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Survey of aphid species and associated parasitoids in Al-Homra, Jordan

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Abstract

Five aphid species were identified in Al-Homra region, Jordan. Those aphid species are: *Aphis gossypii*, *Aphis craccivora*, *Aphis citricola*, *Myzus persicae*, and *Brachycaudus amygdalinus*. In addition, four parasitoids of the Braconidae family were identified. These parasitoids are *Aphidius colemani*, *Aphidius* sp., *Trioxes* sp., *Ephedrus persicae*, and one species *Pachyneuron aphidis* that belongs to the Aphelinidae family and one hyperparasite belongs to the Alloxistidae family. aphids parasitoid population were found belonging to *Aphidius colemani* and *Pachyneuron aphidis* on *Aphis gossypii* and *Myzus persicae* were in large number in April.

Keywords: Aphid, Parasitoid, population dynamics, Jordan

1. Introduction

Aphids (Hemiptera: Aphididae) have evolved to be the most successful exploiters of higher plants, particularly flora of the temperate regions [1, 2]. Aphids have a significant reproductive potential and produce several generations per year [3]. Consequently, their populations can reach economically important levels within a short time due to the production of Alate adults under favorable environmental conditions, In fact, Aphids can spread very quickly and can migrate to far distances [4-7].

Aphids create a group of potential permanent or occasional pests that occur in all types of terrestrial habitats in the world. When aphids are in sufficient numbers, they can cause a great damage in agroecosystems by sucking plant sap This can drain the plant of its nutrient sap, and cause a breakdown in its tissues [3, 8]. Moreover, Aphid infestation causes leaf area reduction, growth retardation, early leaf defoliation, stunted growth, and pre mature death. Some aphids have toxins in their saliva that cause plant tissues to become yellow around the feeding site, and develop deformities such as leaf-curl and galls [9]. This reduces plant growth and crops yield (Sullivan [10]. The indirect effect of Aphid infestation is changing the microflora communities on plant surfaces by depositing honey residues [11]. The other indirect effect of aphid infestation is transmitting viruses to plants. In fact, about 192 Aphid species out of 4000 known species aphid are vectors for 275 viruses [1, 2].

Aphids have many natural enemies such as, hymenopteran parasitoids that play an important role in managing aphid population number. Those parasitoids belong to two groups: *Aphelinus* and related genera (Aphelinidae) and the Aphidiinae (Braconidae: Aphidiinae) [12-14].

Forty-two species of aphids and their host were identified and recorded from 1983-1984 in Jordan [15, 16]. The aim of this study is to identify the different aphid species and the associated parasitoids in Al Homra region, in Jordan.

2. Materials and methods

2.1 Study area

The area of Station of Princess Tasneem Bent Ghazi for Agricultural Research at Al-Homra region (32°01'N-35°49'E) is about 1000 hectares. This research station is located in Jordan valley extending from Kufr Huda to King Abdullah canal with different elevations ranging from 200 m below sea level to 400m above the sea level.

The station has a unique ecosystem and vegetation. It has tropical plant species in the region around King Abdullah canal, and subtropical plant species in the northern part of the station. Fruit tree species of both high and low chilling hours requirement are grown in the station.

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2.2 Aphid survey

A survey for different Aphid species infesting different plant hosts was conducted in Al-Homra region from February to May 2015. Five leaves from the infested cultivated plants were collected and placed in paper bags. Live aphids were preserved in 90% ethyl-alcohol and 75% lactic acid 2:1 [17]. Number of aphids of each leaf sample was counted. Slides of different types of aphids were prepared. Aphid species were classified according to “aphids on the world’s crops” using aphid classification key [18].

2.3 Parasitoid survey

Different infested plant parts with different aphid species were collected from the field and placed in paper bags as described earlier. Aphid mummies of the same species and the plant sample were placed in groups. Samples were kept in ventilated plastic petri dishes until adult aphids hatched. The petri dishes were incubated inside a growth cabinet (22.5 °C, 65% relative humidity, 16:8 L: D photoperiod). Prepared slides were used to make the classification according to aphid parasitoid key [19-21].

