomen width was 1.02 ± 0.09 mm. Winged green peach aphids seemingly attempt to colonize nearly all plants available. Their highly dispersive nature contributes significantly to their effectiveness as vectors of plant viruses.The females arrive at a host tree and give birth to a wingless egg-laying generation. The males are attracted and mate with the egg-producing females. These females then lay eggs, which will grow over the winter and hatch in the spring.*

Key words: *Myzus persicae, behaviour, life cycle, biometrical measurements*

INTRODUCTION

Green peach aphids can attain very high densities on young plant tissue, causing water stress, wilting, and reduced growth rate of the plant. Prolonged aphid infestation can cause appreciable reduction in yield of root crops and foliage crops. Early season infestation is particularly damaging to potato, even if the aphids are subsequently removed (PETITT and SMILOWITZ 1982).

The stages or the succession of generations of a species at the end of which the insect will be in a status identical to the initial one is called biologic cycle. The species which perform their biologic cycle on two host plants have a dioecic cycle (e.g. *Myzodes persicae*), and are migratory.

Contamination of harvestable plant material with aphids, or with aphid honeydew, also causes loss. Contamination of vegetables by aphids sometimes presents quarantine problems (STEWART et al. 1980).

The major damage caused by green peach aphid is through transmission of plant viruses. Indeed, this aphid is considered by many to be the most important vector of plant viruses throughout the world. Nymphs and adults are equally capable of virus transmission (NAMBA and SYLVESTER 1981), but adults, by virtue of being so mobile, probably have greater opportunity for transmission. Both persistent viruses, which move through the feeding secretions of the aphid, and non-persistent viruses, which are only temporary contaminants of aphid mouthparts, are effectively transmitted. KENNEDY et al. (1962)

listed over 100 viruses transmitted by this species. Some of the particularly damaging diseases include potato leafroll virus and potato virus Y to *Solanaceae*, beet western yellows and beet yellows viruses to *Chenopodiaceae*, lettuce mosaic virus to Compositae, cauliflower mosaic and turnip mosaic viruses to *Cruciferae*, and cucumber mosaic and watermelon mosaic viruses to *Cucurbitaceae*. A discoloration in potato tubers, called net necrosis, occurs in some potato varieties following transmission of potato leafroll.

Aphids are one of the most studied entomological groups, as regular pests and especially as virus vector of cultivated plants.

In Romania researches were carried out at ICCP, Brasov by DONESCU (1996), (1997), (1998), (2001) and DRAICA (1996). In the climatic conditions specific for the West zone aphids have characteristic life cycle.

The scientific literature shows that there are differences regarding the aphid species virulence and that not all forms of the same species are transmitting the viruses in the same way (BUIOC, 1998). *Myzus persicae* is the most dangerous aphid and have a virulence of 1.

In spread of viruses at potatoes the other species have a virulence between 0,1- 0,286 (HARTON, 1983 cited by BEDO, 1996).

MATERIAL AND METHODS

The researches have been carried out for a period of three years, 2005 - 2007 in the experimental field of the Didactic Station Timisoara (STN) and Varfurile, Arad county. The aphids have been collected with the yellow vessel traps on a two days.

Colonization and dispersal behaviour

On secondary host plants, *Myzus persicae* prefers upper young leaves of the plant while others aphids sit in the lower region of the plant. For example, *Aphis nasturti* and *Aphis frangulae* prefer leaves closest to the earth for solar radiation protection and they like wet earth. There are also differences depending on the season. For example, when the weather is cooler with more rainfall, aphids seek protection in the leaves that are rolled.

Some aphids form large colonies, others are solitary and only when there is a massive multiplication cohesive populations are formed. During an annual cycle, alternations between apterous and winged forms of aphids were observed.

For *Myzus persicae* species, first alates seen in spring are individuals that migrate from the primary host to colonize secondary hosts, usually cultivated plants, on which the next generations spend the entire season. During spring and summer there is a disseminating flight, which allows aphids to colonize new secondary host plants. In the autumn, aphids migrate again to the primary host plants. These flights are made by individuals involved in sexual reproduction, ginopars and males.

For aphids, distinction should be made between migration flights and dispersion flights. The migration flight is a migration of the alates from wooden winter hosts to herbaceous summer host plants.

In the autumn aphids migrate back to the primary hosts. What determines them to migrate is the colour yellow and green. Some types of aphids, after landing on plants, take samples by puncture. If the answer is negative, they move on or pass to any neighboring plants. Once they have settled on a host plant, they give birth to other generations. After giving birth to some larvae on one plant, *Myzus persicae* goes to the next plant and gives birth to a few larvae there as well.

In a dispersion flight, the population is spreading to larger areas. Both flights aim to preserve the species.

The population of aphids can be influenced by the action of some species of ants. Thus, STARY (1970) showed that, due to the activity of ants, aphids can remain in the good places of a plant for a longer period of time and in a greater number than in the absence of ants. ORLOB (1963) observed that predatory Coccinellidae adults and larvae were attacked by ants and this is one of the factors that determined the populations of aphids to multiply.

