CLASSICAL BIOLOGICAL CONTROL OF APHIDS BY USING OF LADYBUGS SPECIES IN SOME ROSE VARIETIES

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Abstract. *Aphids are considered to be the most common and most harmful species of insect attacking the rose. The western area of Romania is favorable for the development of a large number to the generations, regardless of the species of aphids. Reducing the population level of aphids by ladybugs (an inexpensive and environmentally friendly biological method is, in fact, the main objective of this paper). In recent years, the ladybugs populations have increased considerably in the natural environment, which has implicitly led to the reduction of the aphid populations present on the plants. It is known that the main food of the ladybugs is aphids, so the interaction between them has been and remains a permanent subject of research in the field of classical biological combat. Three biotic factors have been implicated in this paper: aphids, ladybugs, and rose. The place of observation was identified in the western area of country (Arad County, Santana village). The observations were made during the years 2016 and 2017 and materialized in weekly readings. The rose varieties studied were Rosa Blue Monday, Queen Elizabeth and Rosa Aida. Rose varieties were selected on the basis of frequency in the area and trade availability. Five plants of each variety were monitored and analyzed. The results showed that on all rose varieties there were both aphids and ladybugs. Aphids were represented by the species Macrosiphum rosae (rose aphid), Myzaphys rosarum (pink aphid of the rose) and the predators (ladybugs) of the invasive species Harmonia axyridis (Asian ladybugs). The Rosa Aida variety was highlighted by a total of 130.75 aphids consumed by predators. Average results were obtained on the Queen Elizabeth variety (21.7 aphid consumed). Low efficiency was recorded in the Rosa Blue Monday variety, where only 8.71 aphids were consumed. The explanation would be that where the aphid's population is large and the population of the predators grows. As a recommendation, exploitation of ladybugs present in crops is encouraged. By naturally controlling biological exploitation of the ladybugs it reduces number of chemical treatments.*

Keywords*: biological control, aphids, ladybugs, rose.*

INTRODUCTION

The cultivated rose can be affected by over 30 species of aphids that feed on roses, cultivated around the world. Of these aphids, almost half are found in Europe. Among all, the following are worth mentioning: *Chaetosiphon fragaefolii*, *Chaetosiphon tetrarhodum*, *Longicaudus trirhodus*, *Macrosiphum euphorbiae*, *Macrosiphum rosae*, *Maculolachnus submacula*, *Metopolophium dirhodum*, *Myzaphis bucktoni*, *Myzaphis rosarum*, *Rhodobium porosum*, *Sitobion fragariae* and *Wahlgreniella nervata* (BLACKMAN AND EASTOP, 2004; GROZEA, 2006). The most frequent species is far *Macrosiphum rosae* (MEHRPARVAR ET AL., 2016). In our country some of these are present. Populations of aphids, fortunately, can be controlled by ladybugs, sirphis larvae and parasitic wasps (GROZEA, 2015, FLINT, 2013), and also Chrysopidae and entomopathogenic fungi *(Lecanicillium lecanii*) and spiders from Thomisidae family. Predators can be very important in controlling aphids (BUGG ET AL, 2008, CLARK, 2011), especially in non-sprayed gardens that destroy natural species as well as pests. Typically, natural enemy populations do not appear in significant numbers until aphids begin to be numerous.

MATERIAL AND METHODS

The studies were conducted in the western part of the country, more precisely in Santana locality in Arad County. The observation period totally covered the year 2016 (April-October) and partly 2017 (May). The observations were made in weekly readings (in more cases, 4 readings/month).

The material under observation consisted of two varieties of rose, Rosa Blue Monday and Rosa Aida, which were common in the area and purchased from the market. There have been monitored and analyzed 5 plants of each variety. There have been studied populations of aphids and ladybugs, too. These were expressed by the number of colonies, the number of aphids/colonies and the number of ladybugs of each analyzed variety. At each reading the aphids and the ladybugs present on the 5 plants/rose variety were quantified.

In order to better express the ratio, respectively the interaction between the predator-pest and the aphid-ladybugs, a calculation formula was set up to replicate the value of the aphids consumed/analyzed period:

(Total number of aphids x total number of ladybugs)/100 = Total aphids consumed (adapted formula).

Observation points were established using the GPS and the identification of the points.

Samples of plants and insects were analyzed by laboratory using the magnifying glass. Thus, all the details necessary for species identification have been established, the number of aphid-larvae individuals smaller than 1 mm.

RESULTS AND DISCUSSIONS

The results obtained from observations made in Santana locality, the County Arad, between April 2016 and May 2017, showed that all 3 varieties of rose were attacked to aphids. On all varieties there were species of Coccinelidae (ladybugs) of genus Harmonia. Data on colonies number, aphids/colonies number and number ladybugs are shown in the custom tables and figures for each analyzed variety/hybrid.

