

**FECUNDITY, SEX RATIO, LIFE SPAN AND FEEDING CAPACITY IN
DIFFERENT RESISTANT STRAINS OF THE PREDATORY MITE,
AMBLYSEIUS GOSSIPI (EL-BADRY)**

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Abstract

Four resistant strains of the predacious mite *Amblyseius gossipi* as well as a susceptible strain were chosen to study the effect of resistance on life span, fecundity, sex ratio and food consumption. The results showed that the egg incubation period of the resistant strains increased significantly in comparison with the susceptible strain. The resistant strains had longer larval stage, lower fecundity and higher female ratio. Although the feeding capacity decreased as well, the resistant strains could withstand the frequent use of pesticides, and could survive in conditions in which their number is very low.

INTRODUCTION

It is well known that *Amblyseius gossipi* is a good predator not only against spider mites but also against aphids and egg masses of *Spodoptera littoralis*. From the practical point of view the population of *A. gossipi* will increase in good numbers if certain factors exist, i.e. fecundity, availability of food, food consumption and sex ratio (Osman *et al.*, 1979a & b; Hislop *et al.*, 1981; Roush and Hoy 1981; Abou-Awad and El Banhawy 1985). The aim of the present study was to study the influence of resistance to insecticides on the biology of the predacious mite *A. gossipi*.

MATERIALS AND METHODS

Feeding Capacity

About 30 adult females were placed separately on sweet potato leaf discs surrounded by a ring of Tangle-foot and were kept in Petri-dishes. A constant number of immature stages of *T. arabicus* (Attiah) were introduced to each female. Counts of daily consumed prey individuals were recorded for 10 days. New prey individuals were added daily to keep the constant food supply. The same technique was followed to determine the number of eggs of *T. arabicus*, nymphs of *Aphis gossypii* and eggs of *Spodoptera littoralis* consumed /female / day.

Biotic Potential

Virgin females were mated to appropriate males and placed separately on sweet potato leaf discs surrounded with rings of Tangle-foot kept in Petri-dishes. Fresh castor-oil pollen grains were added for feeding. The females were transported daily to new discs and the deposited eggs on each disc were kept until hatching. Hatched larvae allowed to complete development until reaching adults. The sex ratio was recorded, and thirty females were used for each test.

RESULTS AND DISCUSSION

Four resistant strains of the predacious mite *Amblyseius gossypii* were used in this study. The first was 25.7 -fold resistant to dicofol, the second was 21.4-fold resistant to omethoate, the third was 13.2 - fold resistant to thiodicarb and the fourth was 27- fold resistant to deltamethrin.

As shown in Table 1 the egg incubation periods of all resistant strains increased significantly compared with the susceptible strain. A significant increase in larval stage was also observed. Protonymphs and deutonymphs had durations longer than normal. This was more evident with the dicofol resistant strain. The postembryonic period of all strains apparently increased. The effect was more pronounced in the thiodicarb resistant strain. Compared with the susceptible strain, the longevity of resistant adults females was shorter, yet significant interstrain differences in adult longevity within the resistant strains were observed.

Table 1. Effect of the development of resistance to insecticides on the life span of the predacious mite *Amblyseius gossipi*

Resistant strain	Average duration in days						
	Incubation period	Larva	Protonymph	Deutonymph	Total Immature	Life Cycle	Adult longevity
Dicofol	2.20 ± 0.18	2.27 ± 0.10	2.32 ± 0.08	2.28 ± 0.15	6.87 ± 0.43	8.88 ± 0.38	15.55 ± 0.26
Deltamethrin	2.67 ± 0.13	2.80 ± 0.17	2.40 ± 0.10	2.82 ± 0.18	8.02 ± 0.32	10.68 ± 0.22	13.13 ± 0.35
Omethoate	3.30 ± 0.16	2.90 ± 0.09	2.68 ± 0.15	3.00 ± 0.15	8.58 ± 0.24	11.88 ± 0.27	11.58 ± 0.27
Thiodicarb	4.30 ± 0.27	3.85 ± 0.22	3.02 ± 0.18	4.18 ± 0.16	11.05 ± 0.35	15.35 ± 0.38	10.80 ± 0.19
Susceptible	1.22 ± 0.06	1.13 ± 0.07	1.62 ± 0.12	1.27 ± 0.08	4.02 ± 0.13	5.24 ± 0.15	20.21 ± 0.27

As presented in Table 2, the fecundity of all the resistant strains decreased significantly. Similar results were indicated by several workers (Hislop *et al.*, 1981; Roush and Hoy 1981; Abou -Awad and El -Banhawy 1985; Konig and Hassan 1986; El-Bagoury and El -Banhawy 1987). Results in Table 2 also showed that the number of adult females exceeded that of males. The female - male ratio ranged from 1.08 for the susceptible strain to 2.83 for the thiodicarb resistant strain.

