

Influence of Nitrogen and Potassium Fertilization Levels on the Population Density of the Bird Cherry – Oat Aphid, *Rhopalosiphum padi* Linnaeus (Homoptera: Aphididae).

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ABSTRACT

The experiments were carried out in the experimental farm of Sakha Agricultural Research Station, Kafr El – Sheikh Government during two successive seasons, 2013/14 and 2014/15. This study was carried out to determine the relationship between rates of N and K Fertilization on the average number of the bird cherry – oat aphid, *Rhopalosiphum padi* attacking wheat. The obtained results showed that, *R. padi* population increased significantly by increasing the rate of nitrogen fertilizer (Nitrates 33.5%), the average numbers of *R. padi* on wheat during the two successive seasons. The highest average number of *R. padi* was recorded on nitrogen rates of 200 Kg with an average of 342.5 ± 95.7 and 236.2 ± 56.9 indiv. respectively. While, the lowest average number of aphid was recorded on nitrogen rates of 0 Kg with an average of 259.4 ± 79.4 and 179.7 ± 47.6 indiv. respectively. Statistical analysis during the two seasons indicated significant differences between the aphids' and N rates on wheat. The results indicated that increasing potassium fertilization level from 25 to 75 Kg /fed. Caused a significantly decreasing in the average number of *R. padi* during the first season while the second season was in significantly. the highest average number of *R. padi* was recorded on the first level of potassium fertilization with an average number of 213.2 ± 64.7 and 170.8 ± 52.1 indiv. respectively. While, the lowest average number of aphid was recorded on the four level of potassium with an average of 154.1 ± 48.3 and 123.1 ± 36.8 indiv. respectively.

Keywords: Aphids, Fertilization, Wheat.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most important grain crop all over the world. (Anwar et al. 2009). It is the main winter cereal crop which gained a particular importance for human consumption According to the Food and Agriculture Organization of the United Nations (FAO 2012). Aphid species are considered as one of the most serious pests attacking wheat causing damage to the plants either directly by sucking juice or indirectly as a vector of diseases, (Zia, et al. 2010). Yield losses due to infestation with aphids differed from 7.5 to 18.7% (El- Rawy, 2013).

Fertilization is an important agronomic strategy used extensively to increase crop yield. Although the effects of fertilizers are extensively investigated in wheat, there is little information to assess the effect of fertilizer application on wheat. While, the population density and the average number of the main aphid species especially *R. padi*, affected significantly with different rates of fertilizations (Youssef, 2006 and Al Habashy, 2008). On the other hand, from the available literature some authors have studied the relationship between nitrogen fertilizer level and aphids' infestation and increasing nitrogen level causes increase in the infestation rate with this insect pest (Draz et al. 2013). From the essential components of pest management programs are fertilization levels the nitrogen as well as potassium. (Bi, et al. 2003; El-Zahi, et al. 2012 and Saleh, et al. 2016).

The present study aimed to throw the light on the effect of different nitrogen and potassium levels on the population density and average numbers of the main aphid species to serve as a basis for the use of this information's in integrate pest management programs.

MATERIALS AND METHODS

The experiments were carried out in the experimental farm of Sakha Agricultural Research

Station, Kafr El – Sheikh Government during two successive seasons, 2013/14 and 2014/15. This study was carried out to determine the relationship between rates of NPK Fertilization on the average number of *R. padi* on wheat crop. (variety Sids12). Seeds for each were sown in the third planting date, (Beginning of December) for the two successive seasons and the experimental area was about 1600m². The area was divided to 32 replicates, each replicate was about 50 m² and the replicates arranged in Completely Randomized Design, and for each fertilization treatment 4 replicates were used.

