

## THE SIDE EFFECTS OF SOME FUNGICIDES ON *Aphis craccivora* KOCH POPULATIONS INFESTING FABA BEAN

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### ABSTRACT

Laboratory and field experiments along two years (2000 and 2001) were conducted to evaluate the side effects of six fungicides commercially used namely Antracol, Euparem, Cuprox, Propem, Rizolex and Topsin for controlling disease, on the reproductive potential of cowpea aphid *Aphis craccivora* (Koch) infesting faba bean seedlings. The obtained laboratory results revealed low reduction in the mean number of aphids 6 days after treatment ranging from 10.06 to 31.00%. Meanwhile, data of field experiments showed low reduction for all tested materials in the first 5 days, but the mean number of aphids increased gradually throughout the experimental period compared with the control plots and reached 69.64 & 92.96, 76.36 & 97.52, 80.32 & 102.24, 78.16 & 83.16, 72.80 & 95.28 and 55.64 & 74.92 for Rizolex, Antracol, Propem, Euparem, Cuprox and Topsin, for the two years 2000 & 2001, respectively. Topsin was the most favorable fungicide in the presence of aphids giving the highest initial reduction and significantly the least residual increased rate in aphid population.

### INTRODUCTION

Some systemic fungicides are commonly used for the treatment of seeds or plants to control different fungal diseases. In Egypt, faba bean plants are sprayed with fungicides against plant pathogens, which cause plant diseases. Meanwhile, faba bean plants are liable to infestation with aphids, mainly *Aphis craccivora* Koch during different stages of crop development especially in the seedling stage. Possible interference of using fungicides on aphid pathogens has been reported to cause disruption of entomopathogenic fungi. In the past few years, the entomopathogenic fungi have been extensively studied and used for control of many important insect pests on various crops around the world (Trefi, 1984 and Anderson *et al.*, 1988).

Feng and Johnson (1990) found that entomophthoraceous fungi often cause high mortality in aphid populations in many crops and may thereby diminish aphid damage.

Many authors investigated the effect of systemic fungicides on the life span and the rate of reproduction of aphids (Nanne and Radcliffe, 1971; Sagenmuller, 1977; Hendi and Kansouh, 1988; Akhtar and VanEmden, 1992, and El-Khawass and Khalifa, 1997).

In the field, the effect of fungicides is not well documented, and available results are contradictory. Wilding (1982) found that aphid-pathogenic fungi were suppressed by fungicides, while Zimmerman and Basedow (1980) reported that the proportions of aphids infected by fungi were not affected.

The present study was undertaken in laboratory and in field to investigate the side effects of six conventional fungicides used for the control

of fungal pathogens on winter populations of cowpea aphid *Aphis craccivora* infesting faba bean.

### MATERIAL AND METHODS

Six fungicides, commercially used for controlling faba bean diseases, were evaluated under field and laboratory conditions for their effects on the prevalence of *Aphis craccivora*. The tested fungicides and their rates of application were:

- |             |                     |
|-------------|---------------------|
| 1. Antracol | 300 gm. / 100 liter |
| 2. Euparem  | 250 gm. / 100 liter |
| 3. Cuprox   | 250 gm. / 100 liter |
| 4. Propem   | 250 gm. / 100 liter |
| 5. Rizolex  | 400 gm. / 100 liter |
| 6. Topsin   | 150 gm. / 100 liter |

#### Laboratory studies;

In the laboratory, *Aphis craccivora* colony was established on seedlings of faba bean *Vicia faba* variety Giza 402. Five seeds were planted in small plastic pots 20 cm. in diameter and 16 cm. in height under constant conditions of  $22\pm 1^{\circ}\text{C}$ , 65-70% R.H., and photoperiod of 10L: 14D. Apterous adult females of *Aphis craccivora* were placed on two-week-old bean plants for 12 hours and were then carefully removed and the produced nymphs were left to reach adult stage before exposure to treated and untreated plants.

