SEASONAL ABUNDANCE OF POTATO APHIDS AND ASSOCIATED NATURAL ENEMIES

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(Manuscript received 2 July 1998)

Abstract

Studies were carried out at El-Badrashin, Giza Governorate during two successive years (1995 & 1996). Obtained results showed that infestation of potato plants by potato aphids was much higher in summer plantation than in nili plantation in both years of study. On potato summer plantation, the infestation increased and fluctuated from the beginning of the season till the end of March, then decreased rapidly until crop harvesting in May. In nili plantation, on the other hand, aphid infestation was much lower at the time of plant sprouting, it then increased with the growing season from late October to the end of harvesting time.

Statistical analysis of the obtained data showed high partial negative correlations between aphid population density and each of temperature, wind velocity, photoperiod and rainfall in summer and nili plantations in both years.

A positive correlation was found between plant age and aphid population density in the nili plantation, while negative correlation was found in summer plantation.

The predaceous and parasitic insects found associated with aphids were Coccinella undecimpunctata L.; Chrysoperla carnea Steph.; Syrphus corollae F.; Aphidoletes meridianalis Felt.; Onus albidipennis Reuter; Aphetelus sp., Spalangia sp. and an unidentified species (Chalcidae).

INTRODUCTION

The potato, \textit{Solanum tuberosum} L. is an important Solanaceous crop in many parts of the world. During the last twenty years, the potato cultivated area has steadily increased in Egypt, rendering potatoes the second most important vegetable crop after tomatoes. In the field, potato plants are attacked by several insect pests, such as aphids, white flies and potato tuber moth. Seasonal abundance of aphids was studied in different parts in world, i.e. El-Saadany et al. (1976) in Egypt, Robert (1981) in France, Zuransa et al. (1992) in Korea.
MATERIALS AND METHODS

Three feddans at El-Badrshein region, Giza Governorate, was cultivated with Nicola potato variety during the two successive years 1995 and 1996. The experimental area was divided into three equal plots. Forty days after planting, weekly samples of 100 plants were collected at random from each plot in paper bags and taken to the laboratory for examination. The number of aphids and their associated natural enemies per 100 leaves were counted and recorded. Parasitoids and predators were identified according to Richards and Davies (1977) and Mani (1982). The prevailed weather conditions as well as the plant age were recorded during sampling and their effects on the fluctuation of potato aphid populations were evaluated through the estimation of the correlation coefficient (r) according to Dowine and Heath (1985).

RESULTS AND DISCUSSION

Fluctuation of seasonal abundance of potato aphids

The three aphid species Myzus persicae Sulzer, Aphis gossypii Glover and Macrosiphum pisi Harris were collected from the experimental potato plantations. Data presented in Tables 1 & 2 show that the population of aphids attacking potato plants in summer plantation during two successive years (1995 and 1996) increased gradually until almost the last week of March (1995) or the first of April (1996), and then decreased rapidly until harvesting. In the nili plantation, during the same successive years, aphid population increased from the first week of November and continued at high density during November and December until harvesting. Tables 3 & 4. El-Saadany et al. (1976) reported that the infestation with aphids on potato plant in Kalubia Governorate was high in March and rapidly increased reaching a peak towards the end of that month, then decreased gradually until it almost disappeared during the second half of May.

It was noticed that, aphids were found in large numbers on the mature middle leaves as well as on immature upper leaves of potato plants. This is in accordance with the findings of Inaizumi (1968), but in contrast with those of Schreier (1953), who found that the density of aphids population was not related to the position of the leaves on the stalk of potato plant.

In both summer and nili plantations Myzus persicae was the most dominant
aphid species, while *Aphis gossypii* was much less abundant during the whole season. * Macrosiphum pisi*, on the other hand, was scarce in summer plantation and completely absent in the nili plantation.

Results on the relationship between aphid numbers and climatic factors in summer plantation, Tables 1 & 2, showed that there was negative correlation between the population density of aphids and each of temperature ($r = -0.6$ and -0.5), wind velocity ($r = -0.7$ and -0.2), photoperiod ($r = -0.5$ and -0.4) and rainfall ($r = -0.5$ and -0.4) in both years, respectively.

