

## EFFECT OF SOME INSECTICIDES ON APHID INSECT *MYZUS PERSICAE* (Sulzer) AND IT'S PREDATORS AND PARASITES

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### ABSTRACT

Present study aimed to determine the effects of three insecticides which were Actara, Match and Nimex on *Myzus persicae* (Sulzer) and on it's both parasite *Aphidius matricariae* Haliday and predators *Coccinella septempunctata* L. and *Coccinella novemnotata* Herbst. Results showed that all three insecticides effected parasitic efficiency, of *Aphidius matricariae* and Nimex recorded highest mortality rate on *Myzus persicae* (Sulzer) which was 98-73. All three used pesticides (Actara, Match and Nimex) affected predatory and parasitic efficiency after direct exposure, while less effects the same pesticides on predator efficiency of both *C. septempunctata* and *C. novemnotata* have been recorded after indirect treatment.

**Keywords:** *Coccinella septempunctata* L. and *Coccinella novemnotata* Herbst.  
Insecticides( Actara, Match and Nimex)

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### INTRODUCTION

The use of selective pesticides and safe methods which specific only there target (pest) doesn't affect to natural enemies that highly efficient in reducing the number of prey specially aphids and other insect families that important to the biological control such as Coccinellid, including *Coccinella septempunctata* L., seven- spotted ladybird, and nine- spotted ladybird *Coccinella novemnotata* herbst (Al-Mallah, and Al-Mikhlaifi, 2005). Pesticide such as trigard has direct impact on aphids and reduce it is number without affecting the efficiency of their biological enemies (Al-Mallah and Ali, 2007).

According to the previous study by Abdel-Wali, *et al.* (2007), which reported that 0.5% concentration of trigard had a fatal effect on seven- spotted ladybird, in mean of 47.3 and 43 insect for both male and female respectively. Many insecticides such as Sumicidin, Abamectin, Pirimicarb and Actara have been used against insect pest of peach specially Aphids which attacks 44 plant families (Palumbo, 2011).

However, other investigation proved that pesticide like trigard not affected the predatory efficiency of *Coccinella novemnotata* and parasitic efficiency of *Aphidius matricariae* (Fuentes-Contreras *et al.*, 2007 and Saljoqi and Van Emdem, 2003). Actara pesticide which is derived from Benzoylphenylurea, considered as systemic insecticide it affects acetylcholine receptors in the central nervous system of insects (Silva *et al.*, 2012).

Recently, Botanical insecticides or plant extracts such as neem oil have been shown to be very effective against insects in many ways, the ingestion of green pesticides by insect cause death, however they are harmless for human( Silva *et al.*, 2012). The mode of action of Botanical pesticide have been explained by BaozhuZhong *et al.*(2017) and Fuentes-Contreras *et al.*(2007), that neem oil causes hormonal imbalance which prevent larval growth and cause death. Additionally, larvicidal effects of neem oil has been recorded against more than 200 insect species, also azadirachinewhich can be extracted from neem tree showed larvicidal activity by 60 to 70% after 3 to 14From treatment days(Palumbo *et al.*, 2008).Secondary plant product such as tetranortriterpenoid from neem leaves or seeds has bitter test which inhibit juvenile hormone in insect and result in death of insect from all stages of their (larvae, pupae and nymphs), thus, immune system of insect cannot response(Zanuncio *et a.*, 2016).

### MATERIALS AND METHODS

The present study was conducted during 2018 \_2017 at the department of Plant Protection - Faculty of Agriculture and Forestry University of Mosul, the investigation carried out under controlled laboratory condition (at an average temperature of  $20 \pm 5^{\circ}$  C and relative humidity  $45 \pm 5\%$ ). This study includes the following points:

#### First: Insect Breeding

The different life stages of the Spotted ladybird *Coccinellaseptempunctata* and Spotted ladybird *Coccinellanovemnotata* predator were collected from infected potato fields. The eggs(over 350 eggs) were kept in sterile plastic petri-dishes with a diameter of 9 cm and observed daily until hatching while larvae and adults were isolated in small breeding cages (10 x 20 x 15 cm) and provided with leaves of infected potato with aphids. Specialized cages have been used for the collection of aphids *Myzuspersica* from untreated field with pesticide for more than one season. All samples (ladybirds, aphids and parasite ) were sent for diagnosis at the Museum of Natural History in Baghdad.