The six fungicides were sprayed on two-week-old faba bean plants at the previously mentioned recommended doses. Five adult aphids (at the rate of one aphid per seedling to avoid crowding) were placed carefully on the plants of each treated or untreated experimental pot. Treated and check pots were covered with cylindrical glass cage 18 cm. in diameter and 50 cm. in height to exclude extraneous insects and to confine the aphids. The top of each cage was covered with glue-on special muslin cloth to allow aeration. All experimental pots were placed in a growth chamber adjusted at similar holding conditions of temperature, relative humidity and illumination period. Each treatment or untreated check was replicated 10 times. After 6 days, the number of nymphs, apterous and alatae progeny were recorded for each treated and untreated pots (Hendi and Kansouh, 1988).

Reduction percentages were determined according to the following equation:

$$\% R = \{(C-t)/C\} * 100$$

Where % R = reduction percentage, T = number of alive aphids in treated pots, and C = number of alive aphids in the check.

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

#### Field studies:

The present study was conducted in a farmer's field at El-Hadka Village in Fayoum Governorate during two successive years 2000 and 2001. Faba bean *Vicia faba* variety Giza 402 was planted on 20 September and sprayed on 1<sup>st</sup> of November in 2000, whereas planted on 15 September and sprayed on 1<sup>st</sup> November in 2001.

Two feddans moderately infested with *Aphis craccivora* were divided into 28 plots. No insecticides were applied until fungicides were sprayed. The experiments were conducted in a randomized block design with 4 replicates for each treatment. Fungicides were sprayed using hand sprayer machine at the recommended doses. Number of aphids (nymphs and adults) was recorded by examining 25 plants per plot randomly chosen before and after 2, 5, 7, 10, 15, 20 and 30 days from application. Reduction percentage was calculated according to Henderson and Tilton (1955).

## RESULTS AND DISCUSSION

### Laboratory studies

The effect of six systemic fungicides on the reproductive potential of cowpea aphid was evaluated under laboratory conditions. Data obtained in Table (1) revealed that all tested fungicides gave low reduction in reproductive potential of *Aphis craccivora* nymphs. Rizolex was the most effective (38.76%), followed by Topsin and Antracol (33.2&28.77%, respectively) and Euparem (22.00%), while Cuprox and Propem were the least effective fungicides (15.23&12.17%, respectively).

Results recorded in Table (1) also showed that reduction in the number of apterous and alatae as compared with that of untreated check, possibly due to the apparent decrease in population density of the progeny of exposed aphids.

Table (1): Effect of different fungicides on the reproduction of *Aphis craccivora* on faba bean plants 6 days after treatment under laboratory conditions.

Treatment	Nymphs		Apterous		Alatae		Total	
	Mean	%R	Mean	% R	Mean	% R	Mean	% R
Antracol	88.40 c	28.77	47.30 ab	15.54	6.60 a	38.89	142.30 b	25.46
Euparem	96.80 d	22.00	50.80 bc	9.29	7.30 ab	32.41	154.90 c	18.86
Cuprox	105.20 e	15.23	54.30 c	3.04	8.80 b	18.52	168.30 d	11.84
Propem	109.00 e	12.17	53.50 c	4.46	9.20 bc	14.81	171.70 d	10.06
Rizolex	76.00 a	38.76	43.70 a	21.96	10.30 bc	4.63	130.00 a	31.90
Topsin	82.90 b	33.20	44.80 a	20.00	8.90 b	17.59	136.60 ab	28.44
Control	124.10	---	56.00	---	10.80	---	190.90	---
L.S.D.	5.49	----	4.39	----	1.61	----	6.72	----

Means followed by the same letter in the same column are not significantly different.

R = Reduction.

However, Hendi and Kansouh found that Topsin-M and Bavistin caused significant reduction on the reproductive potential of *Schizaphis graminum*, while Topsin-M reduced the reproduction potential of *Rhopalosiphum padi* and Bavistin resulted in non-significant reduction.

### Field studies

Field studies performed in 2000 and 2001 compared the effect of six fungicides on cowpea aphids.

