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Use the *Coccinella undecimpunctata* L. for controlling *Aphis gossypii* Glover and *Myzus persicae* (Sulzer) on cucumber in Egypt

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ABSTRACT

Three rates of *Coccinella undecimpunctata* L. (Coleoptera: Coccinellidae) stages release in cucumber field for controlling *Aphis gossypii* Glover and *Myzus persicae* (Sulzer) (Hemiptera: Aphididae) was repeated 4 times at 15-day intervals. The tested rates were 12000 predator larvae/ feddan/releases, 6000 predator adults/feddan/releases and combination of 6000 larvae and 3000 adults/feddan/releases. The releases were conducted during 2007 and 2008 at a location in Qalubia Governorate. This release indicated the potential use of this predator to control the targeted aphis on cucumber. Reduction in aphids' populations and subsequent yields were significant. Highest reduction and yield gain was observed when combination larvae and adults were released.

Key words: *Coccinella undecimpunctata*, *Aphis gossypii*, *Myzus persicae*, Control

INTRODUCTION

Cucumber, *Cucumis sativus* L. is one of the most important cucurbitaceous vegetable crops in Egypt. It is cultivated under different environmental conditions as open field and greenhouses for local consumption and exportation (Hanafy *et al.*, 2008).

Sucking insects especially aphids are considered as one of the most serious pest all over the world. It has a wide host range including cucumber. Also they transmit serious plants pathogenic viruses such as cucumber mosaic virus (Gerling, 1990). Aphids are controlled by different chemical insecticides which pollute the environment. The extensive and repeated use of insecticides has disrupted the natural balance between these pests and their natural enemies (Amer and Marei, 2001).

Many authors supported the use of safe alternative control methods such as biological control (Ahmed *et al.*, 2001). Predators are one of the major groups of natural enemies which play a noticeable role against different insect pests. Studying the relationship between sap sucking insects pests as favorable preys and their predators enable to know how these predators cold share in this natural balance. Moreover, it could give the opportunity for determining the best timing for releasing of more effective predatory species in the fields, suffering from pests attack, in the frame of Integrated Pest Management (IPM) strategies, side by side with safe alternative control methods (Bahy El-Din, 2006).

Predators belong to family Coccinellidae, comprise one of the most active groups of predatory species, that feed on different sucking pests including aphids. This family gained the interest of many investigators as important group of predator in the biological control of insect pests attacking different crop plants (Bahy El-Din, 2006).

The aphids, *Aphis gossypii* and *Myzus persicae* (Hemiptera: Aphididae) constitute the essential prey for the majority of Coccinellidae (Saharaoui *et al.*, 2001). *Coccinella undecimpunctata* L. (Coleoptera: Coccinellidae) is an extremely important predator of many species aphids (Ibrahim, 1948 & 1955b).

Both the adult and larval stages of many coccinellid species feed on insects harmful to plants, such as aphids (Ibrahim, 1955a Anonymous, 1997; Arnett jr., *et al.* 1980 and Waldbauer, 1998).

The present study amid at the releasing of *C. undecimpunctata*) as a predator for controlling the *A. gossypii* and *M. persicae* during growing seasons of 2007 and 2008 at a location in Qalubia Governorate.

MATERIAL AND METHODS

Rearing of insects:

***Coccinella undecimpunctata* L.:**

Aphis craccivora koch. was used as prey to rear *C. udecimpunctata*. Both insects were cultured in the laboratory according to the method described by (Bahy El-Din, 2006).

Field studies: An area of about half feddan cultivated with cucumber was chosen at Qalubia Governorate. This area was divided separately into 3 treatments and a control (C.). Cucumber was sown on April, 16th and 18th, during 2007 and 2008 seasons, respectively. All plots received the normally recommended agricultural practices. Predator's release started on May, 14th and 16th at the seasons, respectively and was repeated 4 times at 15-day intervals. The first rate was *C. undecimpunctata* second stage larvae (CUL) at the rate of 12,000 predators/feddan. The second rate was *C. undecimpunctata* adults (CUA) a rate of 6,000 predators/ feddan. The last rate was a combination of second stage larvae and adults of the predator (CULA) at the rate of 6000 larvae and 3000 adults/feddan. The actual release area for each rate of release was 175 m^2. Sampling started (after application compared with the control) on May, 21st and 23rd and continued weekly until July, 23rd and 25th during 2007 and 2008 seasons, respectively. The efficacy of different releases was measured as the population of the aphids (*A. gossypii* and *M. persicae*) on 10 plants. Each plant was presented by four leaves at each count.

Statistical Analysis:

The formula of Henderson and Tilton (1955):

% Population reduction = 100 * (1- ((Ta x Cb) / (Tb x Ca))

Where Ta = number of larvae after release.

Tb = number of larvae before release.

Ca = number of larvae in the control after release.

