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## Efficiency of *Coccinella undecimpunctata* (Reiche) adults, in Suppressing *Aphid gossypii* (Glover) Population on Tomato Plant

Inas M. Yahia and Noha A. Ibrahim

Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt

\*E-Mail : [nawibrahim20@gmail.com](mailto:nawibrahim20@gmail.com)

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### ABSTRACT

Biological control is a very safe and effective method for the management of pests. In this study, *Coccinella undecimpunctata* (Reiche) adults were used in the management of *Aphid gossypii* population. The total mean reduction percentage of *A. gossypii* individuals recorded 67.8, 74.7 and 85.26 % at three different levels of release treatment at 1, 3 and 5 adult predators/plants respectively. Also, the results showed that releasing of *C. undecimpunctata* adult stage reduced the damage caused by *A. gossypii* in the total yield of tomato plants. Also, the fruit weight and the fruit's number/ plant increased in presence of predators compared with control.

### INTRODUCTION

Tomato (*Lycopersicon spp.*) is economically one of the most important vegetables (Polston and Anderson, 1999). Cotton aphid (*Aphis gossypii* Glov.) is one of the basic pests of tomato. It is a direct plant-sucking pest and it can cause serious problems on leaves, stems and fruits (Sharma and Joshi, 2010). It also causes direct damage by secreting honeydew that causes the development of sooty- mold (Blackman and Eastop, 2000). Chemical control tactics have been the primary method for managing infestation, but this strategy has become less effective due to the development of an insecticide-resistant population (Siebert, *et al.* 2012). Biological control of pests include predators, parasitoids are very effective and save method for controlling (Collier and Steenwyka, 2003 and Griffiths, 2007). The predaceous insects form a large diverse group. Over 16 orders of insects contain predaceous members, in approximately 200 families including the spiders and mites, there are probably in excess of 200,000 species of arthropod predators (Obrycki and Kring, 1998). Many crops contain a rich assemblage of predators, and it is common to find 300-500 species of predators in a given crop. The number of species of parasites is speculative, ranging from an estimate of 800,000. The greatest diversity of parasites is found in the Hymenoptera (Uzma, 2010). However, many Diptera is parasites, and rare representative taxa are also found in the Coleoptera, Lepidoptera and Neuroptera. Strepsiptera are true zoological parasites, as they do not kill their hosts (Xia *et al.*, 2004; Tazerouni, 2011 and Bauer, *et al.*, 2011).

## MATERIALS AND METHODS

### 1- Mass Rearing of *A. gossypii* (Homoptera: Aphididae).

*A. gossypii* is the most preferable prey for the mass production of *C. undecimpunctata*. A strong culture of this aphid should be available during the rearing time to maintain the predator rearing process.

The tomato seeds were planted in plastic trays (25X 40X15 cm) that contained peatmoss. The Seeds were planted at 1-2 cm deep and followed with irrigation and fertilizers as required. When the first leaflet appeared, after about one week from cultivation, tomato leaves were infested with *A. gossypii*, distributed over the new foliage of cultivated trays. Culturing of tomato plants and artificial aphid infestation was a continuous process carried out at weekly intervals.

The infested plants were followed until the population of *A. gossypii* increased and become enough about 100 nymphs /plant, for rearing the ladybird, *C. undecimpunctata*.

### 2- Mass Rearing of *C. undecimpunctata*

A stock culture of ladybird was obtained from infested plants and transferred to the laboratory. Only 10 adults ♂+ 10 adults ♀ of ladybird (to prevent larval cannibalism) were transferred to each rearing cages (30 cm diameter X 25 cm height) and kept in wooden cages (100X135X135 cm) with nylon gauze sides. To maintain the predator culture, a suitable number of the prey was offered daily to the predator.

### 3- Predators Release:

The effect of *C. undecimpunctata* release on the cotton aphid, *A. gossypii* were studied under filed conduction at Giza Governorate. The area of 300 m<sup>2</sup> was divided into four replicates, cultivated with tomato seedlings. The treatment was represented by three replicates and plastic sheets were fixed around each treatment. The predator was released at a rate of 5 individuals/plant, while the buffer area and control were left free of release.