According to BODENHEIMER and SWIRSKI (1957) colonies of aphids attended by ants have double or triple speed of multiplication colonies as compared to the unattended ones.

RESULTS AND DISCUSSIONS

Aphids live in symbiotic relationships with ants. Aphids' faeces are rich in sugary substances.

They are avidly consumed by ants, bees and some species of flies.

Wheeler believes that aphids show changes in structure and behaviour that provides indisputable evidence that they have adapted to life with ants: aphids do not try to escape or to defend themselves.

Aphids release honeydew slowly when are visited by ants instead of eliminating it as quickly as they do in their absence. Many of the aphids that usually live with ants have developed an anal brim of hairs to support the drop of honeydew until it can be swallowed by ants. The modifications undergone by ants to benefit more from their association with aphids are almost entirely behavioural.

Figure 1: *Myzus persicae* (alata) seen through binocular lanses

Ants do not eat or kills aphids; they protect them from predators and parasites. Some species of ants move aphids to a safer place if they are disturbed. Some ants hide the colonies of aphids in shelters.

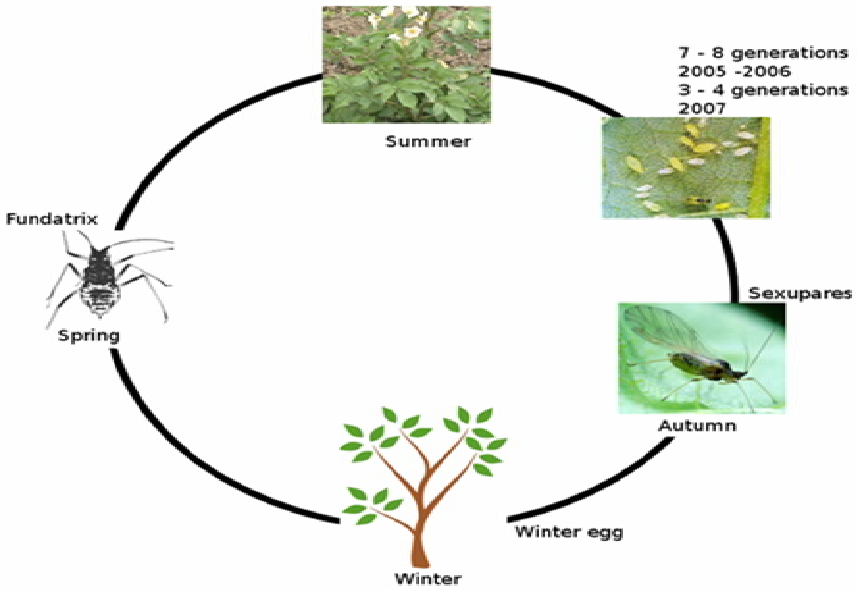

Figure 2: *Myzus persicae* life cycle

In the conditions of the Western Plain the species Myzus persicae Sulz. Winters in egg stage on the bark of stems or branches of peach and plum trees, where the fundatrix form together with the first three generations usually appears in early April. The winged fundatrigenous aphids start migrating to secondary host plants (e.g. potato) in the second decade of May. The average multi-annual date of flight towards the potato is 20th May.

In the years 2005 and 2006, Myzus persicae presented up to 8 virginogeneous generations. In the year 2007, due to the high temperatures which affected the prolificacy of the species negatively, it only had 3 generations on the potato culture (Figure 1).

The rate of reproduction is positively correlated with temperature which affects all biological stages.In late August the potato no longer provides enough food quality, so in early September migration flight to primary hosts begins. The flight occurs on average around September 2.

Table 1.

Biometrics measures *Myzus persicae*

Nb. art.	Body length (mm)	Head+thorax length (mm)	Head width (mm)	Thorax width (mm)	Abdomen (mm)	
					Length	Width
1	2,65	1,25	0,45	1	1,40	1,15
2	2,60	1,20	0,40	0,90	1,40	1,05
3	2,60	1,20	0,45	0,95	1,40	1,10
4	2,60	1,20	0,45	0,90	1,40	1,05
5	2,60	1,20	0,40	0,90	1,40	0,95
6	2,60	1,15	0,40	0,85	1,45	1,10
7	2,60	1,20	0,40	0,90	1,40	1
8	2,60	1,15	0,40	0,90	1,45	1
9	2,60	1,10	0,45	1	1,50	1,10
10	2,50	1,20	0,40	0,90	1,30	1,10
11	2,50	1,15	0,40	0,90	1,35	1,15
12	2,50	1,10	0,40	0,85	1,40	1,10
13	2,45	1,20	0,40	0,90	1,25	1,10
14	2,45	1,15	0,40	0,80	1,30	0,90
15	2,45	1,10	0,40	0,85	1,30	0,85
16	2,45	1,10	0,40	0,80	1,35	0,90
17	2,40	1,20	0,40	0,95	1,20	1,05
18	2,40	1,20	0,40	0,90	1,20	1
19	2,40	1,15	0,40	0,80	1,25	0,95
20	2,40	1,15	0,40	0,85	1,25	1,05
21	2,40	1,10	0,40	0,95	1,30	1,10
22	2,40	1,10	0,40	1	1,30	1,10
23	2,40	1,10	0,40	0,90	1,30	1,05
24	2,40	1,10	0,40	0,95	1,30	1,10
25	2,40	1,05	0,40	0,90	1,35	1,05
26	2,25	1,10	0,40	0,85	1,15	0,95
27	2,25	1,10	0,40	0,90	1,15	0,90
28	2,20	1,05	0,40	0,85	1,15	0,85
29	2,10	1	0,40	0,80	1,10	0,90
30	2,10	1	0,40	0,85	1,10	0,95
Average	**2,44**	**1,14**	**0,41**	**0,89**	**1,31**	**1,02**
Average deviation	**0,03**	**0,01**	**0,00**	**0,01**	**0,02**	**0,02**
Standard deviation (s)	**0,15**	**0,06**	**0,02**	**0,06**	**0,11**	**0,09**
(m) Min	**2,1**	**1**	**0,40**	**0,80**	**1,1**	**0,85**
(M) Max	**2,65**	**1,25**	**0,45**	**1**	**1,5**	**1,15**