In potato nili plantation, Tables 3 & 4, a high negative correlation was found between the population density of aphids and each of temperature, wind velocity, rainfall and photoperiod ($r = -0.8$ and -0.7; -0.2 and -0.5; -0.4 and 0; -0.7 and -0.6) in both years, respectively. These results agree with that reported by Oliveira (1971) who found that the size of aphid populations was negatively correlated with the amount of rainfall and temperature, while migration of aphids was aided by wind.

On the other hand, a positive correlation was found between aphid population density and plant age of nili plantation ($r = +0.5$ and +0.6 in 1995 and 1996, respectively), but the opposite occurred in summer plantation ($r = -0.6$ and -0.6) in both year. This may be due to the interference of weather conditions which vary considerably in both seasons of plantations.

**Associated natural enemies of aphids**

Five predaceous natural enemies of aphids attacking potato crop were collected during the present study. These are *Coccinella undecimpunctata* L., *Chrysoperla carnea* Steph., *Syrphus corollae* F., *Aphidoletes meridionalis* Felt. and *Orius albidipennis* Reuter. The most abundant species was *C. undecimpunctata*, while the least abundant one was *A. meridionalis*. Three Hymenopterous endoparasitoids were also found attacking potato aphids; *Aphelinus* sp. (Aphelinidae) a common parasitoid of aphids in Egypt, *Spilomicrus* sp. (Diaeretiidae) and another unidentified species which probably belongs to the family Chalcididae. The last two hymenopterous parasitoids are recorded for the first time as a new parasitoids of aphids in Egypt. Harakdy (1975), however, recorded three different hymenopterous endoparasitoids of *Myzus persicae* in Egypt. Obycki and Touber (1985) in U.S.A., found that the most abundant predators of aphids on potatoes were, *Coccinella transversoguttata* Richardson, *Coleomegilla* sp., *Hippodamia convergens*, *H. tredecimpunctata* and
H. glacialis and three species of chrysopidae. They also found two parasitoids, Aphidius sp. and Praon sp.

The population of detected natural enemies of aphids in the present study increased gradually with aphid infestation and fluctuated due to changes in weather conditions and fluctuations in aphids population during both summer and nili plantations, Table 5.
Table 1. Seasonal abundance of aphids in summer plantation in El-Badrshin, Giza, during 1995 together with the prevailing weather conditions and plant age.

<table>
<thead>
<tr>
<th>Date of collection</th>
<th>Aphids/100 leaves of potato</th>
<th>Temperature (°C)</th>
<th>RH (%)</th>
<th>Wind velocity at 2m (m/sec)</th>
<th>Amount of rainfall (mm)</th>
<th>Photo period (h)</th>
<th>Plant age days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Myzus persica</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aphis gossypii</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Macrosiphum pisi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>Max</td>
</tr>
<tr>
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<td>475</td>
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<td>10</td>
<td>0</td>
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<td>1550</td>
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</tr>
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<td>19</td>
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Correlation coefficient (r) = -0.6

Note: Weather information were obtained from the General meteorological Authority.
Table 2. Seasonal abundance of aphids in summer plantation in El-Badrshin, Giza, during 1996 together with the prevailing weather conditions and plant age.

<table>
<thead>
<tr>
<th>Date of collection</th>
<th>Aphids/100 leaves of potato</th>
<th>Temperature (°C)</th>
<th>Wind velocity at 2m (m/sec)</th>
<th>Amount of rainfall (mm)</th>
<th>Photo period (h)</th>
<th>Plant age days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Myzus persica</td>
<td>Aphis gossypii</td>
<td>Macrosiphum persica</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
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<td>-</td>
<td>0</td>
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<td>5.1</td>
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<td>08-05</td>
<td>6</td>
<td>100</td>
<td>0</td>
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<td>-</td>
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</table>

Correlation coefficient (r) = -0.5 0.3 -0.2 -0.2 -0.4 -0.4

Note: Weather information were obtained from the General Meteorological Authority.
Table 3. Seasonal abundance of aphids in nill plantation in El-Badreshin, Giza, during 1995 together with the prevailing weather conditions and plant age.