3. Results and Discussion

3.1 Aphid survey results

Five aphid species were identified colonizing different cultivated plants in Al-Homra region; *Aphis gossypii* Glover 1877, *Aphis craccivora*, Koch 1854, *Aphis citricola* Van der Goot 1912, *Myzus persicae* Sultz 1776, and *Brachycaudus amygdalinus*. Aphid species and their corresponding host plants are shown in Table (1).

Table 1: Different cultivated plants infested with different aphid species in Al-Homra.

No.	Aphid species	Host plant
1	<i>Aphis gossypii</i>	<i>Hibiscus cannabinus</i>
		<i>Lycopersicon lycopersicum</i> (Tomato)
		<i>Citrus limon</i> (Lemon)
		<i>Solanum melongena</i> (Eggplant)
2	<i>Myzus persicae</i>	<i>Capsicum annum</i> (Pepper) <i>Solanum melongena</i> (Eggplant)
3	<i>Brachycaudus amygdalinus</i>	<i>Prunus amygdalinus</i> (Almond)
		<i>Prunus persica</i> (Peach)
4	<i>Aphis craccivora</i>	<i>Citrus limon</i> (Lemon)
5	<i>Aphis citricola</i>	<i>Citrus limon</i> (Lemon)

Three aphid species (*Aphis gossypii*, *Aphis citricola* and *Brachycaudus amygdalinus*) showed a population increase in plant sample during experiment period until they reach the peak in April. On the other hand, *Aphis craccivora* and *Myzus persicae* showed early population growth in March. This may be due to the temperature effects and host plant developmental stage. The average temperature in March and April were 19.9 °C and 23.4 °C, respectively Figure (1). In addition, some aphids species such as *Myzus persicae* and *Aphis gossypii* have wide host range, and can transfer from host plant to another host plant to reach host suitability. However, *Brachycaudus amygdalinus* and *Aphis citricola* were found in plants of short time growing season as *r* strategy of aphid population trend build up rapidly and decline after fresh twinge growth finished (22, 23).

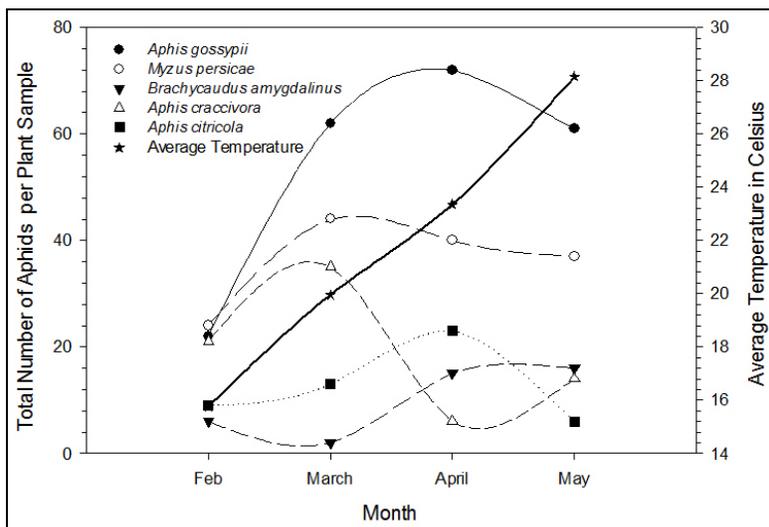


Fig 1: Aphid Population Dynamics in different host plants infested with aphid in Al-Homra and average temperature.

3.2 Parasitoid survey results

Different natural enemies associated with aphid species are recorded in the present study (Fig 2). Five different parasitoids and one hyper-parasite were identified in the collected samples. Four of these parasitoids belong to

Braconidae family; *Aphidius colemani*, *Aphidius* sp. *Trioxes* sp. *Ephedrus persicae*, and one from Aphelinidae family (*Pachyneuron aphidis*). The hyper-parasite belongs to Alloxistidae family, Table (2).

