



# SEASONAL PRESENCE OF APHID NATURAL ENEMIES AND EFFECT OF THE FUNGUS *LECANICILLIUM LECANII*, IGR MULIGAN AND THE PESTICIDE CONFIDOR ON THE SEVEN-SPOT LADYBIRD *COCCINELLA SEPTEMPUNCTATA*

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## Abstract

A study was conducted in 2015 and 2016 to find the seasonal presence of *Coccinella septempunctata* and relative effectiveness of the fungus *Lecanicillium lecanii* (Zimmerman), insect growth regulator (Muligan), and the pesticide Confidor of the aphids natural enemies which infect the wheat plants (Ebaa 99 Variety) in the field and laboratory. The results revealed the presence of two species of ladybird, *Coccinella septempunctata* and *C. undecimpunctata*; one species of flowers flies, Syrphidea, and four Hymenoptera parasitoids, (three of them Braconidae and the other Aphelinidae). Also have been diagnosed fungal diseases, *Uocladium* sp and *Fusarium* sp. Both species of beetles appear at the beginning of January and increased to reach its peak at mid-February and then began to decline until the disappearance at mid-April. Flowers flies and parasitoids started to appear in December and reach its peak at mid-February then start to decline until the disappearance at April. The impact of the fungus *L. lecanii* concentration ( $1.5 \times 10^7$ ) spore / ml on *C. septempunctata* adults was less than the insect growth regulator, Muligan and pesticide Confidor. The relative effectiveness of the fungus was 6.67% at 14 days post-treatment while it was 26.67% and 66.67% for the insect growth regulator Muligan and the pesticide Confidor respectively with significant differences.

**Key words :** *Lecanicillium lecanii*, IGR Muligan, *Coccinella septempunctata*.

## Introduction

The importance of agriculture in the insurance needs of the community and they enjoy what they want to the consumption of agricultural products as well as achieving satiated them and are not subjected to poverty and famine. Cereal crops are the boundary between the human race and famine (Mangelsdorf, 1966). The wheat, corn, and rice, which has small grains constitute the most important element in the human food, and amounted about 42.5% calories in food. In Iraq, the wheat area planted was estimated at 4147 acres in 2015. Wheat crop infested by different pests from the planting until harvest, aphids species the most important, it affects on all varieties, causing extensive damage as a result of absorption of plant sap from the leaves, stalks and the ears, influential on the vitality and production of the plant. Four species of aphids was recorded infested wheat crop, cereal aphid *Schizaphis graminum* (Rondani), corn leaves aphid *Rhopalosiphum maidis* (Fitch), Bird cherry-oat aphid

*Rhopalosiphum padi* (L.), and the English grain aphid *Sitobion avenae* (Fab.) (Ashfaq and *et al.*, 2007; Akhtar *et al.*, 2010; Herbert *et al.*, 2014 ). A range of pesticides used to control aphids, as Confidor, and insect growth regulator Muligan. The random use of these pesticides has led to a breach of the ecosystem and the impact on non-target organisms, especially natural enemies, including predators Coccinelidae family, which is of great biocontrol agent in the biological control of aphids.

Female fertility of the predator *Coccinella septempunctata* affected adversely when it fed on aphid individuals treated with insect growth regulator, which trend touse of substitution on pesticides in combat the aphids such as fungus *Verticillium lecanii* , which mainly used to control scale insects. Aphids and white fly that infest a wide range of crop, *V. lecanii* used successfully to control *Aphis gossypii* in laboratory and greenhouse, its effectiveness reached to 96.7% (Anderson *et al.*, 2007; Chavan and others, 2008). So This study conducted to

determine the seasonal presence of natural enemies that attack aphids on wheat in Baghdad and to the effectiveness of the insect growth regulator Muligan, chemical pesticide Confidor and the fungus *Verticillium lecanii* on the *C. septempunctata*.

## Materials and Methods

### The cultivation of the wheat plants

The cultivation of Wheat crop variety Ebaa 99 planted in the College of Agriculture / University of Baghdad fields in the Jadiriya agricultural season 2015-2016. A chosen land area of 672 m<sup>2</sup> and carried them all the recommended processes to serve the crop before planting by tilling and arrangement, modify and made main Runnels width 2 m and secondary Runnels width 1.30m, the land was divided into 70 replicates in dimensions (2m × 2 m), everyone be divided for ten lines, the distance between line and last 20 cm, compound fertilizer (DAP) Diamonium phosphate was added before sowing process.

