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SUSCEPTIBILITY OF SQUASH PLANTED IN NEWLY RECLAIMED DESERT LAND TO INFESTATION BY APHID SPECIES AND THEIR CONTROL BY THE USE OF SAFE COMPOUNDS

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Field studies were carried out on squash plants cultivated in sandy soil in newly reclaimed land at Regwa farm (62 km. north Cairo) during the winter and the summer plantations (October, 2001 and April, 2002, respectively). Results indicated that squash plants in winter plantation were more susceptible to aphids infestation than those sown in summer. *Aphis gossypii* was found to be the most dominant and abundant aphid species on squash plants, being 56.38 and 62.10 % for dominance degrees and 31.25 and 17.60 % for abundance degrees in winter and summer plantations, respectively. The safe materials Kz oil, Pirimor, Biovar and Biofly were evaluated against aphids in squash fields using two techniques. In the first technique, the populations of alate aphids were counted by green water pan during the period from plant emergence till fruit ripening. However, in the second technique, direct counts of aphids on the squash leaves were made during the growing period of the plants. The maximum reduction in aphid population and the highest squash yield were obtained after using transparent Biovar or transparent Biofly. Therefore, it is advisable to use transparent Biovar or transparent Biofly for controlling aphids in squash fields. Significant negative correlation was found between the accumulated mean number of aphids and the yield of squash fruits.

Keywords: dominance, abundance, aphid species, squash plants, control.

Squash crops cultivated under open field or plastic house conditions are subjected to attack with several insect pests such as aphids, thrips, whiteflies,...etc. (Basky, 1986; Adlerz, 1987; Giustina *et al.*, 1989; Nasser, 1999; Mahran, 2001). Therefore, it is important to protect these crops from the infestation with these pests. Many aphid cause feeding damage on squash plants and also transmit many viral diseases to the plants in newly reclaimed

land (Adlerz, 1987; Basky and Nasser, 1989 and Bansal *et al.*, 1991). The aim of the present study is to calculate the dominance and abundance in aphid species that infect squash plants, cultivated in sandy soil newly reclaimed lands. Moreover, certain safe compounds were evaluated to determine their efficiency in controlling aphid infestation to select the more active ones for controlling these insect pests.

MATERIALS AND METHODS

Experiments were conducted in newly reclaimed land of sandy soil located at Regwa area (62 km north Cairo), during two seasons (2001 and 2002). Squash seeds *Cucurbita pepo* L. var. 'Balady' were cultivated an area of about half feddan in the shape of rectangle 30×70 meters on two different dates; in October 9, 2001 and April 21, 2002. The following chemical compounds were used at the recommended doses: KZ oil (95 % EC) at the rate of 1.5 % and Pirimor (50 % w.p.) at the rate of 75 cm^3 /100 liter of water, Biovar and Biofly (the commercial biofungicide) was used as active bioagent of the fungus *Beauveria bassiana* (Bals.) Vuill..at rate of 100-ml./100 liter of distilled water (one ml contains $30X10^6$ conidia) for Biofly commercially produced by El-Naser Co. but Biovar at rate of 200 gm./100 liter of distilled water (one mg contains $32X10^6$ conidia) provided by Plant Protection Institute, Ministry of Agric. Dokky, Cairo. Application of different treatments were started 20 days after seed cultivation when each seedling was beared at least four leaves. Spraying each tested the chemical compounds and fungicides using hand sprayer provided with one nozzle

Collection of aphids

This experiment was carried out in half feddan. The usual agricultural practices for cultivation of squash were followed without the use of chemical pesticidal treatments to allow natural infestation of aphids. Plants were examined visually twice a week for aphid colonies. The number of infested plants as well as number of aphids on each leaf were counted and recorded. Aphids of each leaf were placed in glass vial containing 70 % ethanol and transferred to the laboratory entomology at Desert Research Center. Whole mount on glass slides were prepared and aphid species identified and count by microscopic examination according to Habib and El-Kady (1961).

The dominance degree for the captured aphid species were calculated as a percentage according to the following formation equation:

$$D\ (\%) = \frac{t}{T} \times 100$$

Where,

D : Dominance degree (%)

t : Total number of each aphid species during the experimental period.

T : Total number of determined aphid species during the same period.

Abundance degree for aphid species, collected during the sampling period, was calculated as a percentage according to the following equation:

$$A\ (\%) = \frac{n}{N} \times 100$$

Where,

A : Abundance degree (%)

n : Total number of samples in which the desired aphid species appeared.