Table 2. Effect of resistance on fecundity and sex ratio of *A. gossipi*.

Resistant strain	Average number of eggs / female	Percentage of hatchability	Female - male ratio
Dicofol-selected strain	18.30 $\pm$ 1.47	94.40 $\pm$ 1.37	1.60 $\pm$ 0.09
Deltamethrin-selected strain	13.10 $\pm$ 0.52	86.60 $\pm$ 2.10	2.19 $\pm$ 0.08
Omethoate-selected strain	10.95 $\pm$ 0.79	82.95 $\pm$ 1.03	2.36 $\pm$ 0.05
Thiodicarb-selected strain	8.75 $\pm$ 0.22	77.75 $\pm$ 1.58	2.83 $\pm$ 0.10
Susceptible strain	17.40 $\pm$ 0.41	100.00	1.08 $\pm$ 0.04

The effect of selection pressure on the feeding capacity of *A. gossipi* was also studied. Four different natural foods namely, the egg stage of *Tetranychus arabicus*, immature stage of *T. arabicus*, nymphal stage of *Aphis gossypii* and egg masses of *spodoptera littoralis* were introduced separately to *Amblyseius gossipi* and the percentage of food consumption /female / day was recorded . Data presented in Table 3 revealed that the rate of feeding of all the resistant strains decreased significantly in comparison with the susceptible strain. The average eggs consumed /female/day ranged among the resistant strains from 7.73 to 16.22 compared with 20.81 eggs/female/day for the susceptible strain . The same pattern of decrease in rate of feeding was also observed in case of immature stage of *T. arabicus*, nymphal stage of *Aphis gossypii* and egg masses of *Spodotera littoralis*. These results are in agreement with those of Osman *et al.* (1979 a, b) and Hislop *et al.* (1981)

Table 3. Effect of resistance on the feeding capacity of *A. gossipi*.

	Mean number of preys consumed / female / days			
	<i>T. arabicus</i>		Nymphs	Eggs
	Eggs	Immatures	<i>Aphis gossypii</i>	<i>S. Littoralis</i>
Dicofol	16.22 $\pm$ 0.53	9.67 $\pm$ 0.09	6.63 $\pm$ 0.19	6.17 $\pm$ 0.18
Deltamethrin	11.52 $\pm$ 0.26	6.72 $\pm$ 0.24	5.40 $\pm$ 0.17	5.82 $\pm$ 0.24
Omethoate	9.84 $\pm$ 0.31	5.53 $\pm$ 0.21	5.28 $\pm$ 0.16	5.13 $\pm$ 0.20
Thiodicarb	7.73 $\pm$ 0.27	4.82 $\pm$ 0.19	3.37 $\pm$ 0.15	4.04 $\pm$ 0.23
Susceptible	20.81 $\pm$ 0.58	13.32 $\pm$ 0.39	7.62 $\pm$ 0.22	10.03 $\pm$ 0.32

Although the biotic potential of the predacious mite *Amblyseius gossipi* was apparently affected by selection for resistance to insecticides, this disadvantage was compensated by increased postembryonic period during which *A. gossipi* adults could act as an efficient predator. The increase of female to male ratio was another advantage that could enable the predator to survive and propagate under pesticide pressure.

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**الخصوبة النسبية الجنسية، فترة الحياة والكفاءة الغذائية لبعض
السلالات المقاومة للمبيدات من العنكبوت المفترس
*Amblyseius gossipi***

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- تم دراسة تأثير المقاومة للمبيدات في اربعة سلالات من الاكاروس المفترس *Amblyseius gossipi* المقاوم للديكوفول ، دلتامثرين ، اوميثويت، ثيوديكارب علي فترة الحياه الخصويه ، النسبه الجنسيه واستهلاك الغذاء ، وأوضحت الدراسة الآتي:
- ١ - فترة حضانه البيض والعمر اليرقي للأربعة سلالات المقاومة زادت زياده معنويه بالمقارنه بالسلاله الحساسيه.
 - ٢ - هناك تأثير عكسي حيث اظهرت المقاومة نقص في الخصويه ولكن تم تعويض ذلك بزيادة في عدد الإناث المنتجة بالنسبة للذكور .
 - ٣ - سببت المقاومة في الاكاروس المفترس في نقص معنوي في الكفاءه الغذائيه عند المقارنه بالسلاله الحساسه ومع ذلك فإن السلالة المقاومة من الاكاروس المفترس تستطيع مجابهة الاستخدام المستمر للمبيدات حتي في ظروف قلة الأعداد.