### *Rhopalosiphum padi* cultures

The Oats aphid *Rhopalosiphum padi* were collected from wheat field in Baghdad / Jadriya University, where maintained under greenhouse conditions in the Ministry of Science and Technology / Department of Agricultural Research for several generations fed on wheat plants variety of 99 planted in plastic utensils diameter of 5 cm and a height of 10 cm containing soil composed of clay and Pettmos., put utensils inside the cage along the rib 56 cm.

### Collect ladybird seven-spots *sempunctata occinella*

Ladybird stages were collected from the same wheat field using perforated plastic cans and transferred to wheat plants had been infested with aphids, to perpetuate the colony aphids added to feed ladybirds until growth and access to adult stage.

### Preparation at concentrations of insecticide Confidor, insect growth regulator Muligan and fungi *L. lecanii*

#### Pesticide confidor

The active ingredient of the pesticide is Amidacloprid 200gm / Lt, the user trade name

Was Konfprem, the concentration used was 12 ml / 20lit.

#### Insect growth regulator Muligan

The active ingredient is Pyriproxyfen 100gr Lt, lotion commercial user EC 10%, Insecticide inhibits the growth and development of larvae the concentration Used 50 ml / 100 liters.

### Preparation isolation of fungus *L. lecanii*

In This study used local isolation of the fungus *L. lecanii*, which obtained from the Department of Agricultural Research / Ministry of Science and Technology and activated to ensure the vitality and the purity of the fungus, the isolate was grown and mentioned at the PDA media, the active isolation was transmitted by cutting a small piece of the outer edge by a sterile needle and transmit it to the plastic dish center containing PDA media, dishes incubated at a temperature of  $2 \pm 25$  °C until the colonies growth is complete, the contaminated farms were excluded and pure farms preserved in the refrigerator until used.

### Estimate the population densities of the aphids natural enemies

When the aphids sampling estimated, the natural enemies were calculated, it has been sampling a weekly out of the field by taking 50 plants (sample) in orthogonal diagonals style by cutting 25 plants of each pole and sampling continued weekly until the end of April / 2016, Samples were placed in plastic bags and transported to the laboratory for further investigation.

### Study the relative effectiveness of the pesticide chemical Confidor, insect growth regulator Muligan and fungus *L. lecanii* on the seven-spot ladybird *Coccinella septempunctata*

The Adults were treated on 04/01/2016 and left for 20 minutes, then transferred by brush to plastic cans where It was moved every 10 insects in to plastic can height of 10 cm and a diameter of 5 cm, with a perforated sides for ventilation, contain wheat's leaves infected by aphids, with three replicates for each treatment, the cans are closed by two layers of soft cloth and put in the Incubator, results were recorded after 1,3, 7.9 and 14 days of treatment. The relative effectiveness was Calculated and the results corrected by Abbot equation, 1925.

## Results and Discussion

### The Population density of aphid natural enemies on wheat plants

Fig. 1 show the population densities of natural enemies during the wheat planting season, (ladybird of seven spots and ladybird of 11 points) began to appear since the beginning of January in density of 3 insect / sample at a temperature 18°C and relative humidity 86%, then increase to reach its peak of 14 insect / sample in mid-February when the temperature was 23.92°C and relative humidity of 50.13%, then the numbers gradually decline to 0 insect / sample in mid-April, when the temperature was 30.87°C and relative humidity 62.98%,

while The syrphid flies appeared in the field it was 2 insect / sample in December at a temperature 12.34°C and relative humidity 69.47%, then started to increase until it reached 10 insect / sample at mid-February. At mid-March, the temperature was 24.9°C and relative humidity 51.93%, the density increased, 11 insect / sample. After that, the density decreased until disappeared in mid-April, when the temperature reached 30.87°C and relative humidity 62.98%.for the parasitoids were presence in the field in early of December at temperature 12.34°C and relative humidity 69.47% in 8 Mummies / sample, then declined to 3 Mummies / sample at mid-February, when the temperature was 21.35°C and relative humidity of 70.59%, then increased even reached 10 mummies / sample in mid-March at a temperature of

