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Predators As biological control agents against *Myzus persicae* in tomato crop

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Abstract
The results obtained that, the % reduction of *Myzus persicae* population by releasing *Coccinella undecimpunctata* and *Chrysoperla carnea* (Stephens) on tomato plants in green house in Faculty of Agriculture, Al-Azhar University. Predators releasing caused % reduction on *M. persicae* population compared with control treatments. The suppression of *M. persicae* population by three treatments of predators released (*C. undecimpunctata* and *C. carnea*), *C. carnea* and *C. undecimpunctata* on tomato plants were (85, 83, 80 and 84, 82, 79%) on 7th days after releasing with three treated for the first experiment and second experiment, respectively. After two weeks, from predators released the % reduction reached to (90.5, 89 and 85%) and (90, 89% and 83%) for three treated during the two experiments respectively.

Keywords: *Coccinella undecimpunctata, Chrysoperla carnea, Myzus persicae,* tomato

Introduction

Tomatoes may lose their commercial value when severely attacked *Myzus persicae* and *Tauta absoluta* it's become a pests of tomatoes in both field and greenhouses [1-3]. Its major host is *Solanum lycopersicum* (tomato), [4] other hosts also exist Such as *Capsicum* spp. (Pepper), [5-8].

Aphid parasitoids (Hymenoptera: Braconidae and Aphelinidae) have been used in biological control and integrated pest management (IPM) programs much more often than other aphid natural enemies. They have the advantage of preying exclusively on aphids, although many will attack a wide range of species. Several of natural enemies are produced commercially in large numbers, particularly for use in glasshouses, where some important aphid species have developed resistance to chemical insecticides. In addition, several parasitoid species have been moved around the world and used in classical introductions to combat major aphid pests of outdoor crops, [9-11]. Coccinellidae predators are tolerant to many insecticides which is an advantage over other predators. It is the most important beneficial insect of cotton pests, with its immature and mature stages as voracious feeder of all the species of aphids, [4, 12-16].

There are some pests which cause a greet damage of the vegetables production such as cabbage aphid, *Brevicoryne brassica* (L.), cotton Aphid *Aphis gossypii*, (Hemiptera: Aphididae), these pests controlled by predators such as ladybirds, Aphid lion and parasites such as parasitic wasps, [17-20].

These Insect predators belong to family *Coccinellidae* and *Chrysopidae*, these feed during the larval and adult stages on different sap-sucking pests including aphids, [21, 22]. Several studies have been carried out in different parts of the world concerning the predation activity of many predator species such as *Chrysoperla undecimpunctata* and *Chrysoperla carnea*. Among those who contributed much to these studies are [23, 24]. The neuropteran predator's *C. carnea* and *C. septempunctata* (Wesm) have attracted considerable attention as a biological agent to control important agricultural pests, [25].

Many attempts have been made by releasing some bio-control agents, particularly common *Coccinellid* and *Chrysopidae* species for controlling aphid species, [26]. The green lacewings, *Chrysoperla carnea* (Stephens) is a polyphagous predator, commonly found in agricultural systems. It has been recorded as an effective generalist predator of aphids, [27-29].

The aim of this study to evaluated the efficiency of *Coccinella undecimpunctata* and *Chrysoperla carnea* against *Myzus persicae* on tomato plants.

Materials and Methedos

Evaluate the efficiency of 2nd instar larvae of *Chrysoperla carnea* (Four larvae /plant) and adult of *Coccinella undecimpunctata* (Four adults/ plant) as biological control agents of *Myzus persicae* on tomato plants under green house of 300 m^2 in Faculty of Agriculture, Al-Azhar University. The area was divided into 12 replicates (5x 5 m^2) as treated by the two predators *Chrysoperla carnea* and *Coccinella undecimpunctata* (three replicates); for each one and three replicates as control. A plastic sheet was fixed between each replicate. Randomized samples of 10 leaves /replicate were taken just before the predator release as pre-count and then samples picked up weekly intervals as post-counts. The samples were put in paper bags, directly transferred to laboratory. Immature and adults of *M. persicae* were counted with aid of a stereomicroscope, after 3, 7 and 14 days.