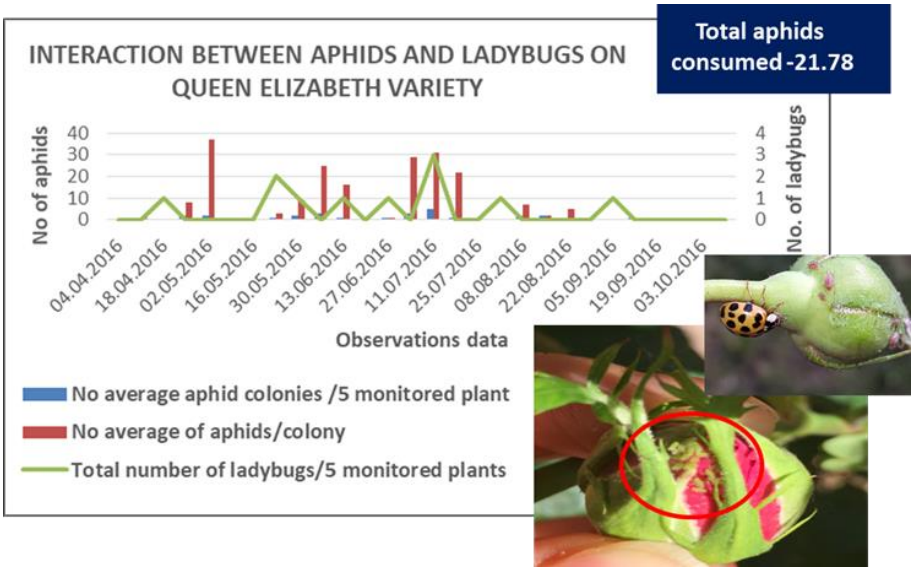

Figure 1. Interaction between aphids and ladybugs on Queen Elizabeth variety, in year of 2016

Interaction between the predator-pest respectively the aphid-coccinelids expressed as the total of the aphids consumed. This value was obtained from the calculation formula mentioned in the material and method. This formula is valid only for the year 2016, with a fully developed cycle of aphids and ladybugs.

In table 1 it can be seen that in Queen Elizabeth rose variety, the average values of the present aphid ranged from 1 to 37 individuals/colony (5 colonies in total) (figure 1). As a rule, only colonies are visited by predators. The predator-to-pest ratio is balanced, with abundance of aphids. One ladybugs consumed on average 0.7 aphids (table 1). The total amount of aphids consumed reached 21.78 (figure 1).

Table 1

Interaction between aphids and ladybugs on Queen Elizabeth variety, in year of 2017

Geographic coordinates/variety/ hybrid analyzed	Date of observations	No average aphid colonies /5 monitored plant	No average of aphids/colony	Total number of ladybugs/5 monitored plants
lat: 46.34838 long: 21.51115	02.05.2017	0	0	0
	08.05.2017	0	0	0
	14.05.2017	0	0	1.5
	22.05.2017	2.33	9	0
	30.05.2017	2	31.5	0
Total aphids consumed daily: 0.7				

On the Rosa Blue Monday variety, it was observed that the total number of aphids consumed in 2016 had a small total value of 8.71 (figure 2).

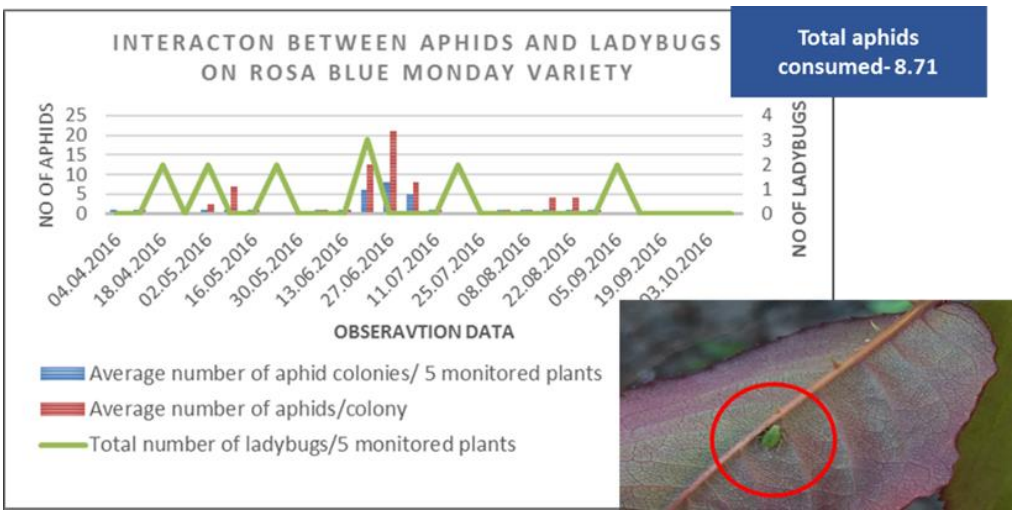

Figure 2. Interaction between aphids and ladybugs on Rosa Blue Monday variety, in year of 2016

Perhaps and because of the low aphids' population. This has implicitly attracted a smaller number of ladybugs. The population of ladybugs has only consumed 0.71 aphids per day in 2017, the situation being positive correlated with 2016 (table 2).