24.9°C and relative humidity of 51.93%, then decline even became 0 mummies / sample in mid-April, when the temperature 30.87°C and relative humidity 62.98%. The natural enemies were present wherever the prey was existed because they are biotic factors that based on the population density of prey( density dependent factors) and these prey affected greatly by a type and abundance food,temperature and relative humidity. it notes that the enemies do not exist on the mature dry wheat,which non-existence of aphids on plants where it migrated to other plants and grasses. predators and parasitoids are important natural factors its significance come due to its distinguished performance in the normal arrangement of pest, because of increased its attack rate wherever the pest numbers increased, rate of parasitism and predation changed accordingly to changing of prey density, and directly proportional with the increase of the pest intensity

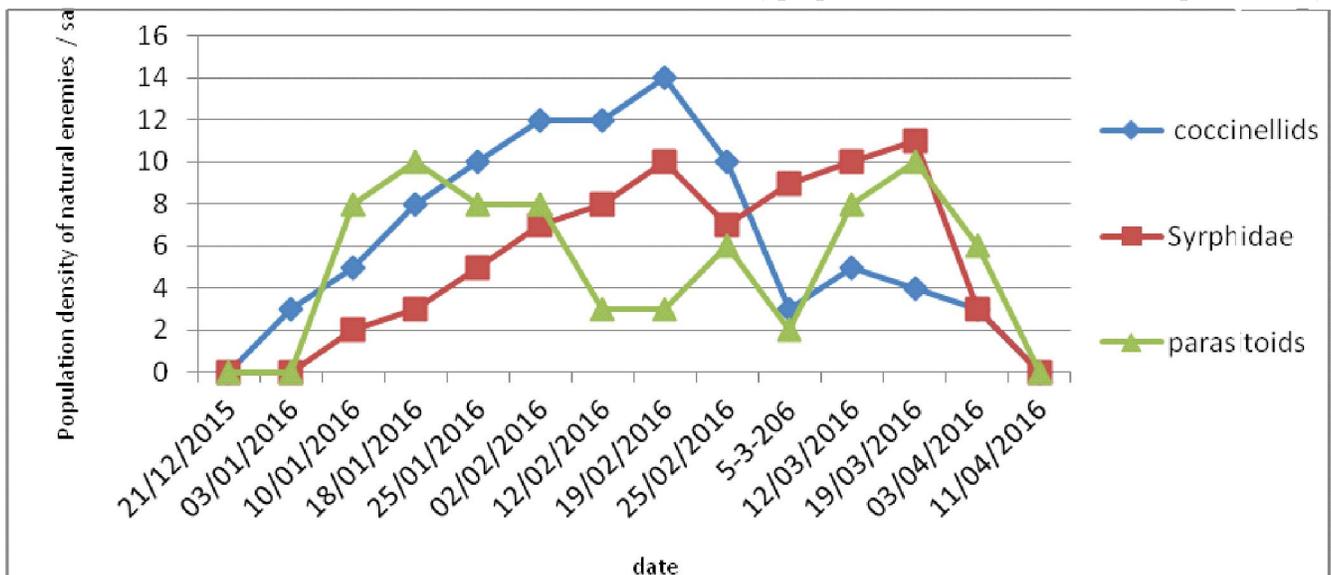


Fig. 1: Population densities of the aphid natural enemies during wheat growth season 2015-2016.