Mass rearing of *Coccinella undecimpunctata* (L.)

When the population of *Myzus persicae*, increased and reached to suitable density individuals (approximately 100 individuals/ plant) on tomato plants, these plants were inoculated with *Coccinella undecimpunctata*. The stock culture of ladybird was obtained from infested plants and transferred to laboratory. Only 10 adults ♂+ 10 adults ♀ of ladybird (to prevent larval cannibalism) were transferred to rearing cages (30 cm diameter X 50 cm high) and kept in wooden cages (100X150X150 cm) with nylon gauze sides. To maintain the predator culture, a suitable number of the prey daily offered to the predator.

Mass rearing of *Chrysoperla carnea*

Five pairs of the green lacewings *Chrysoperla carnea* adults were confined in the glass chimney (6cm x10cm) was placed in the Petri dish (10 cm.). Another small petri dish (5 cm. diameter) was placed in the bigger Petri dish for holding cotton soaked in distilled water to maintain moisture. The upper open end of glass chimney was covered with black muslin cloth and was tightened with rubber band. The diet (sugar: yeast extract: honey: distilled water: casein 3g: 2.5gm: 2.5gm: 10 ml: 2 gm) provided with intervals of 24 hours. Eggs laid by female green lacewing on the walls of chimney and muslin cloth were harvested. After hatching the newly hatched larvae were fed on frozen eggs of *Sitotroga cerellela*. The process continued until the formation of cocoons. The cocoons formed were removed gently with camel hair brush to other empty glass chimneys to observe and record the emergence of adults.

Statistical analysis

The % Reduction of infestation was calculated according to the equation of [30]. (ANOVA) of the obtained data were performed by using SAS program, [31].

Results and discussion

Table 1 & 2: showed that the interaction of *Coccinella undecimpunctata* and *Chrysoperla carnea* caused insignificant suppressed of *Myzus persicae* population on tomato plants.

The results obtained that aphid population before released were (145, 140, 142 and 137, 135, 140 individuals/plant) while it recorded on control (133, 125, 121 and121, 122, 120 individuals /plant) for the three treatments during two season respectively. Predators releasing caused reduction percentages on *M. persicae* population compared with control during two successive seasons. During first season, *M. persicae* population achieved (11, 9 and 6 individuals /plant) after *C. undecimpunctata* and *C. carnea* released on 3rd; 7th and 14th days. While aphid population recorded (20, 17 and 10 individuals /plant) after releasing of *C. undecimpunctata* on 3rd; 7th and 14th days, and releasing *C. carnea* reduced the aphid population to reach (21, 15 and 9 individuals /plant) on 3rd; 7th and 14th days after predator releasing. In addition, the reduction of *M. persicae* population continuing to second season compared with control which recorded (10, 9 and 6 individuals /plant) after releasing C. *undecimpunctata* and *C. carnea* on 3rd; 7th and 14th days respectively. After releasing *C. carnea* the aphid insects population achieved (20, 15, 10 individuals /plant) on 3rd, 7th and 14th days respectively.

Also, in case of releasing C. *undecimpunctata* the aphid insects population achieved (25, 15, 9individuals /plant) on 3rd; 7th and 14th days respectively.