Although the population levels were slightly higher in year 2001 as shown in Tables 2 & 3, it could be noticed that the percent reduction caused by the six fungicides revealed the same trend throughout the experimental period in the two successive years.

Table (2): Effect of fungicides on percent reduction of cowpea aphid on faba bean plants under field conditions year 2000).

Treatment	Before treat	Mean number of aphids / 25 seedlings														
		48 h	% R	5 days	% R	7 days	% R	10 days	% R	15 days	% R	20 days	% R	30 days	% R	
Antracol	28.84 bc	21.08 b	31.41	14.78	27.36 b	30.16	43.48 c	54.84 d	-50.83	63.15 b	-59.18	72.92 c	-79.41	76.36 cd	-86.85	
Euparem	30.96 d	26.76 d	18.69	32.48 c	32.48 c	29.50	46.44 c	56.60 de	-45.54	68.76 c	-61.43	74.88 c	-71.62	78.16 d	-78.16	
Cuprox	29.92 cd	23.48 c	26.36	26.24 b	21.22	44.04 c	50.76 c	58.92 b	-35.06	58.92 b	-43.13	64.64 b	-53.30	72.80 bc	-71.71	
Propem	31.64 d	24.84 c	26.33	33.16 c	5.86	50.96 d	60.36 e	51.87	72.36 c	-66.23	79.28 d	-77.80	80.32 d	-79.15		
Rizolex	25.80 a	19.60 ab	28.71	23.12 a	19.50	39.12 b	46.60 b	43.79	59.80 b	-68.47	67.20 b	-84.82	69.64 b	-90.49		
Topsin	27.28 ab	18.40 a	36.71	22.92 a	24.53	27.08 a	41.36 a	-20.70	49.32 a	-31.41	52.32 a	-36.09	55.64 a	-43.94		
Control	31.08	33.12	-----	34.60	-----	36.00	39.04	-----	42.76	-----	43.80	-----	44.04	-----		
L.S.D.	1.97	1.53	-----	2.04	-----	2.96	3.82	-----	4.55	-----	4.31	-----	4.33	-----		

R = Reduction.

Means followed by the same letter in the same column are not significantly different.

Table (3): Effect of fungicides on percent reduction of cowpea aphid on faba bean plants under field conditions (year 2001).

Treatment	Before	Mean number of aphids / 24 seedling														
		48 h	% R	5 days	% R	7 days	% R	10 days	% R	15 days	% R	20 days	% R	30 days	% R	
Antracol	32.66 bc	24.80 c	30.73	31.80 b	17.96	51.44 d	-27.57	63.28 bc	-41.47	76.32 c	-55.44	84.28 d	-65.99	97.52 d	-82.00	
Euparem	28.40 a	23.64 bc	24.01	32.92 bc	2.28	45.96 b	-31.16	60.80 b	-56.41	69.48 b	-62.84	75.00 b	-69.97	83.16 b	-78.59	
Cuprox	33.20 c	22.84 ab	37.20	34.48 cd	12.44	49.48 cd	-20.79	64.52 c	-41.98	74.20 c	-48.76	79.80 c	-54.70	95.28 cd	-75.03	
Propem	34.32 c	24.44 bc	34.99	35.84 d	11.96	58.28 e	-37.62	66.72 d	-46.29	81.20 d	-57.48	93.12 e	-74.63	102.24 e	-61.69	
Rizolex	30.56 ab	23.40 bc	30.10	28.80 a	20.55	47.36 bc	-25.60	63.16 bc	-51.00	72.60 bc	-58.13	85.28 d	-79.61	92.96 c	-85.52	
Topsin	30.76 b	21.64 a	35.78	28.28 a	22.49	35.56 a	5.31	47.76 a	13.44	61.76 a	-33.64	66.96 a	-40.11	74.92 a	-48.55	
Control	33.52	36.72	-----	39.76	-----	41.36	45.88	-----	50.36	-----	52.08	-----	54.96	-----		
L.S.D.	2.24	1.69	-----	2.47	-----	3.40	3.09	-----	4.15	-----	3.94	-----	3.98	-----		

R = Reduction.