The rates of nutrient elements were tested as follow :

- To evaluate the effect of nitrogen fertilization on *R. padi*, four rates of nitrogen (Urea nitrate 33.5%) 0, 90, 150 and 200 Kg per Fadden were used and the rate of phosphorus (ph₂o₅ 15%) and the rate of Potassium (K₂O 24%) was applied.
- To evaluate the effect of potassium fertilization on *R. padi*, four rates of (potassium sulphate 24% k₂o) 0, 25, 50 and 75 Kg per Fadden were used and the rate of phosphorus (ph₂O₅ 15%) and the rate of nitrogen (N 33.5%) was applied.
- The quantity of fertilizers was added to plants at three equal times for nitrogen, the first of the quantity was added with plantation, the second one with the first irrigation and the third rate with the second irrigation. While phosphate and potassium were used all quantity with plantation. Pesticides treatment was avoided completely. The weekly examination was started from adding NPK fertilizer and continued until harvest. During two successive seasons number of *R. padi* was counted on 20 plants.

RESULTS AND DISCUSSION

Effect of nitrogen:

The main purpose of this study was to determine the relationship between fertilization of wheat plants by nitrogen rates (0, 90, 150 and 200 Kg) and constant rate

of phosphorus fertilization P₂O₅ 15% (200 Kg /fed.) on *R. padi* wheat plants during the two successive seasons. Data represented in Fig. (2) Showed that the total numbers and their ratios of *R. padi*, during the two seasons. Nitrogen rates of 200 Kg attracted the highest numbers and ratio of *R. padi* during the two seasons and represented by 5822 (28%) and 4016indiv.(28%) respectively. While, Nitrogen rates of 0 Kg attracted the lowest number and ratio of *R. padi* during the two seasons and represented by 4410(21%) and 3055indiv.(22%) respectively.

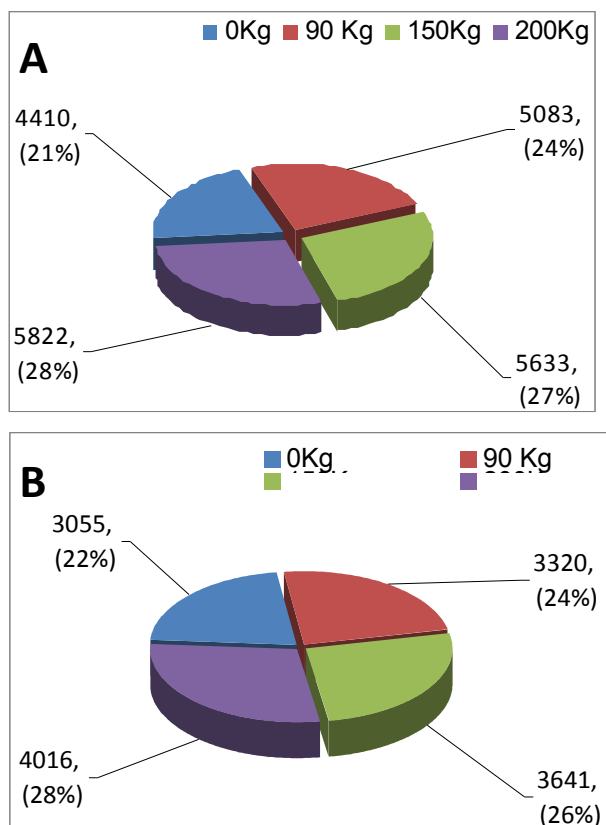


Fig 1. Total number and their ratios of *R. padi* on different rates of N during the two successive seasons 2013/14 (A) and 2014/15 (B) at Kafr El-Sheikh Governorate.

Data presented in Table (1) showed the average numbers of *R. padi* on wheat during the two seasons. The highest average number of *R. padi* was recorded on nitrogen rates of 200 Kg with an average of 342.5 ± 95.7 and 236.2 ± 56.9 indiv. respectively. While, the lowest average number of aphid was recorded on nitrogen rates of 0 Kg with an average of 259.4 ± 79.4 and 179.7 ± 47.6 indiv. respectively.

As a conclusion, data presented in table (1) and illustrated in fig. (1) Showed that *R. padi* population increased significantly by increasing the rate of nitrogen fertilizer (Nitrate 33.5%). The seasonal numbers of aphid were 5822 and 4016 indiv. with N fertilization at 200 kg of nitrogen fertilizer by adding nitrogen fertilizer at the rates of 0.90, 150 and 200 Kg/feddan, respectively. Statistical analysis during the two seasons indicated significant differences between the aphids' and N rates on wheat plant.