The suppression percentages of *M. persicae* individuals were (86.3, 83, 83.5 and 86, 84.2, 84%) on 3rd days after releasing with three treatments for the first and second seasons respectively. Then after 7 days of predators releasing the suppression percentage of *M. persicae* individuals were (89, 86, 88 and 86.7, 88.2, 92%) with three treatments for the first and second seasons respectively. At the end of the experiment, after two weeks of predators released, the reduction percentages reach its maximum (91.7, 91 and 95%) and (90, 88.5% and 92%) for the three treatments during two seasons, respectively. Generally in all cases, the numbers of consumption aphids had been eaten did not differ between three different treatments. These results agree with [32] who investigated the efficiency of the ladybirds *Hippodamia variegata* (Goeze) and /or *C. carnea* (Stephens) as biological control agents of the cotton aphid *A. gossypii*. The predator: prey ratios of 1:30 and 1:90 significantly reduced the population of *A. gossypii*. At 1:30 and 1:90 there was no difference in efficiency between the uses of the predators alone or in combination. Also, [33] tested two antagonist combinations, the parasitoid *Aphidius colemani* (Viereck) with the predator species *C. carnea* (Stephens) against *Myzus persicae* (Sulz.) on sweet pepper plants. They reported cleared that, compared to the release of the parasitoid alone the aphid mortality was increased slightly than combined release of parasitoid and predator. [34], indicated that biological control of whitefly on tomato plants in greenhouse using *Encarsia formosa* (Gahan) only was not effective in winter season. The addition of *Eretmocerus eremicus* (Rose and Zolnerowich) and *Dicyphus Hesperus* (Knight) had the positive effect in several cropping systems; *D. Hesperus* was the effective predator of all stages of whitefly. Also, [35] evaluated the prey preference of the omnivorous bug *Dicyphus tamaninii* (Wagner) (Heteroptera: Miridae) among 5 different prey species, and its interaction between three different natural enemies *Amblyseius cucumeris* (Oudemans) *Phytoseiulus persimilis* (Athias-Henriot) and *Aphidius colemani* (Viereck) commonly used in greenhouses. The results demonstrated that *A. cucumeris*, *P. persimilis*, and *A. colemani* individuals were attacked by *D. tamaninii* in absent of unparasitized *A. gossypii*.

Table 1: Interaction between *Coccinella undecimpunctata* (L.) and *Chrysoperla carnea* (Stephens) against *Myzus persicae* (Sulzer) infesting tomato plants in the first Season.

Treatment	No. of *Myzus persicae*/ plant before release	No. of *Myzus persicae* / plant after release (%)					
		3rd day		7th day		14th day	
	No	No.	%	No.	%	No.	%
C. undecimpunctata	145	21	86.3	15	89	9	91.7
control	133	120	-----	93	-----	75	------
C. carnea	140	21	83	15	86	9	91
control	125	120	-----	87	------	80	-----
C. undecimpunctata + *C. carnea*	142	11	83.5	9	88	6	95
control	121	100	-----	90	-------	88	------

Table 2: Interaction between *Coccinella undecimpunctata* (L.) and *Chrysoperla carnea* (Stephens) against *Myzus persicae* (Sulzer) infesting tomato plants in the second Season.

Treatment	No. of *Myzus persicae*/ plant before release	No. of *Myzus persicae* / plant after release (%)					
		3rd day		7th day		14th day	
	No	No.	%	No.	%	No.	%
C. undecimpunctata	137	25	86	15	86.7	9	90
control	121	115	-----	100	-----	80	------
C. carnea	135	20	84.2	15	88.2	10	88.5
control	122	91	-----	86	------	79	-----
C. undecimpunctata + *C. carnea*	140	10	84	9	92	6	92
control	120	89	-----	86	-------	79	------

Conclusion

The interaction of *Coccinella undecimpunctata* and *Chrysoperla carnea* caused insignificant suppressed of *Myzus persicae* population on tomato plants.

Coccinella undecimpunctata and *Chrysoperla carnea* releasing caused reduction percentages on *M. persicae* population compared with control as combination or alone.

Using of combination from *Coccinella undecimpunctata* and *Chrysoperla carnea* against *Myzus persicae* is prefer than using both alone.