The females arrive at a host tree and give birth to a wingless egg-laying generation. The males are attracted and mate with the egg-producing females. These females then lay eggs, which will grow over the winter and hatch in the spring.

Myzus persicae has two maximum flight curves recorded in the second decade of May and third

decade of June.

Wingless adult aphids are green to pale yellow they measure about 1.9 to 2.3 mm in length. Winged (alate) aphids have a black head and thorax, and a yellowish green abdomen with a large dark patch dorsally. (Figure 1) They measure 2.1 to 2.6 mm in length. Winged green peach aphids seemingly attempt to colonize nearly all plants available. Their highly dispersive nature contributes significantly to their effectiveness as vectors of plant viruses.

It can be observed that, out of a total of 30 individuals of the species *Myzus persicae*, (table 1) the smallest length of the body established for aphids captured in West Zone of Romania was 2.1 mm, while the biggest was 2.65 mm. The average body length was 2.44 ± 0.15 mm. (figure 3)

By analyzing the data presented in the table regarding the length of the head and thorax, it may be noticed that the maximum length of these parts was 1.25 mm and minimum length was 1.0 mm. The average value calculated for the length of these parts was 1.14 ± 0.06 mm.

The minimum width of head was 0.40 mm and the maximum width of head was 0.45 mm. The average value calculated for head width was 0.41 ± 0.2 mm.

As far as the thorax width is concerned, this was minimum 0.80 mm and maximum 1.0 mm. Mean thorax width was 0.89 ± 0.06 mm

Analyzing data on the length and width of the abdomen, it can be seen that the minimum length of the abdomen was 1.10 mm and minimum width was 0.85 mm, the maximum length of the abdomen was 1.50 mm and the maximum width was 1.15 mm. The mean length of the abdomen was 1.31 ± 0.11 mm, while the average value calculated for abdomen width was 1.02 ± 0.09 mm

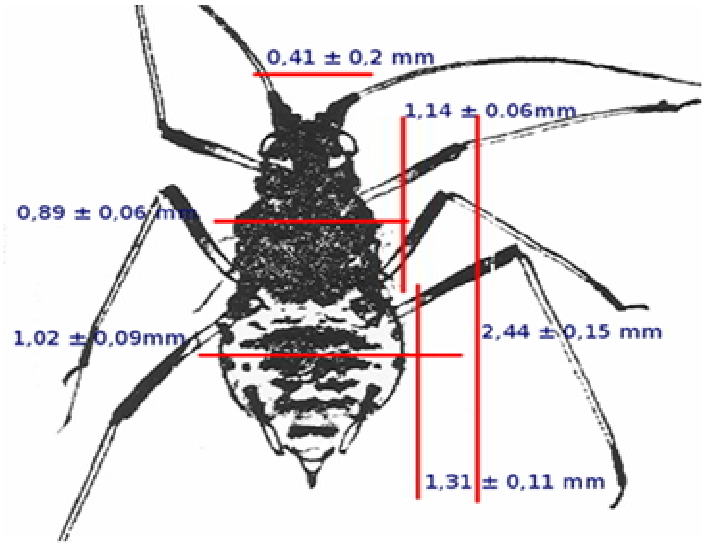

Figure 3: Biometrical measures of *Myzus persicae*

CONCLUSIONS

Aphids live in symbiotic relationships with ants. Aphids' excrements are rich in sugary substances. They are avidly consumed by ants, bees and some species of flies.

The average multi-annual date of flight on the secondary host plant potato is 20th May. In the years 2005 and 2006, *Myzus persicae* presented up to 8 virginogenous generations. In the year 2007, due to the temperature which affected the prolificacy of the species negatively, it had only 3 generations in the potato culture, being found in the potato culture only until the first part of June and not being captured in July and August.

Myzus persicae has two maximum flight curves recorded in the second decade of May and third decade of June.

The average body length was 2.44 ± 0.15 mm.

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