Cb = number of larvae in the control before release.

The above formula was used to calculate the reduction rate among aphids populations after application of the three tested treatments. The data were subjected to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05 level, using SAS (Anonymous, 1988).

Yield Assessments:

Yield was evaluated at the end of the experiment for each treatment. Data are presented as expected weight kgs/feddan.

RESULTS AND DISCUSSION

1-Release of the predator against aphids (*A. gossypii* and *M. persicae*) in cucumber field:

Results concerning the effect of tested rates of predator' release on the aphids (*A. gossypii* and *M. persicae*) and their percentage reduction are presented herein.

Obtained results revealed that the numbers of aphids (*A. gossypii* and *M. persicae*) adults and nymphs on cucumber plants were obviously reduced in the various treatments compared to the control. The overall means of aphids/40 leaves were [(174.82, 151.27, 132.73 & 240.82) and (172.35, 148.18, 130.73 & 226.91)] and [(181.91, 157.82, 136.64 & 260.09) and (195.00, 167.09, 147.09 & 249.36)] on cucumber plants, respectively during 2007 and 2008 for CUL, CUA, CULA and control, respectively.

Statistical analysis of aphid's populations for year 2007-2008 showed significant differences between the three tested treatments compared with the control. The obtained values for 2007 for A. *gossypii* and *M. persicae* were [(F= 12.06, P = 0.0001 and L.S.D. 0.05= 39.25) and (F= 11.91, P= 0.0001 and L.S.D. 0.05= 35.05)], respectively. The relative values during 2008 for both aphids were [(F= 9.20, P = 0.0002 and L.S.D. 0.05= 51.34) and (F= 10.28, P= 0.0001 and L.S.D. 0.05= 40.00)], respectively.

The overall average of reduction of aphid's populations (*A. gossypii* and *M. persicae*) is illustrated at Figs.1- 4. The obtained reduction was 46.36, 55.95 & 62.96 % and 42.97, 54.13 & 61.87 % due to CUL, CUA and CULA release, respectively during 2007. The relative results for the three treatments had the same trend (i.e. 40.79, 50.64 & 58.86 % and 41.03, 52.40 & 59.61 %, during 2008, respectively).

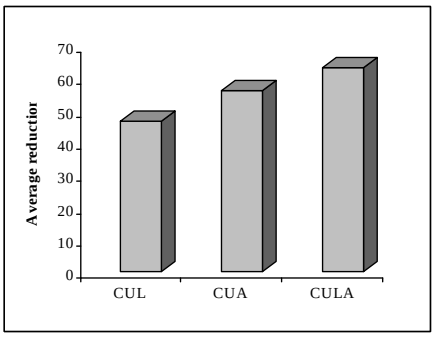

Fig.(1) : Average reduction of release in cucumber plants with *C. undecimpunctata* (CUL), *C. undecimpunctata* (CUA) and *C. undecimpunctata* (CULA) on the population density of *A. gossypii* in Qalubia Governorate during 2007 season.

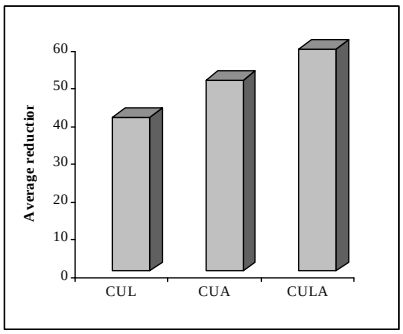

Fig.(2) : Average reduction of release in cucumber plants with *C. undecimpunctata* (CUL), *C. undecimpunctata* (CUA) and *C. undecimpunctata* (CULA) on the population density of *A. gossypii* in Qalubia Governorate during 2008 season.

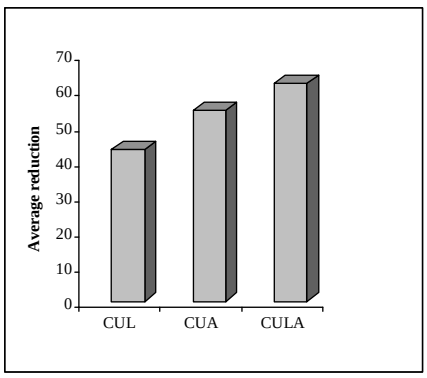

Fig.(3) : Average reduction of release in cucumber plants with *C. undecimpunctata* (CUL), *C. undecimpunctata* (CUA) and *C. undecimpunctata* (CULA) on the population density of *M. persicae* in Qalubia Governorate during 2007 season.