Means followed by the same letter in the same column are not significantly different.

Table (2) showed that in the year 2000 the tested fungicides after 48 hours gave low initial reduction of 18.89, 26.33, 26.36, 28.71, 31.41 and 36.71% for Euparem, Propem, Cuprox, Rizolex, Antracol and Topsin, respectively, while in the year 2001 it was 24.01, 34.99, 37.20, 30.10, 30.73 and 35.78%, respectively, for the same fungicides (Table 3).

Considering the residual effect of the tested compounds data proved the important role of time elapsed from treatment. It could be pointed out from Tables 2 & 3 that the reproductive potential of aphids increased gradually after 7 days and reached its maximum after 30 days compared with the control plots. After 30 days, the mean number of aphids in sprayed plots was 69.64&92.96, 76.36&97.52, 80.32&102.24, 78.16&83.16, 72.80&95.28 and 55.64&74.92 for Rizolex, Antracol, Propem, Euparem, Cuprox and Topsin, for the two years 2000 & 2001, respectively.

Comparing the six fungicides used, Topsin was the favorable fungicide giving the highest initial reduction and significantly the least residual increased rate in aphid population.

The data obtained in the present investigation are generally in agreement with that of Nanne and Radcliffe (1971) who suggested that fungicides might protect green peach aphids from infection by entomogenous fungi. This hypothesis was indicated by increased aphid population and a reduction of the incidence of diseased aphids in the fungicidal treatments. In this respect, Sotherton and Moreby (1988) also found that aphid numbers in plots sprayed with fungicides were twice as those found in unsprayed plots 20 days after treatment.

In contrast, Zimmerman and Basedow (1980) failed to affect the proportion of cereal aphids in two applications of systemic fungicides to cereal crops.

Such results suggest that it is necessary to use an aphicide on those plots previously sprayed with fungicides after 7 days in fields highly infested with aphids.

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الآثار الجانبية لاستخدام المبيدات الفطرية على تعداد من اللوبيا الذى يصيب الفول  
البلدى  
لونيس صليب سوريال  
معهد بحوث وقاية النبات - مركز البحوث الزراعية - الدقى الجيزة.

أجريت تجارب معملية وحقلية لمدة عامين (٢٠٠٠ و ٢٠٠١) لتقدير الآثار الجانبية لسنة  
أنواع من المبيدات الفطرية، المستخدمة في مكافحة الأمراض، على تكاثر من اللوبيا على بلدرت  
الفول البلدى.  
أشارت النتائج المعملية إلى أن استخدام المبيدات الفطرية أدى إلى نقص بسيط في متوسط تعداد  
المن بعد ستة أيام من المعاملة بنسبة تتراوح بين ١٠,٠٦ و ٣١,٠٩%.  
وفي نفس الوقت أدت نتائج الحقل إلى نقص بسيط في تعداد المن حتى اليوم الخامس ثم زاد  
متوسط أعداد المن تدريجياً خلال التجربة بالمقارنة بالمنطقة الغير معاملة ووصلت إلى ٦٩,٦٤ &  
٩٢,٩٦ ، ٧٦,٣٦ & ٩٧,٥٢ ، ٨٠,٣٢ & ١٠٢,٢٤ ، ٧٨,١٦ & ٨٣,١٦ ، ٧٢,٨٠ & ٩٥,٢٨ ،  
٧٤,٩٢ & ٥٥,٦٤ فرداً للريزولكس والانتراكلول والبرويم والايوباريم والكويركس والتوبسين  
لسنة ٢٠٠٠ و ٢٠٠١ على التوالي. يعتبر التوبسين أفضل المبيدات الفطرية في حالة وجود المن  
لأنه يسبب أعلى نسبة خفض لأعداد المن في البداية وأقل نسبة زيادة لتعداد المن بعد ٣٠ يوماً من  
الرش.