N: Total number of samples taken all over the growing season of squash plants.

Sampling aphid on plant

Two counting techniques of aphids were used in the following experiment. The first technique was conducted by counting the alate aphids by green water pan during the period from plant emergence until fruit ripening and the obtained alate are tabulated in table (2). As recommended by Halbert *et al.,* (1986) alate aphids were caught by means of plastic green water pans, measuring 25 cm in diameter and 10 cm in depth. All pans were set at 50 cm above ground. The traps were filled with water and a few drops of liquid detergent to reduce the surface tension of the water and mixture with either Kz oil, Pirimor, Biovar and Biofly, the traps were changed every five days. Each treatment was replicated 3 times by using 24 pans, including untreated control containing water and few drops of liquid detergent. Alate aphids were collected weekly from the water pans and whole mount were prepared for microscopic identification of the aphid species. The accumulated counts of aphids were recorded. In the second technique, direct counts of aphids on the squash leaves were made during the growing period of the plants and the obtained data are recorded. Sampling flying insects with traps can give two precise, quantitative pieces of information; the numbers in the air and time of flight. In both experiments, seven treatments were carried out to minimize the infestation level of aphids. The weight of squash crops were measured and recorded.

The obtained data were subjected to the analysis of variance (F test) as described by Snedecor and Cochran (1970).

RESULTS AND DISCCUSION

Data given in table (1) shows that mean total number of 346.78 aphids per squash leaf were recorded when plants were cultivated in winter plantation. When plants were sown in April 2002 (summer plantation), the

number was 82.53 aphids per squash leaf, with highly significant difference between both means (t = 0.9868). This means that the winter plantation was more susceptible to aphid infestation than the summer one. These results are in agreement with those reported by Furuta (1988) who found that to aphid born in winter had longer lifespan and smaller rate of increase and deposited more nymphs than those in spring.

TABLE (1). Mean number of different aphids species (per leaf) infesting squash plants

Aphid species	Planting dates					
	October 9,2001			April 21, 2002		
	No. Caught*	Dominance %	Abundance** %	No. Caught*	Dominance %	Abundance** %
Aphis gossypii Glover	195.50± 3.35	56.38	31.25	51.25 ± 8.46	62.10	17.60
Rhopalosiphum maidis Fitch	62.20 ± 9.22	17.94	18.75	0.33 ± 0.01	0.400	7.25
Schizaphis Graminum Rondani	54.15 ± 8.34	15.62	17.60	0.21 ± 0.02	0.254	6.10
Aphis craccivora *Koch*	20.25 ± 2.56	5.84	12.80	10.14 ± 0.39	12.286	11.35
Aphis nasturtii Kalt	2.10 ± 0.12	0.61	6.25	4.30 ± 0.25	5.210	6.25
Myzus persicae (Sulzer)	3.33 ± 0.11	0.96	6.25	12.55 ± 0.53	15.207	10.20
Unidentified species	9.25 ± 0.42	2.67	11.85	3.75 ± 0.06	4.544	6.75
Total	346.78	100.00		82.53	100.00	
F. value	32.17			24.22		
L.S.D.	8.82			4.46		

* Means ± S.E

** 25 samples were taken during the experiment

Dominance and abundance of aphid species

From table (1), it is observed that *Aphis gossypii* was the most dominant species, which encountered 56.38 and 62.10 % of the total number of collected aphids. Another six species were identified as well as unidentified species during winter and summer plantation, respectively.

TABLE (2). Means ±S.e for accumulated number of alate aphids collected by green water pan (25 cm in diameter and 10 cm in depth) from the time of seedling emergence until fruit ripening.

Treatments	Planting dates			
	October 9, 2001		April 21, 2002	
	No. Caught	Reduction %	No. Caught	Reduction %
KZ oil	254.67 ±17.15	28.50	54.55 ± 11.57	50.89
Bio-var	246.20 ±18.54	30.88	62.22 ± 13.13	43.98
Transparent Bio-var	100.06 ± 9.68	71.91	19.57 ± 2.19	82.38
Pirimor	234.42 ±16.65	34.19	66.68 ± 12.15	39.97
Bio-fly	264.88 ±26.17	25.64	69.83 ± 16.59	37.13
Transparent Bio-fly	103.17 ±10.15	71.04	21.77 ± 4.85	80.40
Black strips*	185.36 ±11.96	47.96	54.02 ± 7.19	51.36
Untreated check	356.19 ±32.15		111.07 ±12.58	
F. Value	21.27**		14.95**	
L.S.D. at 0.05	50.13		16.87	

* Plastic board rectangle of 30 × 20 cm.

