



Research Article

Estimation of the numerical number of some insect predators on four tomato cultivars

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Abstract

The results of the study on tomato cultivars (AMWAJ, NOUN, MAESTRO, BAYAN) in tomato fields located in the Dujail region of Salah al-Din governorate showed that insect predators were present in abundance in the tomato crop, as the average number of pests for the cultivar was in the two regions Dujail1 and Dujail2 (the average is the larvae of the predator), 7.46, 6.75, and 6.39, respectively. As for the (average of predatory animals), they were 21, 5.29, 4.56, and 3.23, respectively.

Keywords: Predator, cultivar, Tomato, predatory animals

Introduction

The tomato plant, *Lycopersicon esculentum*, is one of the main vegetable crops in the world, which belongs to the Solanaceae family. The western part of the South American continent is the original home of the tomato, and it is one of the economically important vegetable plants with high nutritional value. The estimated production of the tomato crop in Iraq is about 619.6 thousand tons for the year 2020 (Ministry of Planning, 2021).

Ripe tomato fruits contain vitamins A, and C, a small number of vitamins K, and B, sugary and fatty substances, and minerals such as iron, copper, sulfur, potassium, phosphorus, and calcium. Cancer and the leaves and stems contain glucoside citruid alkaloids, the most important of which is photomatin (Al-Qahtani, 2009).

The tomato plant is affected by many fungal, bacterial, viral, or physiological pathogens that affect its production (Boulhout and Hamidouche, 2013). As for pests, they are defined as any living organism that infects a person or his property (plants or animals) and causes him harm. Insects are among the pests, as well as part of the microbes, animals, parasites, birds, snails, and rodents. The tomato plant, *Lycopersicon esculentum*, is

infected with many of them. Insect infections top the list of pests that affect this crop. (Al-Issa, 2017). Among the agricultural pests that afflict tomato plants during the growing season is the whitefly, *Bemisia tabaci*, the tomato leaf miner, *Tuta absoluta* of green plums, *Myzus persicae*, as well as the red two-spotted tit, *Tetranychus urticae*, which causes quantitative and qualitative losses in yield (Howedy et al., 2013).

There are predators and parasitoids in the Iraqi environment that have an important role in reducing the number of pests, and there are many predators and parasitoids of these insect pests, including the seven-pointed ladybug, *Coccinella septempun*, the lion of the carnea *Chrysoperla*, and many wasps and types of ants (Shaaban and Nizar, 1993).

Materials and methods of work

Field setup

Agricultural land was identified within the borders of the Dujail / Salah al-Din district, with an area of 2500 square meters. It was plowed, leveled, and smoothed. Then the land was planned and narrow lines 30 cm wide were opened for it, by the use of drip irrigation technology to irrigate it. A distance of 2 meters was left between one line and another

line, then Dab fertilizer was added. At the rate of one kilogram for each line, the calibration irrigation process was carried out by operating the drip system until confirmation of the regularity of the irrigation process.

Preparing the planting seeds

Seeds of the first-generation hybrid tomato plant, F1, imported and registered in Iraq by the Ministry of Agriculture and commonly cultivated among farmers, were brought from the offices selling agricultural supplies in Salah al-Din, which are mentioned below.



Fig. 1 Preparing a field for tomato cultivation

Table 1. Tomato varieties used in the experiment

Product Name	The Producing company	Importing company	Country of Origin
MAESTRO - F1	Nickerson-zwaan	Dabban	Holland
AMWAJ - F1	Polaris	Kermina	USA
NOUN – F1	OHLSENS ENKE	beautiful key	Holland
BAYAN - F1	Quality vegetable	farmhouse	Taiwan

Cultivating the field

The seeds of four tomato varieties referred to above in the table were planted using a prepared and sterilized peat moss for the requirements of horticultural nurseries, then it was re-sterilized again with a commercial solution of 37% formalin at a dilution rate of 1 formalin: 9 water, where the peat moss was moistened and then placed under a polyethylene cover for a period of 3 days and then it was ventilated and left for 1 week to remove the remnants of the solution, to avoid its effect on the percentage of germination of tomato seeds (Al-Khazraji,

2020) in a cork dish with dimensions of 80×30 cm, and one dish contains 72 cells. Each cell contained a seed, and the seeds were watered until germination and the seedlings reached a height of 15 cm. The field was irrigated a day before planting, after which the tomato seedlings were transferred on 2/15/2020 to the field, where the seedlings were sown on 30 lines, the distance between one plant and another was 50 cm, and the distance between one line and another was 2 m. Some seedlings were also planted in sticks for laboratory examination.



Fig. 2 Tomato seedlings and seedlings

Service operations were carried out for the crop, including irrigation after the completion of cultivation, and continued irrigation as needed and at regular times according to the plants' need for water. All usual agricultural practices were followed and no chemical pesticides were used during the study period. Samples were taken two weeks after the date of planting the seedlings and continued until the crop was harvested. The intervals between each sample were 7 days, and 45 samples were collected from each class for each replicator, which was randomly selected. The samples were

transferred to the laboratory in tubes containing 70% ethyl alcohol, and the number of insect species was counted.