These results are in agreement with those of Nevo and Coll., (2001). El- Zahi, et al., (2012). Draz, et al. (2013). The mentioned that, the effect of different rates of Nitrogen (N) fertilizer (80, 120, 160 and 200 N units/feddan) on population density of piercing sucking insect pests was also concerned on tomato plants. Rates of nitrogen fertilizer showed high significant effect on populations' densities for each of *B. tabaci* nymphs, *E. decipiens* and *T. tabaci*. Where, rates of 80 and 120 units of nitrogen fertilizer showed lowest level of population densities for those pests. On contrary rates of nitrogen fertilization hadn't any significant effect on population's density of *A. gossypii*. So it recommended not increasing rates of N fertilization to levels higher than 120 unite/feddan at tomato fields. Khorchid (2013) showed that the aphids' population (*R. padi* and *S. graminum*) on Giza 168 wheat variety was more susceptible to aphid infestation with fertilization at 150 units of nitrogen fertilizer. On the other hand, the wheat plants which were treated by 90 units of nitrogen fertilizer, the infestation of aphids was the lowest value.

Table 1. Influence of rates of N on the average numbers of *R. padi* on wheat plants during 2013/14 and 2014/15 seasons .

Rates of N.	2013/14 season	2014/15 season	Av.±SE
0Kg	259.4 ± 79.4c	179.7 ± 47.6b	219.6 ± 63.5
90Kg	299.0 ± 90.9b	195.3 ± 50.8a	247.2 ± 70.9
150Kg	331.4 ± 98.2a	214.2 ± 55.1a	272.8 ± 76.7
200Kg	342.5 ± 95.7a	236.2 ± 56.9a	289.4 ± 76.3
LSD at 5%	6.4	4.3	

In a column, means followed by the same letter are not significantly different at the 5% level

Effect of Potassium:

The main purpose of this study was to determine the relationship between rates of K fertilization on *R. padi* on wheat plants by potassium sulphate 24% rates (0, 25, 50 and 75 Kg) and constant rates of nitrogen fertilizer (150 Kg/ fed.) and phosphorus (200 Kg/fed.) wheat plants during the two seasons. Data represented in Fig.(2) Showed that the total numbers and their ratios of *R. padi*, The highest numbers and ratio of *R. padi* during the two successive seasons in first level and represented by 3624(28%) and 2904 indiv.(28%) respectively. While, the lowest number and ratio of *R. padi* in the four level of potassium and represented by 2620(21%) and 2093 indiv.(20%) respectively.

Data presented in Table (2) showed the average numbers of *R. padi* on wheat during the two successive seasons. According to the highest average number of *R. padi* was recorded on the first level of potassium fertilization with an average number of 213.2 ± 64.7 and 170.8 ± 52.1 indiv. respectively.

Table 2. Influence of rates of K on the average numbers of *R. padi* on wheat plants during 2013/14 and 2014/15 seasons.

Rates of K.	2013/14 season	2014/15 season	Av.±SE
0Kg	213.2 ± 64.7a	170.8 ± 52.1a	192.0 ± 58.4
25Kg	201.4 ± 62.8 a	169.2 ± 52.1a	185.3 ± 57.5
50Kg	179.4 ± 55.5a	153.6 ± 46.9a	166.5 ± 51.2
75Kg	154.1 ± 48.3b	123.1 ± 36.8a	138.6 ± 42.6
LSD at 5%	5.8	5.3	

In a column, means followed by the same letter are not significantly different at the 5% level

While, the lowest average number of aphid was recorded on the four level of potassium with an average of 154.1 ± 48.3 and 123.1 ± 36.8 indiv. respectively.