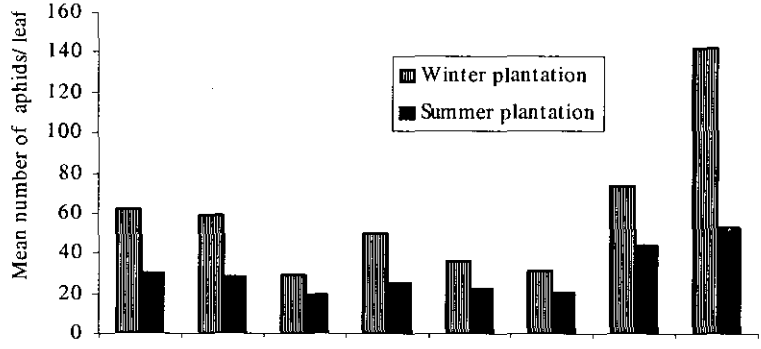

Fig. (1). Mean numbers of Aphids on squash plant treated with different materials during winter and summer plantation

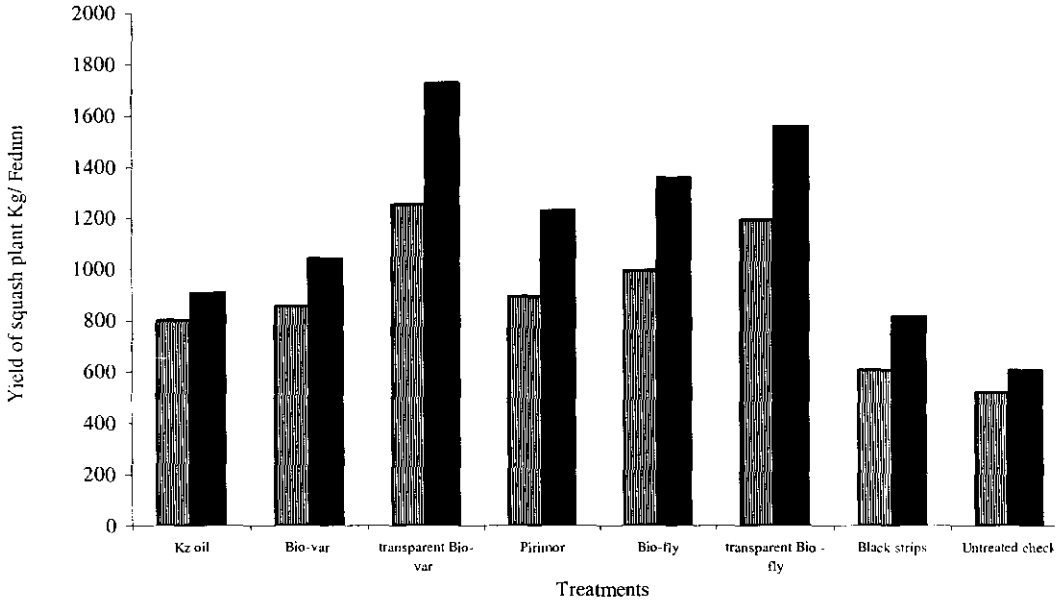

Fig. (2). The mean yield of squash plant during winter and summer plantation.

In summer plantation excluding *A. gossypii*, the dominance of other aphid species ranged between 0.25 and 15.21%. The same trend could be applied for the abundance of these aphid species. Therefore, the present investigation will be concentrated on the winter plantation during which the high population density of aphids was obtained. The second dominant aphid species *Rhopalosiphum maidis*, Fitch was 17.94%, followed by *Schizaphis graminum*, Rondani (15.62%). The highest abundance species 31.25% was recorded for *Aphis gossypii* Glover followed by *Rhopalosiphum maidis*, Fitch (18.75 %), *Schizaphis graminum* (17.60 %) , *Aphis craccivora* Koch (12.80%) and *Aphis nastrutii* Kalt and *Myzus persicae*, Sulzer (6.25 %).

By applying the L.S.D. value, the accumulated number of caught aphids during winter season could be statistically arranged into the following descending orders according to the abundance of the aphid species:

-The first group: *A. gossypii* (195.50 individuals / squash leaf).