#### Second: use of three insecticides against aphid insects:

Three different insecticides have been used against aphid insects, each with labeling recommended concentration which were Actara, Match and Nimexat concentration of 0.5, 0.4, 0.5 %, respectively. Five replications of each concentration were used for increased the rate of accuracy, each concentration prepared in 2ml while the control treatment was sprayed with 2 ml of distal water, each treatment included one refined 20 immature insect and placed on leafs of plant in a Petri dish was treated using 2 ml while the control treatment was sprayed with 2 ml of distal water. Finally, all readings recorded after 24 hours of incubation under laboratory controlled condition and results corrected by Abbott (1925). Third: Effects of three different pesticide according different treatment methods on aphid insects.

Table (1): Three used pesticide each with its active ingredients and origins.

Insecticides	Manufactured company	Groups	Active ingredients
Actara	Syngenta	Neonicatinoid	Thiamethoram 25/wg
Match	Syngenta switzerland	Benzoyalphenylurean	Lufenuron 5%
Nimex	JiangsRotam chemistry	Neem derived product	Azadiractin 4.5 G/L

Three different types of treatment have been used for each pesticide Actara, Match and Nimex each with its recommended concentration 0.05, 0.04, 0.05 ml/l, respectively. In order to determine the best efficiency, first treatment included leaf plant, second treatment included leaf plant with the aphids and third treatment included sprinkles of the plant leaf with both prey and predator. Each treatment which contains 100 insects (20 in each replicate) male or female 4 ml of pesticide prepared and hand sprayed. Five replications of each treatment increased the rate of accuracy and also for the purpose of comparison control treatment has been sprayed with 2 ml of distal water. Finally, all readings recorded after 24 hours of incubation under laboratory controlled condition. The death rate in ladybirds male and female were calculated after 5 days of treatment and the death rates were corrected by Abbott equation, longevity and death rate have been recorded after 5-10 days of parasitic infections. All results recorded and corrected by Abbott (1925). The results were analyzed using completely randomized design (CRD) and the Duncan test at a 5% probability level to determine the significant differences by using SAS program.

$$\text{Efficiency predator} = \frac{\text{No. Aphid. pred.}}{\text{total NO. Aphid}} \times 100$$

## RESULTS AND DISCUSSION

Present study aimed to determine the effects of three insecticides which were Actara, Match and Nimex on *Myzus persicae* and their natural enemies:

First: The effects of three insecticides on *Myzus persicae*. According to the results in the Table (2), Nimex recorded highest mortality rate which was 98-73 and followed by Actara and Match at the range of 96-71 and 87-63, respectively.

Table (2): Effects of Actara, Match and Nimex on *Myzus persicae*

Pesticide	Mortality%	
	Mean ± S.E	Range
Actara	72.16 ± 5.7 C	96-71
Match	74.4 ± 5.0 B	87-63
Nimex	82.8 ± 6.5 A	98-73
Control	8.75 ± 4.2 D	25-0

\* Numbers under the same letter or similar letters do not have significant differences according to Duncan polynomial test at a probability level of 5%.

Second: Effect of pesticides and different treatment methods on predatory efficiency of *C. septempunctata*, *C. novemnotata* and parasitic efficiency of *Aphidiusmatricariae*

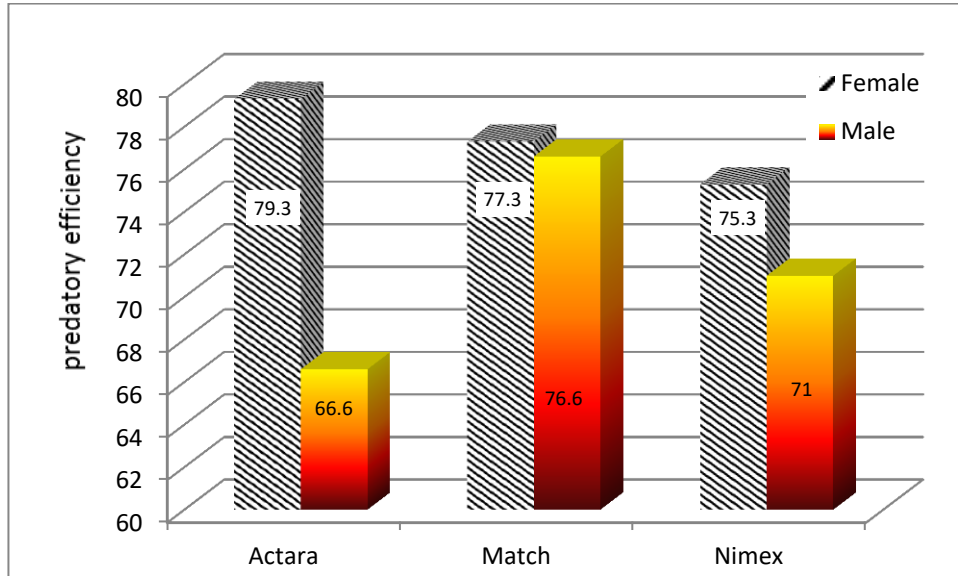
The effects of three treatment methods each with three insecticides for both female and male of *C.septempunctata* and *C. novemnotata* have been recorded. Results in Table (3) showed that different insecticides and treatment methods had significant effects on efficiency of predator, also present result showed the effects of different treatment methods on both male and female separately.