Predators

Predators were collected through air nets after observing them and observing the effect of predators on pests, where they were collected in plastic tubes of 15×25 cm and sent for diagnosis: ladybugs, aphids, Syrphidae flies and predatory bugs from the field for adults, while the larvae were collected using a soft brush.

Statistical analysis

A randomized complete block design (R.C.B.D) was applied to the field experiment, and the data were analyzed using an

ANOVA table. These data were tested by Duncan's Multiple Range Test at a probability level of 0.05 (Al-Rawi and Khalafallah, 1980).

Table 2. The number density of predator larvae in tomato

Average group	Average Region	<i>N. tenuis</i>	<i>C. carnea</i>	<i>Allograpta</i> sp.	<i>C. septempunctata</i>	Region	Te group
6.39 C	5.33 D	12.67 A	4.00 bc	4.00 bc	0.67 d	Dujail 1	Bayan
	6.00 CD	13.00 A	3.00 c	3.00 c	5.00 b	Dujail 2	
		12.84 a	3.50 b	3.50 b	2.84 b	Average treatment in Bayan	
6.75 C	5.67 D	15.00 a	3.67 c	3.67 c	4.33 bc	Dujail 1	MAESTRO
	7.83 C	16.00 a	5.00 bc	4.33 bc	6.00 b	Dujail 2	
		15.50 a	4.34 b	4.00 b	5.17 b	Average treatment in MAESTRO	
7.46 B	6.83 C	12.33 b	5.00 c	4.33 c	5.67 c	Dujail 1	NOUN
	8.08 BC	16.33 a	4.33 c	5.67 c	6.00 c	Dujail 2	
		14.33 a	4.67 b	5.00 b	5.84 b	Average treatment in NOUN	
9.87 A	10.83 A	18.00 a	6.00 d	9.33 c	10.00 c	Dujail 1	AMWAJ
	8.91 B	15.33 b	5.00 d	6.00 d	9.33 c	Dujail 2	
		16.67 a	5.50 c	7.67 b	9.67 b	Average treatment in AMWAJ	

Results and discussion

The density of predator larvae in tomato

The results of Table 1 indicate that the average of the two regions Dujail1 and Dujail2 showed that the number of predator larvae was more abundant in the AMWAJ variety, with some significant differences from the MAESTRO variety and from the NOUN variety, which was not significantly different from the Bayan variety, as the average of the two regions was 9.87, 7.46, 6.75, 6.39, respectively.

As for the region average, the Dujail1 region excelled in the AMWAJ variety compared to the Bayan variety for the same

The region, with significant differences, as the regional average reached 10.83 and 5.33, respectively.

Meanwhile, for the average predator (average pest according to treatments), the predator density of *N. tenuis* was higher than that of *C. septempunctata*, *Allograpta* sp. , *C. carnea* with no significant differences on the AMWAJ cultivar, as the density was 16.67, 9.67, 7.67, and 5.50, respectively, compared to the predator *N. tenuis* on the Bayan cultivar, which differed significantly from the predators *C. carnea*, *Allograpta* sp., *C. septempunctata* with no significant difference between them and for the same cultivar, reaching 12.84, 3.50, 3.50, 2.84, respectively.

Similar uppercase and lowercase letters horizontally and vertically mean that there are no differences between them at a probability level of 0.05.

Table 3. Number of predators in tomato

Average group	Average Region	<i>N. tenuis</i>	<i>C. carnea</i>	<i>Allograpta</i> sp.	<i>C. septempunctata</i>	Region	the group
3.23 B	3.55 D	8.67 a	0.67 c	3.33 B	1.33 bc	Dujail 1	Bayan
	2.91 D	7.00 a	0.67 c	2.00 B	2.00 b	Dujail 2	
		7.84 a	3.50 b	2.67 B	1.67 b	Average treatment in Bayan	
4.56 B	4.58 CD	9.00 a	3.00 b	3.33 B	3.00 b	Dujail 1	MAESTRO
	.433 CD	8.00 a	3.00 b	3.00 B	3.33 b	Dujail 2	
		8.50 a	4.00 b	3.17 B	3.17 b	Average treatment in MAESTRO	
5.29 B	4.25 CD	6.33 b	3.00 c	3.67 C	4.00 c	Dujail 1	NOUN
	6.34 B	12.00 a	3.00 c	6.67 C	3.67 c	Dujail 2	
		9.17 a	5.00 b	5.17 B	3.84 b	Average treatment in NOUN	
9.21 A	9.75 A	11.33 a	9.67 ab	9.00 B	9.00 b	Dujail 1	AMWAJ
	8.66 A	9.00 b	9.00 b	9.67 D	7.00 c	Dujail 2	
		10.17 a	7.67 b	.933 Ab	8.00 b	Average treatment in AMWAJ	

Numerical density of integumentary predators in tomato

The results of Table 2 showed, through the average of the two regions Dujail1 and Dujail2, that the number of complete predators was more abundant on the AMWAJ variety also, with significant differences from the NOUN, MAESTRO, and Bayan classes, with no significant difference between them, as the average of the two regions was 9.21, 5.29, 4.56, 3.23, respectively.