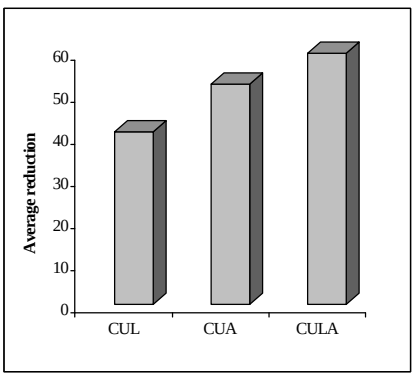

Fig.(4) : Average reduction of release in cucumber plants with *C. undecimpunctata* (CUL), *C. undecimpunctata* (CUA) and *C. undecimpunctata* (CULA) on the population density of *M. persicae* in Qalubia Governorate during 2008 season.

Statistical analysis for 2007 and 2008 reduction results showed significant differences between the three tested treatments for the two aphis species. Obtained results were (F= 31.54, P = 0.0001 and L.S.D. 0.05= 4.38) for *A. gossypii* during 2007 and (F= 47.1, P = 0.0001 and L.S.D. 0.05= 4.08) for *M. persicae* during 2007. During 2008 (F= 55.93, P = 0.0001 and L.S.D. 0.05= 3.57) was obtained for *A. gossypii* and (F= 55.1, P = 0.0001 and L.S.D. 0.05= 3.72) for *M. persicae*, respectively.

2- The yield in the experimental field:

Results of obtained yields are illustrated in Figs.5-6. Results revealed that yield was affected by the tested treatments. The release of both larvae and adults (CULA) gave the highest yield followed by adults only (CUA) and larvae only (CUL) as the least rank during both growing seasons. Increase of yield was proportion to aphids population reduction.

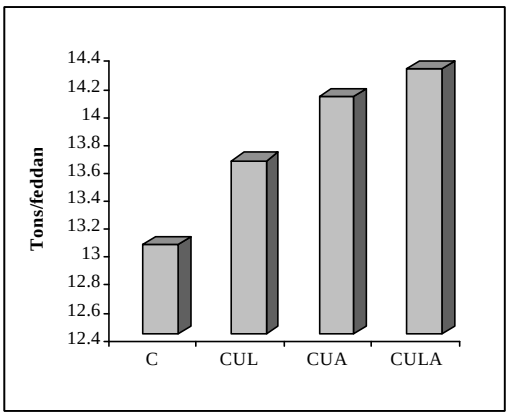

Fig. (5): Yield of cucumber plants (tons/feddan) in three treatments and a control (C.) in Qalubia Governorate during 2007 season.

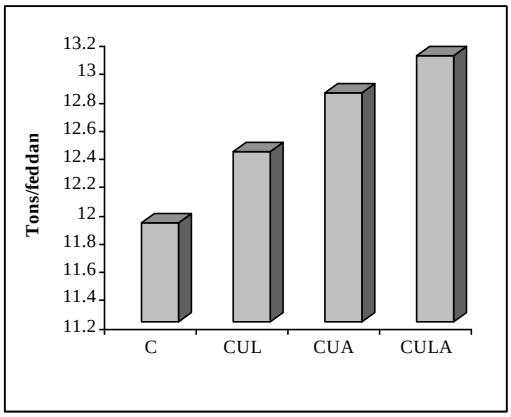

Fig. (6): Yield of cucumber plants (tons/feddan) in three treatments and a control (C.) in Qalubia Governorate during 2008 season.

In conclusion obtained results revealed that *C. undecimpunctata* is a potential predator for *A. gossypii* and *M. persicae* on cucumber under field conditions. Also the released rates had an acceptable control levels. Releasing of (CULA) had the highest reduction percentage compared with the control followed by (CUA) then (CUL).

Obtained results are in agreement with published results in this manner (Arnett jr., *et al.* 1980, Waldbauer, 1998, Ahmed *et al.*, 2001 and Bahy El-Din, 2006). In general, using of such natural enemies in IPM programmer can be useful with other safe alternative control methods. This will decrease the application of harmful pesticides and allow these natural enemies to do their role successfully in the field.

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ARABIC SUMMARY

إستخدام المفترس أبو العيد ذو 13 لمكافحة من القطن ومن الخوخ على الخيار فى مصر

هانى أحمد سيد وأمال أحمد الزغبى

معهد بحوث وقاية النباتات- مركز البحوث الزراعية

تم أستخدام المفترس (أبو العيد ذو 13) كطور كامل ويرقات عمر ثانى لمكافحة من القطن ومن الخوخ على الخيار بمحافظة القليوبية عام 2007- 2008م واستخدمت المعدلات الأتية: 12000يرقة عمر ثانى/ الفدان أو 6000فرد كامل/ للفدان أو خليط من 6000 يرقة عمر ثانى و 3000 فرد كامل/ الفدان مقارنة بغير المعامل.

أظهرت النتائج فاعلية هذه المعاملات الثلاثة فى خفض تعداد نوعى المن وكذلك زيادة المحصول بصورة طردية مقابلة للانخفاض فى تعداد المن خلال موسم النمو.