Table (3): Effects of Actara, Match and Nimex on predatory efficiency of *C. septempunctata*, *C. novemnotata* .

Gender	Predators	Pesticides	<i>C. novemnotata</i>		<i>C.Septempunctata</i>	
	Treatment methods		Mean $\pm$ SE	Range	Mean $\pm$ SE	Range
Female	First	Actara	83 $\pm$ 2.7 b	70-94	88 $\pm$ 3.4b	80-100
		Match	84 $\pm$ 3.5 b	71-97	98 $\pm$ 0.22 a	91-100
		Nimex	72 $\pm$ 4.2 c	65-88	90 $\pm$ 1.7ab	87-100
	Second	Actara	72 $\pm$ 1.2 c	84-76	88 $\pm$ 3.2b	83-100
		Match	65 $\pm$ 4.2 d	82-57	82 $\pm$ 3.4b	65-100
		Nimex	72 $\pm$ 1.2 c	80-65	78 $\pm$ 1.2c	61-100
	Third	Actara	57 $\pm$ 3.1 f	47-70	62 $\pm$ 2.8ef	52-80
		Match	31 $\pm$ 2.7 h	45-62	62 $\pm$ 3.4fg	74-45
		Nimex	43 $\pm$ 1.5 i	39-60	58 $\pm$ 6.2f	40-61
Male	First	Actara	77 $\pm$ 1.9 c	61-90	86 $\pm$ 4.2b	67-100
		Match	81 $\pm$ 1.5bc	76-88	94 $\pm$ 2. 6a	84-100
		Nimex	73 $\pm$ 2.4 c	62-79	82 $\pm$ 3.4b	65-90
	Second	Actara	74 $\pm$ 1.5 c	63-81	72 $\pm$ 1.2 c	65-92
		Match	57 $\pm$ 4.1 f	54-68	78 $\pm$ 1.4 d	62-88
		Nimex	65 $\pm$ 3.5 d	39-72	66 $\pm$ 2.6 d	41-88
	Third	Actara	48 $\pm$ 1.2 g	34-61	42 $\pm$ 6.4 i	35-67
		Match	49 $\pm$ 2.1 g	33-56	58 $\pm$ 2.6 f	47-82
		Nimex	35 $\pm$ 2.8 j	24-52	68 $\pm$ 1.2 d	60-76

\* Numbers under the same letter or similar letters do not have significant differences according to Duncan polynomial test at a probability level of 5%

Predator efficiency according to the interaction between insecticides and sex of *C.septempunctata* have been recorded regardless the methods of treatment, recorded result in male were 79.3, 77.3 and 75.3 for Actara, Match and Nimex, respectively. While recorded result in female were 66.6, 76.6 and 71 for Actara, Match and Nimex, respectively. As shown in Figure (1).



Figure(1): The effect of interference between the pesticide type and the sex of the predator regardless of the type of treatment and on the predatory efficacy of the seven point ladybird.

The recorded results for all three insecticides in both male and female were so close, as shown in figure (2).