Randomized samples of 10 leaves /replicate were taken just before the predator release as pre-count and then at weekly intervals as post-counts. The samples were put in paper bags and directly transferred to the laboratory. Immatures and adults of *A. gossypii* were counted with aid of a stereomicroscope after 5, 7 and 14 days.

A comparison between the yield in the experimental by *C. undecimpunctata* on tomato yield infested by *A. gossypii* and control plots was determined as reported by Abd El-wahab *et al* (2009).

The statistical analysis (ANOVA and Simple correlation) of the obtained data were performed by using Costat software, 1990.

## RESULTS AND DISCUSSION

Table (1) and Fig. (1) indicated that the treatment level (5 predators/plants) caused a higher reduction percentage on *A. gossypii* (85.26%) populations. These results were in agreement with Dreistadt and Flint (1996) who recorded that, adults of *Hippodamia convergens* collected from aggregations were released for Control of *A. gossypii* infesting potted *Dendranthema grandiflora* Hurricane outdoors. A single release of 34-42 adults of *H. convergens* /pot provided 25-84% aphid control.

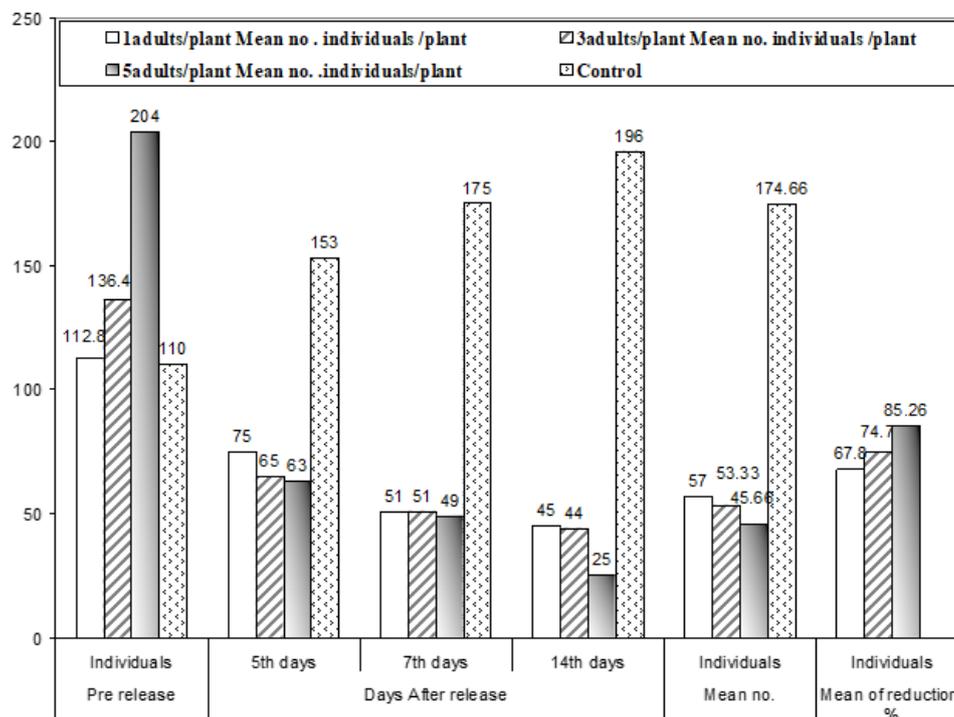
Al-Eryan *et al.* (2001) indicated that releasing *Coccinella undecimpunctata* (Reiche) against *Aphis gossypii* (Glover) at predator: prey ratios 1:100; 1:50 and 1:25 resulted in a reduction of aphid population by about 99.6, 99.4 and 99.4 % respectively within 28 days.