-The second group: *R. maidis* and *S. graminum* (62.20 and 54.15/ squash leaf, respectively.

-The third group: *A. craccivora* (20.25 individuals / squash leaf)

-The fourth group: *A. nasturii* and *M. persicae* (2.10 and 3.33 individuals/ squash leaf, respectively.

For summer season the following three statistically groups were obtained, arranged in descending orders:

-The first group: *A. gossypii* (51.25 individuals / squash leaf)

-The second group: *A. craccivora* and *M. persicae* (10.14 and 12.55/ individuals/ squash leaf, respectively.

-The third group: *R. maidis, S.graminum* and *A. nasturtii* (0.33, 0.21 and 4.30 individuals / squash leaf, respectively).

This agrees with the results obtained by Labbone *et al.* (1982) and Basky and Nasser (1989) who calculated the abundance of important species in flight, their contribution to virus transmission and their relative abundance as vector virus. Leclant (1978) suggested that the number of alate aphids did not reflect the extent of virus transmission but rather the flight behaviour of aphids.

Population Density of Aphids on Squash Plants Treated

The first experiment

The accumulated numbers of alate aphids per green water pan (Table 2) in untreated plots reached a mean of 356.19 aphids/ green water pans during the growing period of the plants. This number was reduced to 100.06 and 103.17 aphids/ green water pan for winter plantation, and 19.57 and 21.77 for summer plantation after using transparent Biovar and transparent Biofly, respectively. By applying the L.S.D. values the number of caught aphids during winter plantation could be arranged statistically into the following three descending groups according to the types of materials used for controlling this insect pests.

-First group: Transparent Biovar and transparent Biofly (100.06 and 103.17 individual/ green water pan, respectively).

-Second group: Pirimor and black strips (234.42 and 185.36 individual/ green water pan, respectively).

-Third group: Pirimor, KZ oil, Biovar and Biofly (234.42- 254.67, 246.20 and 264.88 aphids/ green water pan, respectively).

During the summer season, the following two descending orders were obtained: -First group: Transparent Biovar and transparent Biofly (19.57 and 21.77 aphids / green water pan, respectively).

-Second group: KZ oil, black strips, Biovar, Pirimor and Biofly (54.55, 54.02, 62.22, 66.68 and 69.83 individuals/ green water pan, respectively). The L.S.D. values emphasize the obtained results.

From the fore–mentioned data, it could be concluded that transparent Biovar and transparent Biofly were the more effective in reducing aphid infestation as compound to KZ oil, black strips, Pirimor and Biofly in squash fields. Transparent Biovar and transparent Biofly reduced the population of

aphids by 71.92 % in the winter season and by 82.38 % in the summer season (Table 2).

The second experiment

The aphid population were reduced (Table 3) by 79, 78 and 75 % in the transparent Biovar, transparent Biofly and Biofly treated plots, respectively when compared to the untreated control during winter plantation. This result could be applied for the population of aphids on squash plants treated with different materials during the summer plantation. The highest number of aphids (19.18, 21.05 and 22.19 individuals/ leaf) was obtained when plots were treated with transparent Biovar, transparent Biofly and Biofly, respectively with no significant difference between these means. The same trend of the aphid population on squash plants as being affected by the different materials could be found in the first experiment. This ensures the high pesticidal action of transparent Biovar or transparent Biofly for controlling aphids on squash plants. Loebnstein *et al.* (1984) stated that the transmission of stylet-borne viruses could be impeded when aphid stylets came into contact with oils. Nasser (1999) mentioned that oil used to control the cucurbit viruses and virus spread in these crops was significantly reduced when oil sprays were applied as protectants.

Squash yield from plants treated with different materials

In the second experiment, the squash yield (Kg/feddan) from plants treated with materials was calculated. The obtained results are recorded in table (3). The data clearly show that in winter plantation the highest yield was obtained after using transparent Biovar (1253.00 Kg /feddan) and Transparent Biofly (1191.25 Kg/feddan) with no significant difference between both means.

In the summer plantation, the highest squash yield (1725.50 Kg /feddan) and 1557.25 / Kg /feddan) was obtained when transparent Biovar and transparent Biofly were used for controlling aphids on squash plants. The difference between both means proved to be statically insignificant. These results were in agreement with those obtained by Hammond and Fedigo (1982) Kieckhefer and Kantack (1986) and Mansour *et al.* (1994) mentioned that ability to determine the relationship between yield loss and level of aphid numbers under natural.