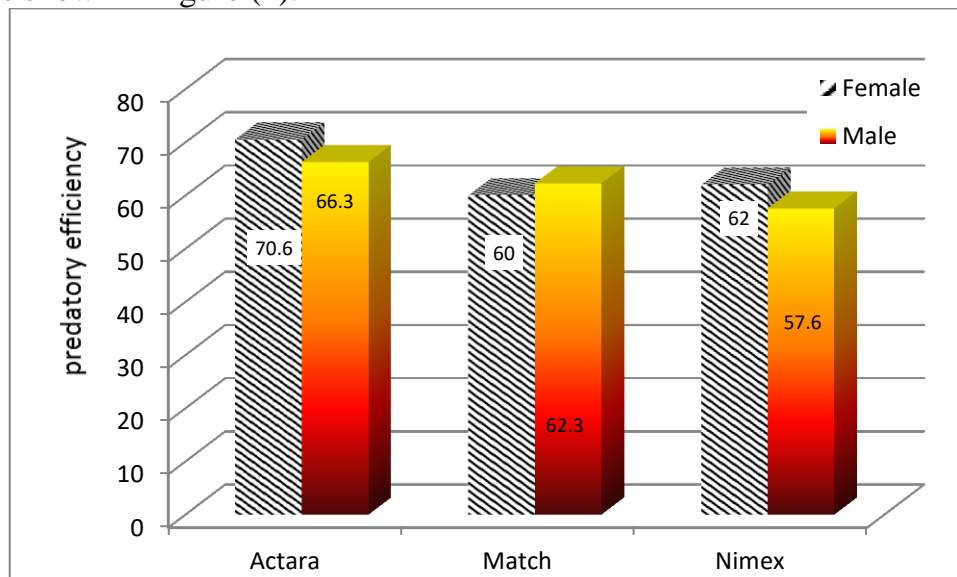
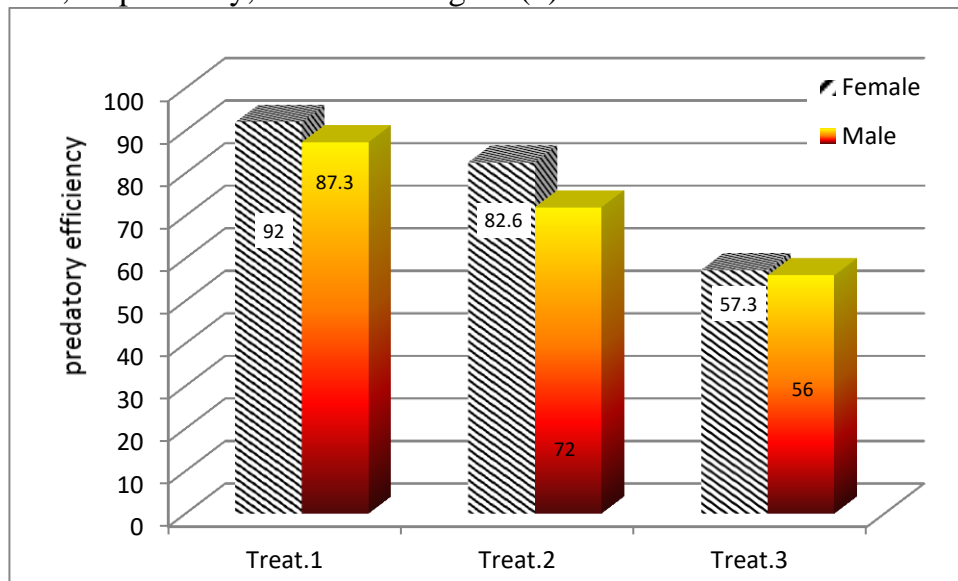


Figure (2): The effect of overlap between the pesticide type and the sex of the predator, regardless of the type of treatment, on the predatory efficiency of the ladybird *C. novemnotata*.

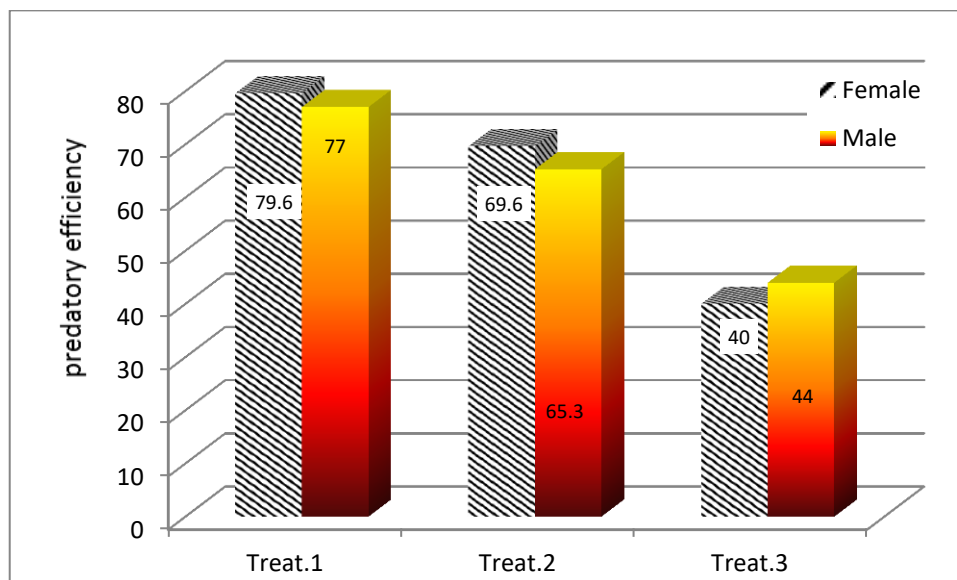
Predator efficiency according to the interaction between treatment methods and sex of *C.septempunctata* have been recorded regardless to the type of insecticide, recorded result showed that all treatment affected the predator