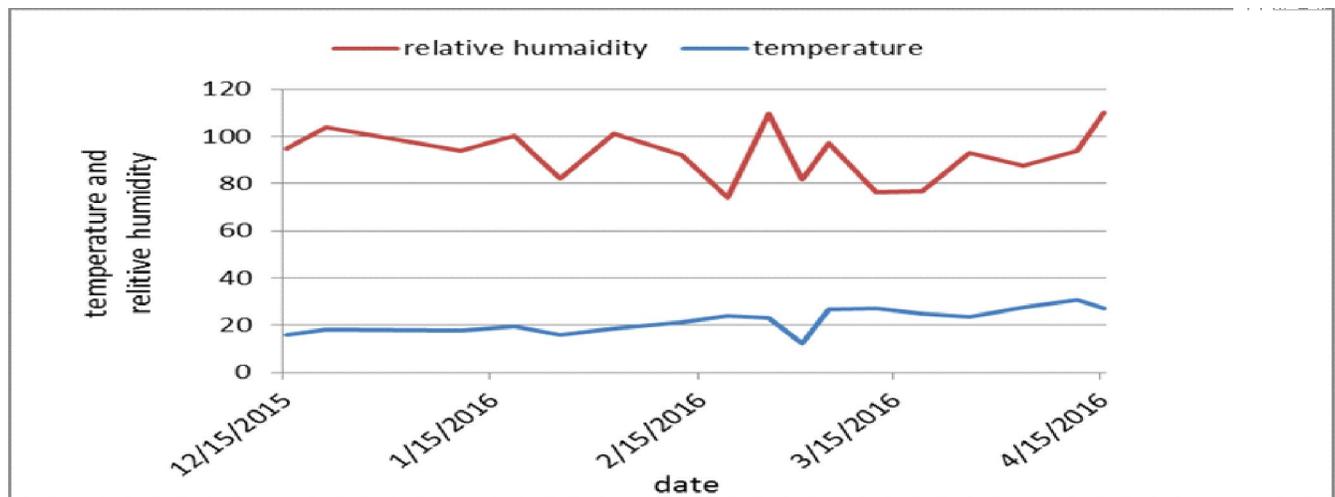


Fig. 2: Temperatures and relative humidity during the wheat growth season 2015-2016.

and thus affects of the reproduction rate for these enemies, so these enemies and prey was linked closely positive with its hosts (Holling, 1965; Smith and Tropp, 2002; Soni and Singh, 2013).

### The relative effectiveness of chemical pesticide Confidor, insect growth Mulligan and the fungus *L. lecanii* on predator *Coccinella septempunctata*

In table 1 the results showed the relative effectiveness of the concentration  $1.5 \times 10^7$  spore / ml fungus *L. lecanii* and insect growth regulator Muligan and pesticide Confidor on the predator *Coccinella septempunctata*, which did not give any killed during the first day of treatment, while Confedor gave relative effectiveness at third day of treatment which reached 40% while the insect growth regulator and fungus did not cause death, at the seventh day of treatment observed the increase of relative effectiveness of Confidor which reached to 53.3% while insect growth regulator and fungus not effectiveness on that day, in the ninth day of treatment the relative effectiveness of pesticide reached to 63.3%, while reached 20% for the insect growth regulator, while the fungus still not effective, at 14th day of treatment the relative effectiveness of confidor reached to 66.67% while reached to 26.67% and 6.67% for growth regulator and fungus, respectively, with significant difference.

Value of least significant differences of means (5% ) L.S.D :

Between treatments = 4.159 , Between periods = 5.370 , Between treatments and periods = 9.301

from the results observed reduction the rate infection of fungus *L. lecanii* against predator adults results not filled with Mehmet (2008), who reported that the relative effectiveness of the isolation of *L.lecanii* concentration  $10^5$  spore / ml reached to 50% after eight days of treatment in the ladybird adult *Coccinella septempunctata* L., the difference in results may be due to the difference in concentration of fungus and a way of treatment on ladybird adult , Steenberg and Hardling (2009) told that the ratio of injury ladybird *Harmonia axyridis* by *Lecanicillium* sp. reach to 16% of the total pathogenic fungi that infect

**Table 1:** The relative effectiveness of the pesticide Confidor, insect growth regulator Muligan and the fungus *L. lecanii* on adults of *Coccinella septempunctata*.

Rate 44.67	Relative efficacy / day					Treatment
	1		7	9	14	
9.33	0.0	Confidor	53.3	63.3	66.67	Confidor
1.33	0.0	Muligan	0.0	20	26.67	Muligan
rate	0.0	<i>L. lecanii</i>	0.0	0.0	6.67	<i>L. lecanii</i>

insects in the field. Khani and others (2012) also mentioned that the pesticide Imidacloprid have a toxicity on ladybird *Cryptolaemus montrouzieri* when feed on cortical insects of citrus.

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