<table>
<thead>
<tr>
<th>Date of collection</th>
<th>Aphids/100 leaves of potato</th>
<th>Temperature (°C)</th>
<th>Wind velocity at 2m (m/sec)</th>
<th>Amount of rainfall (mm)</th>
<th>Photo period (h)</th>
<th>Plant age days</th>
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<tbody>
<tr>
<td></td>
<td>Myzus persica</td>
<td>Aphis gossypii</td>
<td>Macrosiphum pilii</td>
<td>Total</td>
<td>Max.</td>
<td>Min.</td>
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<tr>
<td>21-10</td>
<td>614 91.2</td>
<td>59 8.8</td>
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<td>673</td>
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<td>17.7</td>
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Correlation coefficient (r) = -0.8, 0.7, -0.2, -0.4, -0.7, 0.5

Note: Weather information were obtained from the General Meteorological Authority.
Table 4. Seasonal abundance of aphids in nili plantation in El-Badrashin, Giza, during 1996 together with the prevailing weather conditions and plant age.

<table>
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<th>Date of collection</th>
<th>Aphids/100 leaves of potato</th>
<th>Temperature (°C)</th>
<th>R.H %</th>
<th>Wind velocity at 2m (m/sec)</th>
<th>Amount of rainfall (mm)</th>
<th>Photo period (h)</th>
<th>Plant age days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Aphid gossypii</td>
<td>Macrosiphum psalenes</td>
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<td>Min.</td>
<td>Avg.</td>
<td></td>
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Correlation coefficient (r): -0.7, 0.5, -0.5, -0.6, 0.5

Note: Weather information were obtained from the General Meteorological Authority.
Table 5. Relative abundance of aphids and their associated natural enemies collected from potato plants at El-Badrshen, Giza, during two successive plantation seasons (1995 & 1996).

<table>
<thead>
<tr>
<th>Aphids and their natural enemies</th>
<th>Average number/100 leaves of potato</th>
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<tr>
<td></td>
<td>1995</td>
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<td></td>
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</tr>
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<td>1- Aphids</td>
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<tr>
<td>2- Natural enemies</td>
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</tr>
<tr>
<td>i- Predators:</td>
<td></td>
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<tr>
<td>Chrysopa carnea</td>
<td>1.6</td>
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<tr>
<td>Syrphus corollar</td>
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<td>Aphidoletes meridionalis</td>
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<td>Orius albidipennis II-Parasitids</td>
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<tr>
<td>Hymenopterous Parasitids</td>
<td>8.2</td>
</tr>
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</table>
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الكثافة الموسمية لحشرة من البطاطس والاعدا الطبيعية للساحبة

هادي محمد عبد الفتاح، محمد فوزي حيدر، هاشم علي عبد الرحمن.

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قسم علم الحشرات - كلية العلوم - جامعة عين شمس - القاهرة.

2 معهد بحوث وقاية النباتات - مركز البحوث الزراعية، الدقي، الجيزة.

تمت هذه الدراسة في منطقة البدرشين، محافظة الجيزة، وأوضحت النتائج أن أعداد نباتات البطاطس بلغت عالية في الزراعة الصيفية منها في الزراعة الخريفية خلال ستة دراسة (1995 - 1997). وتقدمت الألمازات في الزراعة الصيفية ونادراً ما أثرت كثافة الفراشات من بداية الموسم حتى نهاية شهر مايو. ثم ناقشت في أطسا مسمى الصاعد في مايو. أما في الزراعة الخريفية فقد بدأت الإصابة قبلة على البذور التي محاولة الزراعة، ثم أثرت خلال الموسم الزراعي

اعتباراً من أوائل أكتوبر وحتى نهاية موسم الصاعد.

وقد ثبت التحليل البيئي للمحاولة وجود علاقة جزيئياً سلب بين كثافة النبات وبين كل من درجات الحرارة وسرعة الرياح وفترة الإضاءة وكمية الأمطار في كل من الزراعة الصيفية والخريفية وذلك خلال سنتين دراسة. كما كان الارتباط الجيني موجباً بين كثافة النبات وعمر النبات في الزراعة الخريفية، بينما كان الارتباط سلبياً في الزراعة الصيفية.

وجدت الفحوصات والتمثيلات الصيفية للساحبة مصاحبة للنبتة التي يسبب البطاطس في النقل: أبو العيد ذو الأحادية، أبو العيد ذو مهاجمة، أسود، نبات السكر، نبات السكر، نبات السكري، نبات للأوربي، نبات من جنس القلائم، نوع من جنس سيلفيوس، نوع من جنس سيلفيوس، ومنطق من عائلة (كالسبيدي) غير معروف حالياً.