Table 2: A list of parasitoids associated with different host plants infested with aphid in Al-Homra.

No.	Parasites	Aphid host	Host Plant
1	<i>Aphidius colemani</i>	<i>M. persicae</i>	Pepper (<i>Capsicum annum</i>)
2	<i>Aphidius</i> sp.	<i>A. gossypii</i>	Straw berry (<i>Fragaria spp</i>)
3	<i>Pachyneuron aphidis</i>	<i>A. gossypii</i>	Kenaf (<i>Hibiscus cannabinus</i>)
4	<i>Trioxes</i> sp	<i>A. gossypii</i>	Pepper (<i>Capsicum annum</i>)
5	<i>Ephedrus persicae</i>	<i>M. persicae</i>	Pepper (<i>Capsicum annum</i>)
6	<i>Alloxista</i> sp.	<i>A. gossypii</i>	Eggplant (<i>Solanum melongena</i>)

Aphidius colemani and *Aphidius* sp. peaked early during the study and did not reach high population density on the cultivated host (Figure 2). This could be due to alternative host availability or to unsuccessful parasitism relationship (24). This explains the weak efficacy of these parasitoids. In addition, suitability of the aphid to the development of the parasite varies as the aphid develops agree *Aphidius sonchi* its aphid host, *Hyperomyzus lactucae* (25), and the long

delay of adult emergence, up to more than two weeks after aphid population density reach the peak. This shows synergism in natural enemy trend in the field. *Pachyneuron aphidis* showed the highest density population compared to other parasitoid population (12). The reason could be due to the hanging down position of the body during flights. Moreover, parasitoids size that is similar to aphid size helps in facilitating parasitism relationship (26).

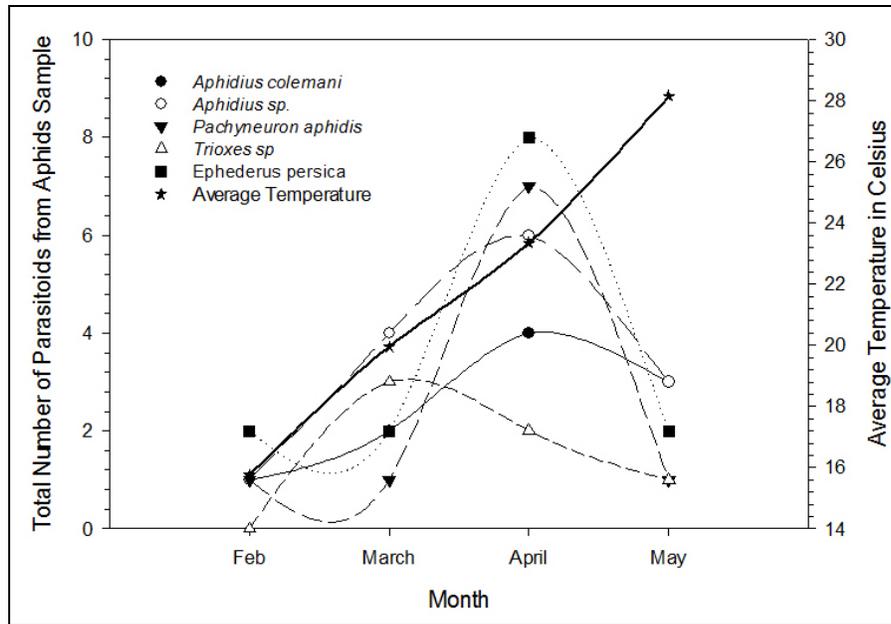


Fig 2: Aphid Parasitoid Population Dynamics in Al-Homra region and average temperature

This study is only a preliminary step in describing aphid – parasitoid complex in newly agricultural area investment with no massive application of pesticides usage. This study contributes to the biological control program against Aphids pests in this area.

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