Generally, from the fore mentioned data, it obvious that *A. gossypii* was the most dominant and abundant species on squash plants. On the other hand, the population of aphids was higher in winter plantation than in summer one this agrees with the results of Mahran (2001) on cucumber plants at Assiut. According to Nasser and Basky (1990), crop infection by virus diseases depends not only on the number and seasonal occurrence of vector aphid but also on the proportion of individuals carring the virus and being able to inoculate and disseminate it after landing on the crop. A significant positive correlation coefficient was observed between the main

vectors of Cucumber Mosaic Virus by *A. gossypii*, *A. craccivora* and *M. persicae* and the infection of the plants in cucumber fields. The correlation in total aphid collection was not significant. Organ phosphorus insecticides did not kill aphids quickly enough to prevent within –crop spread of polyviruses (Jayasena and Randles 1984). Moreover, insecticides treatment has often resulted in increased local spread of polyviruses, an adverse effect possibly due to destruction of predators and increased movement of disturbed and irritated aphids immediately before death (Shukla, 1994). Abou-Elhagag, (1995) found that Actelic and Primor effectiveness when used two-spray programme (September and October) exhibited an excellent control against banana aphid population.

In the present study, for controlling this insect pest on squash plants, it is advisable to use transparent Biovar or transparent Biofly to obtain good results and highest yield. Significant negative correlation was found between the accumulated mean number of aphids and the yield of squash fruits.

TABLE (3). Accumulative number of aphids per squash leaf in different plots treated with different materials and weights of resulted crops (Kg/ feddan)

Treatments	Planting dates							
	October 9, 2001				April 21, 2002			
	Aphid		Yield		Aphid		Yield	
	Number/leaf	Reduction %	Kg/feddan	Rate of increment %	Number/leaf	Reduction %	Kg/feddan	Rate of increment %
Kz oil	62.15 ± 2.95	56.31	803.75	54.57	30.09 ± 2.51	43.43	909.00	49.94
Biovar	59.14 ± 2.68	58.42	856.75	64.76	28.15 ± 1.61	47.08	1041.25	71.75
Transparent Biovar	29.29 ± 1.49	79.41	1253.00	140.96	19.18 ± 2.82	63.94	1725.50	184.62
Pirimor	50.55 ± 2.13	64.46	893.75	71.88	25.12 ± 1.44	52.77	1228.75	102.68
Biofly	36.15 ± 1.94	74.59	994.50	91.25	22.19 ± 0.98	58.28	1356.00	123.67
Transparent Biofly	31.48 ± 1.54	77.87	1191.25	129.09	21.05 ± 0.88	60.42	1557.25	156.87
Black strips	73.88 ± 3.16	48.06	604.75	16.30	43.76 ± 1.52	17.73	816.00	34.60
Untreated check	142.24 ± 4.38	-	520.00		53.19 ± 1.98		606.25	
F. Value	11.81 **		18.25**		9.98**		14.52**	
L.S.D. at 0.05	8.15		94.76		5.28		171.35	

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حساسية نباتات الكوسة للاصابة بأنواع المـــنّ المختلفة و مقاومتها بالمركبات الآمنة تحت الظروف الصحراوية

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أجريت الدراسة في منطقة ريجوا حديثة الاستصلاح على طريق مصر الإسكندرية الصحراوي خلال الموسم الشتوي الذي بدأ ٩ أكتوبر ٢٠٠١ و الموسم الصيفي الذي بدأ ٢١ إبريل ٢٠٠٢.

وتشير النتائج المتحصل عليها إن الموسم الشتوي كان أكثر حساسية بالإصابة بأنواع المنّ المختلفة عن الموسم الصيفي . و من ناحية أخرى وجد إن منّ القطن *Aphis gossypii* (Glover) هو أكثر الأنواع انتشارا على نباتات الكوسة خلال موسمي الزراعة .

وقد استخدمت سبع معاملات آمنة لمكافحة المنّ و ذلك للمحافظة على البيئة ، و قد وجد أن(Transparent Biofly, Transparent Biovar) كانت أكفأ المعاملات حيث سببت أكبر خفض في نسبة الإصابة بالمنّ و أعلى زيادة في محصول الكوسة في الفدان خلال موسمي الزراعة، و ينصح باستخدام إحدى المعاملتين المذكورتين في حقول الكوسة لمكافحة المنّ بكفاءة عالية.