Reference

1. EPPO. Data sheets on quarantine pests. *Tuta absoluta*. EPPO Bulletin, Paris: European and Mediterranean Plant Protection Organization. 2005: 35:434-435.
2. EPPO. First report of *Tuta absoluta* in Spain (2008/001). EPPO Reporting Services. Paris: European and Mediterranean Plant Protection Organization, 2008.
3. Mohamed Abdel-Raheem. The tomato leaf miner, *Tuta absoluta*, Biology, Morphology and Control, Lambert Academic Publishing, 2017. ISBN: (978-3-330-35031-1) 60 Pp.
4. Ismail IA, Abdel-Raheem MA. Evaluation of certain Entomopathogenic Fungi for Microbial Control of *Myzus persicae* (Zulzer) at Different Fertilization Rates in Potatoes. Bull. National Research Centre, Egypt. 2010: 35(1):33-44.
5. Vargas HC. Observaciones sobre la bio logia enemigos naturales de la polilla Del tomate, *Gnorimoschema absoluta* (Meyrick). Depto. Agriculture, Universidad Del Norte-Arica. 1970; 1:75-110.
6. NAPPO PAS. First detection of tomato leaf miner (*Tuta absoluta*) in Spain. North American Plant Protection Organization, Phyto sanitary Alert System. Retrieved April 18, 2008.
7. Korycinska A, Moran H. Plant Pest Notice: South American tomato moth, *Tuta absoluta*, Department for Environment, Food and Rural Affairs, Food and Environment Research Agency. 2009; 56:1-4.
8. Potting R. Pest risk analysis, *Tuta absoluta*, and tomato leaf miner moth. Plant protection service of the Netherlands, 2009, 24. www.minlnv.nl
9. Van Emden E, Harrington R. Aphids as crop pests. Wallingford, UK: CABI, 2007.
10. Silva AX, Jander G, Samaniego H, Ramsey JS, Figueroa CC. Insecticide resistance mechanisms in the green peach aphid *Myzus persicae* (Hemiptera: Aphididae) I: A Transcriptomic Survey. PLOS One, 2012, 7.
11. Tang YQ, Mayer RT. Effect of neem seed extract on the brown citrus aphid (Homoptera: Aphididae) and its parasitoid lysiphlebus testaceipes (Hymenoptera: Aphidiidae). Environmental Entomology. 2002; 31:172-176.
12. Muzammil, S., Muhammad, H. and Sajid, N. Biology of *Coccinella septempunctata* Linn. (Coleoptera: Coccinellidae) and its predatory potential on cotton aphids, *Aphis gossypii* Glover (Hemiptera: Aphididae). Pakistan Journal of Zoology. 2008; 40:239-242.
13. Roy HE, Freeman SN, Ormond EL, Thomas APM, Bell JK. *Coccinella septumpunctata* avoids the generalist entomopathogenic fungus *Beauveria bassiana*. p. 19–24. In: Int. Symp. Ecology of Aphidophaga perugia. Perugia, Italy, 19–24 September 2010, 310.
14. Slater R, Paul VL, Andrews M, Garbay M, Camblin P. Identifying the presence of neonicotinoid resistant peach-potato aphid *Myzus persicae* in the peach growing regions of southern France and northern Spain. Pest Management Science. 2011; 68:634-638.
15. Abdel-Raheem MA, Zakia A, Ragab. Using Entomopathogenic Fungi to Control the Cotton Aphid, *Aphis gossypii* Glover on Sugar Beet. Bull. National Research Centre, Egypt. 2010, 35(1):57-64.
16. Abdel-Raheem, M. A. Impact of Entomopathogenic Fungi on Cabbage Aphids, *Brevicoryne brassica* L. in Egypt. Bull. National Research Centre, Egypt. 2011: 36(1):53-62.
17. Zhang SK. Ecology of two *Encarsia formosa* (Gahan) strains and their control efficacy on tobacco whitefly, *Bemisia tabaci* (Genn.). J Bio. Cont. 2003; 18:97-103.
18. Zheng LK, Zhou YF, Song KH. Augmentative biological control in greenhouses: experiences from China. International Symposium on Bio logical Control of