El-Habi *et al.* (1999) tested the efficiency of *C. septempunctata* L. in controlling *A. gossypii* (Glover) populations on cucumber in the greenhouse. This efficiency was a function of the predator/prey ratio and the initial aphid density at the time of the release of the

predator. Prey density had a large influence on the fecundity and establishment of this coccinellid in the greenhouse. Also, Abd El-Wahab (2009) showed that a total number of *C. undecimpunctata* was higher in the second season than the first one when releasing of *C. undecimpunctata* at a rate of 6 adult/2 m<sup>2</sup> gave the best reduction of aphid population 93.14 % followed by the second level (4 adult /2 m<sup>2</sup>) this suppressed the population by 85.6 % and the low level (2 adult /2 m<sup>2</sup>) with 81.86 % respectively.

**Table 1:** Efficiency of *Coccinella undecimpunctata* (Reiche) adults, in suppressing *Aphis gossypii* (Glover) population fluctuation on tomato plants

Treatments	Inspection	Pre-release	Days After release			Mean no.	Mean of reduction %	F value
		Individuals	5 <sup>th</sup> days	7 <sup>th</sup> days	14 <sup>th</sup> days	Individuals	Individuals	
1adults/ plant	Mean no. individuals /plant	112.8	75	51	45	57		4.62
	Redacting %	--	52.2	71.6	79.6		67.8	
3adults/ plant	Mean no. individuals /plant	136.4	65	51	44	53.33		
	Redacting %	--	65.7	76.5	81.9		74.7	
5adults/ plant	Mean no. individuals/plant	204	63	49	25	45.66		
	Redacting %	--	77.8	84.9	93.1		85.26	
Control		110	153	175	196	174.66		



**Fig. 1:** Efficiency of *Coccinella undecimpunctata* (Reiche) adults, in suppressing *Aphis gossypii* (Glover) population fluctuation on tomato plants.

**The Yield Controlled by *Coccinella undecimpunctata* Reiche against *Aphis gossypii* (Glover):**

Data in Table (2) showed that releasing of *C. undecimpunctata* adult stage reduced the damage caused by *A. gossypii* in the total yield. The result proved that the weight of the fruit, the fruit number/ plant and total yield increased (41.76) in presence of predators compared with control (15.19). The obtained data are in the same harmony with Abd El-Wahab *et al.* (2009) who cleared that percentages of yield increased over control in the presence of predator *Coranus Africana* against *B. tabaci* in the tomato field.

**Table 2:** The yield controlled by *Coccinella undecimpunctata* (Reiche) against *Aphis gossypii* (Glover)

Treatment	Weight of fruit (Gm)	No of fruit /plant	Reduce of Weight	Reduce of No	Total yield (Ton /Fadden)	Reduce of yield (%)
Adult5/ plant	32±0.4	9.2±2.0	9.7	20	41.76	7.2
Control	21.6±0.6	5.1±1.3	40	54.5	15.19	66.2

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#### ARABIC SUMMARY

كفاءة الطور البالغ من حشرة أبو العيد ذو الأحد عشر نقطة في خفض الكثافة العددية لمن القطن على نبات الطماطم

ايناس مصطفى يحي ونهى عوض ابراهيم

معهد بحوث وقاية النباتات- الدقى- الجيزة- جمهورية مصر العربية

تعد مكافحة البيولوجية من الطرق الآمنة والفعالة للغاية في إدارة الآفات. وقد تم في هذه الدراسة استخدام الأفراد البالغة من حشرة "أبو العيد ذو الأحد عشر نقطة" في مكافحة "من القطن"، فأظهرت النتائج أن متوسط نسبة الفقد الكلي لأفراد حشرة "من القطن" 67.8 و 74.7 و 85.26% عند ثلاثة مستويات مختلفة من الإطلاق للأفراد البالغة عند 1 و 3 و 5 لكل نبات على التوالي. كما أوضحت النتائج أن إطلاق الطور البالغ من حشرة "أبو العيد ذو الأحد عشر نقطة" يقلل من الضرر الذي يسببه "من القطن" في الناتج الكلي لمحصول نباتات الطماطم. أيضًا لوحظ عدد ووزن الثمار لكل نبات في وجود المقترسات مقارنة بالعينة الضابطة.