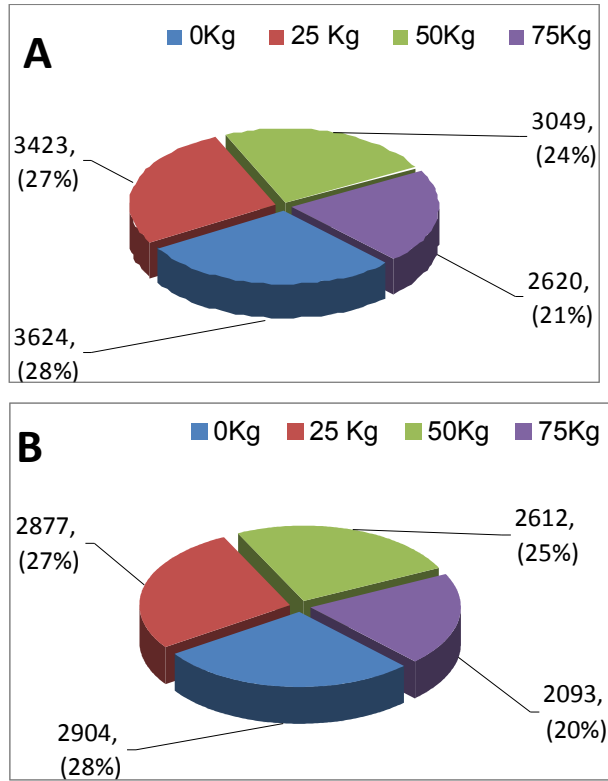


Fig 2. Total number and their ratios of *R. padi* on different rates of K during the two successive seasons 2013/14 (A) and 2014/15 (B) at Kafr El-Sheikh Governorate.

As a conclusion, the highest mean numbers of insects per sample occurred with control (without potassium fertilization) whereas the lowest population density of these insects recorded with 75 kg of potassium /feddan increasing potassium fertilization level from 25 to 75 Kg /fed. Caused a significantly decreasing in the average number of *R. padi* during the first season while the second season was in significantly.

These results are in agreement with those of (Hegab, 2001; Youseef, 2006; El- Gindy, 2002; Al Habashy, 2008 and Saleh, et al. 2016). They mentioned that effect of different rates of N & K fertilizations on wheat plants on population density of aphid insects on wheat plants the highest mean numbers of insects per sample occurred with control (without potassium

fertilization) whereas the lowest population density of these insects recorded with 36 unit of potassium /feddan

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تأثير مستويات التسميد النتروجيني و البوتاسي على الكثافة العددية لحشرة من الشوفان سمير صالح عوض الله¹، سعد بسيوني بليح² و محسنه رزق خليل منصور²

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أجريت التجارب الحالية في المزرعة البحثية بمحطة البحوث الزراعية بسخا محافظة كفر الشيخ وذلك خلال موسمي الدراسة 2014/2013 و 2015 /2014 وتمت هذه الدراسة لتحديد العلاقة بين مستويات التسميد النتروجيني والبوتاسي والمتوسطات العددية لحشرة من الشوفان على القمح. أظهرت النتائج ارتفاعاً معنوياً في تعداد الإصابة بحشرة من الشوفان بزيادة معدلات التسميد النتروجيني (نيتروجين 33.5%) وكان أعلى متوسط تعداد لأفراد المن في المستوى الرابع للتسميد النتروجيني (200 كجم/فدان) وسجل بالمتوسطات 342.5 ± 95.7, 236.2 ± 56.9 فرد بينما سجلت أقل المتوسطات في المستوى الأول 259.4 ± 79.4 و 179.7 ± 47.6 فرد على التوالي. وبينت الاحصائيات معنوية عالية بين تعداد المن بعد تطبيق المعدلات المختبرة من التسميد على نباتات القمح. بينت النتائج أن زيادة مستويات التسميد البوتاسي من 25 كجم إلى 75 كجم/فدان تسبب في نقص معنوي في متوسط تعداد المن وذلك خلال موسمي الدراسة. و كان أعلى متوسط تعداد لحشرة من الشوفان مع المستوى الأول للتسميد البوتاسي و سجل بالمتوسطات 213.2 ± 64.7, 170.8 ± 52.1 فرد على التوالي. بينما سجلت أقل المتوسطات العددية في المستوى الرابع من التسميد البوتاسي وهي على التوالي 154.1 ± 48.3, 123.1 ± 36.8. وقد بينت الاحصائيات معنوية في الموسم الأول بينما الموسم الثاني لا توجد معنوية بين معدلات التسميد البوتاسي المختبرة.