Arthropods, Davos, Switzerland. 2005; 9(5):538-545.
19. Baverstock J, Roy HE, Brown PM, Ware RL, Majerus MEE, Pell JK. The invasive Coccinellid, *Harmonia axyridis*as an intra-guild predator of aphid specific fungus, *Pandora neoaphidis*. p. 38. In: 40th Ann. Meeting of soc. for invertbrate. Pathol. Quebic city, Canada. 2007; 224:12-15.
20. Guri MS, Godonou I, Leclercq S, Yoto GT, James B. Title Assessment of aphid ecology in vegetable systems and potential for biological control agents. Source Acta Horticulturae. 2011; (911):227-230.
21. Shalaby FF, El-Heneidy AH, Hafez AA, Bahy El-Din IA. Seasonal abundances of common *Coccinella* species in some economic field crops in Egypt. Egypt. J Agric. Res. 2008; 86(1):303-317.
22. Hatano E, Kunert G, Michaud JP, Weisser WW. Chemical cues mediating aphid location by natural enemies. European Journal of Entomology. 2008; 105:797-806.
23. Eraky SA, Nasser MAK. Effect of constant temperatures on *Coccinella undecimpunctata* L. (Coleoptera: Coccinellidae). Assiut J Agric. Sci. 1993; 24:223-231.
24. El-Hag EA, Zaitoon AA. Biological parameters for four *Coccinella* species in central Saudi Arabia. Bio. Control. 1996; 7:316-319.
25. Abou-Bakr HE. Bio cycle of *Parachrysopa pallens* (R.) as influenced by nourishment on two different preys (Neuroptera: Chrysopidae). Proc. Int. Cont. Econ. Entomol. Cairo, Egypt. 1989; 11:25-31.
26. Williamson FA, Smith A. Bio pesticides in crop protection. Agrow report (DS-95) PJB Publications, 1994, 120.
27. Yuksel S, Goemen H. The effectiveness of *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) as a predator on cotton aphid, *Aphis gossypii* (Glov) (Homoptera: Aphididae). Proc. Second Turkish Nat. Congr. ENT, 1992, 209-216.
28. Salem SA, Abdel-Raheem MA. Interrelationships among some aphids and their host plants. Swift journals of Agricultural Research. 2015; 1(4):41-46.
29. Abdel-Raheem MA, Lamya Ahmed, Al-Keridis A. Virulence of three Entomopathogenic Fungi against White fly, *Bemisia tabaci* (Genn.) (Hemiptera: Aleyrodidae) in Tomato Crop. Journal of Entomology. 2017; 14(4):155-159.
30. Henderson CF, Tiliton WA. Test with acaricides against the wheat mite. J Econ. Ent. 1955; 48:157-161.
31. SAS institute. SAS/ Stat user’s guide, 6.03 ed. SAS institute, Cary, NC. 1988.
32. Zibai KM, Hatami BH. Singular and joint usage of third larval instars of *Hippodamia variegate* (Goeze.) and *Chrysoperla carnea* (Steph.) in biological control of *Aphis gossypii* (Glover) in greenhouses in Iran. J Sci. Technol. Agric. Nat. Res. 2001; 4(4):19-128.
33. Wiethoff JA, Meyhofer RM, Poehling HM. Use of combinations of natural enemies for biological control of *Myzus persicae* (Sulzer) (Hom. Aphididae) on sweet pepper *Capsicum annuum* L. in greenhouses. [German]. Gesunde Pflanzen, 2002; 54(3/4):126-137.
34. Lambert LH, Chouffot TG, Tureotte GK. Lemieux MS, Moreau JA. Biological control of greenhouse whitefly (*Trialeurodes vaporariorum*) (Westwood) on interplanted tomato crops with and without supplemental lighting using *Dicyphus hesperus* (Quebec, Canada).Bulletin Organization Internationale de Lutte Bioiogique et integree (OILB) / Section Regionale Ouest Palearctique (SROP). 2005; 28(1):175-178.
35. Ghabeish IL, Saleh A, Dababat AE. Prey preference, interaction with selected natural enemies and alternative nutritional sources of the mirid bug *Dicyphus tamaninii* (Wagner). Turkish J Agri. and Forestry. 2010; 34(5):415-420.