While the average of the region, as the Dujail1 region excelled in the AMWAJ variety, with no significant difference from the Dujail2 region, compared to the Bayan variety of the Dujail2 region, with no significant differences from the Dujail1 region, as the average of the region was 9.75, 8.66, 2.91, and 3.55, respectively.

At the same time, the average predator (average pest according to treatments), the density of the predator *N. tenuis* was higher than that of the predators *Allograpta* sp., *C. carnea*, *C. septempunctata*, with significant differences on the AMWAJ cultivar, as the density reached 10.17, 9.33, 8, 7.67, respectively compared to the predator *N. tenuis* on the cultivar Bayan, which differed significantly from the predators *C. septempunctata*, *Allograpta* sp, *C. carnea* with a

significant difference for the same cultivar, reaching 7, 2, 2, 0.67.

Similar uppercase and lowercase letters horizontally and vertically mean that there are no differences between them at a probability level of 0.05.

From the foregoing in Tables (2, 3) it is clear that the increase in the number of prey has a clear effect on increasing the predatory efficiency of the predator, which in turn affects the period of growth and the speed of development, and this is similar to (Holling, 1965), (Murdoch and Oaten, 1975) who mentioned that predators eat More prey in the high population density of the prey compared to the low population density, and then it grows faster and kills more prey because of its larger size. The results are also similar to those (Yüksel and Göçmen, 1992), (Atlihan and Özgökçe, 2004) when they indicated that the rate of consumption of the third larval stage of the predator *C. carnea* was higher compared to the rate of the first and second larval instars and that the more predation is a reasonable reflection of the size The largest, which leads to more gluttony, in addition to the increase in the speed of movement with the advancing larval stages of age may play the same role. Also, the results of the study, in its general

framework, are similar to the results reached by (Al-Taie, 2010) when it was stated that the predator *C. carnea* is highly efficient in attacking and consuming nymphs and adults of aphids and that its efficiency increases with the development of the age stages of the predator, reaching the third most voracious larval stage.

From this, we conclude that the feeding of larvae on different densities of aphid nymphs affects the duration of pupal growth and is inversely proportional, and these results are similar to (Hamad and Muhammad, 2008) who indicated that the increase in both survival rates of the larval stage and the rates of emergence of adults the predator the green lion aphid *C. mutata* increases with the number of prey consumed in the larval stage. These results also agreed with (Abdul-Rahman and Jawad, 2012).

These results were close to the results of Al-Jassani and Monji (2017), who confirmed the susceptibility of infection of some local watermelon cultivars with sap-sucking insects such as the white fly, *Bemisia tabaci* gen, *Aphis gossypii* Glover and cotton thrips, *Trips tabaci* Lind, and estimated the density of their numbers and their enemies, such as the predator of the eleven-pointed ladybug *C. undecimpunctata* and *C. carnea* aphids during the spring season 2014 in the fields of the College of Agriculture, University of Baghdad.

Nesidiocoris tenuis is a useful insect for pest population management in some countries such as Egypt and France, *Nesidiocoris tenuis* is a pest of tomato, while in Sicily, Spain, and many other countries, it is useful for biological control (Castañé et al., 2011). *Nesidiocoris tenuis* has been used to successfully control whitefly in protected fields (Calvo et al., 2012). Various experiments were conducted in greenhouses to evaluate the efficacy of *Nesidiocoris tenuis* on indoor pests. These pests include the whitefly (*Bemisia tabaci*) on tomatoes, and the thrips *Frankliniella occidentalis* Pergande (Thysanoptera: Thripidae) on sweet pepper (Calvo et al., 2012; Sanchez note, 2008; Bouagga et al., 2018) showed that *Nesidiocoris tenuis* increases when the whitefly population is high and vice versa. Getting the right ratio of predator to pest is important to achieve successful pest control and minimize damage to plants when prey numbers are low or absent (Desneux et al., 2010; Calvo et al., 2012; Kim et al., 2016).

Syrphidae larvae are important predators, especially of hemiptera pests (Mengual et al., 2009). In Brazil *Allograpta* species are used as natural biological control agents for *Gyropsylla spegazziniana* (Borges and Lazzari, 2008). It is a predator of the whitefly (*Bemisia tabaci* Gennadius, 1889) and *Trialeurodes vaporariorum* Westwood, 1856 (order Hemiptera and family Aleyrodidae) in tobacco, cotton, tomato, cabbage, soybean, melon, and eggplant crops (Oliveira et al., 2003). Some species of *Allograpta* have also been recorded to be associated with several species of aphids, and have an important role in the natural biological control of this group. It was also found feeding mainly on aphids that

infest citrus and subtropical fruit trees, corn, alfalfa, cotton, grapes, lettuce, and ornamental plants, as well as many wild plants (Ghahari, 2008; Resende et al., 2006) reported that *Allograpta exotica* is the most abundant species of Syrphidae collected from cabbage leaves on which aphids feed.

Conflict of Interest

The author hereby declares no conflict of interest.

Consent for publication

The author declares that the work has consent for publication.

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