Table 2

Interaction between aphids and ladybugs on Rosa Blue Monday variety, in year of 2017

Geographic coordinates/variety/ hybrid analyzed	Date of observations	No average aphid colonies /5 monitored plant	No average of aphids/colony	Total number of ladybugs/5 monitored plants
lat: 46.34838 long: 21.51115	02.05.2017	1	1	0
	08.05.2017	0	0	1.2
	14.05.2017	0	0	0
	22.05.2017	1.5	1	0
	30.05.2017	1	1.5	0
Total aphids consumed daily: 0.2				

The Rosa Aida variety was by far the most frequent variety by aphids and by ladybugs. The total number of aphids consumed in 2016 reached a value of 130.75, (figure 3) of the total of 525 individuals present.

The predatory species, *Harmonia axyridis*, proved to be extremely aggressive, each predator consumed with 2.85 aphids per day. In 2017, the situation was similar to 2016. The results obtained in the monitored month (May) showed that total aphids consumed each day was 2.85 (table 3).

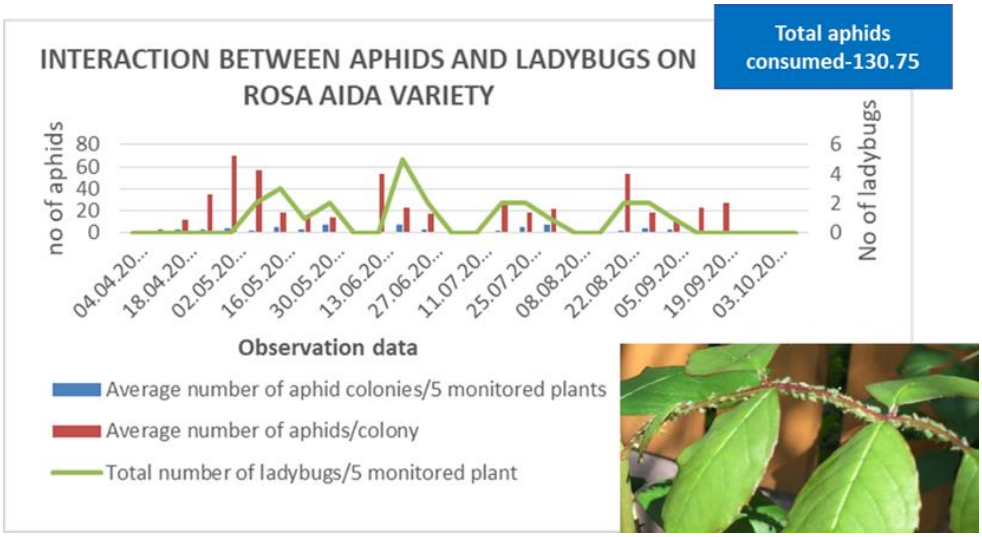

Figure 3. Interaction between aphids and ladybugs on Rosa Aida variety, in year of 2016

Table 3

Interaction between aphids and ladybugs on Rosa Aida variety, in year of 2017

Geographic coordinates/variety/ hybrid analyzed	Date of observations	No average aphid colonies /5 monitored plant	No average of aphids/colony	Total number of ladybugs/5 monitored plants
lat: 46.34838 long: 21.51115	02.05.2017	0	0	0
	08.05.2017	2.75	53.75	0
	14.05.2017	6	161	2.4
	22.05.2017	3.33	105.25	1.35
	30.05.2017	0	0	0
Total aphids consumed daily: 2.85				

CONCLUSIONS

All varieties have been frequented by aphids that have attracted predatory cucumbers. The most common variety of harmful aphids and predatory ladybugs were Rosa Aida with a value of 130.75 aphids consumed.

Among the least frequented by the ladybugs are the Rosa Blue Monday variety with 8.71 aphids consumed. But this is due to the low population of aphids. The ratio of aphids to ladybugs was different depending on the population level of both insects involved.

Asian ladybugs, *Harmonia axyridis* proved to be an effective predator, each predator individual consumed 0.2-2.85 aphids per day.

As a result, we recommend the natural exploitation of crop varieties and, implicitly, the reduction of chemical treatments.

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Part of the data presented in the paper are related to the license work of the first author (actually, student at the master) under the coordination of the co-authors teachers.

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