efficiency, however third treatment had close affected in both male and female by 56 and 57.3, respectively, as shown in figure (3).



Figure( 3): The effect of interference between the type of treatment and the sex of the predator, regardless of the type of pesticide in the predatory efficiency of the ladybird *C. septempunctata*.

Predator efficiency according to the interaction between treatment methods and sex of *C. novemnotata* have been recorded regardless the type of insecticide, as shown in figure (4).



Figure( 4): Effect of interference between the type of treatment and the sex of the predator, regardless of the pesticide type, in the predatory efficiency of ladybird *C. novemnotata*.

The results of present investigation showed that all three used pesticides (Actara, Match and Nimex) affected predatory and parasitic efficiency after direct exposure, while less effects of same pesticides on predator efficiency of both

*C.septempunctata* and *C. novemnotata* have been recorded after indirect treatment, less affects maybe due to the feeding strategies of predator which preferred uncontaminated prey with insecticide. The highest predator efficiency in seven pointed lady bird recorded which due to the size and needs of this insect. This finding agree with previous study done by (Abdel-Waliet al., 2007 and Zanuncioet al.,2016).

The effects of three treatment methods each with three insecticides on rate of parasitic infection, longevity and killing rate of *Aphidiusmatricariae* have been recorded and detailed result have been shown in Table (4).

Table (4): The effects of three treatment methods each with three insecticides on rate of parasitic infection, longevity and killing rate of *Aphidiusmatricariae*

Treatment	insecticide	Parasitic efficiency		Emergent %		longevity		killing rate%	
		Mean±S.E	Rang	Mean±S.E	Rang	Mean±S.E	Rang	Mean±S.E	Rang
First	Actara	89+3.8 b	60-100	16.4+0.2 a	10-20	3+0.2 b	1-4	34.8+0.4 b	0-25
	Match	88+4.2 b	50-100	17.2+0.4 a	10-18	3.2+0.2 a	1-4	15.8+0.8 i	11.1-50
	Nimex	98+1.6 a	50-100	17.6+0.2 a	10-18	2.4+0.2 c	1-3	12.6+2.2 i	10-50
second	Actara	45+5.1 f	30-75	6.8+0.8 e	4-12	3.0+0.4 b	2-4	44.6+2.4 d	33.3-50
	Match	60+1.6 d	40-80	1.4+0.2 f	4-16	2.0+0.4 c	1-4	55.4+0.8 c	22.2-100
	Nimex	76+3.8 c	40-90	14.6+0.4 b	12-18	3.0+0.2 b	1-4	37.9+4.4 e	33.3-50
Third	Actara	18+2.4 h	10-45	1.2+0.2 f	0-3	3.0+0.2 a	2-4	76.5+1.7 a	66.3-100
	Match	39+1.2 g	20-65	8.6+0.8 c	4-10	2.0+0.4 c	1-3	62.0+2.4 b	70-100
	Nimex	50+0.8 c	40-75	7.4+0.2 d	7-12	1.6+0.4 d	1-3	45.4+4.3 d	50-90

\* Numbers under the same letter or similar letters do not have significant differences according to Duncan polynomial test at a probability level of 5%.

The interaction between effects of three treatment methods and three insecticides on rate of infection, emergent rate and killing rate have been recorded and detailed result have been shown in Table (4). Results showed that first treatment method was the safest way and killing rate not exceed 23.7 % which followed by second and third treatment methods.

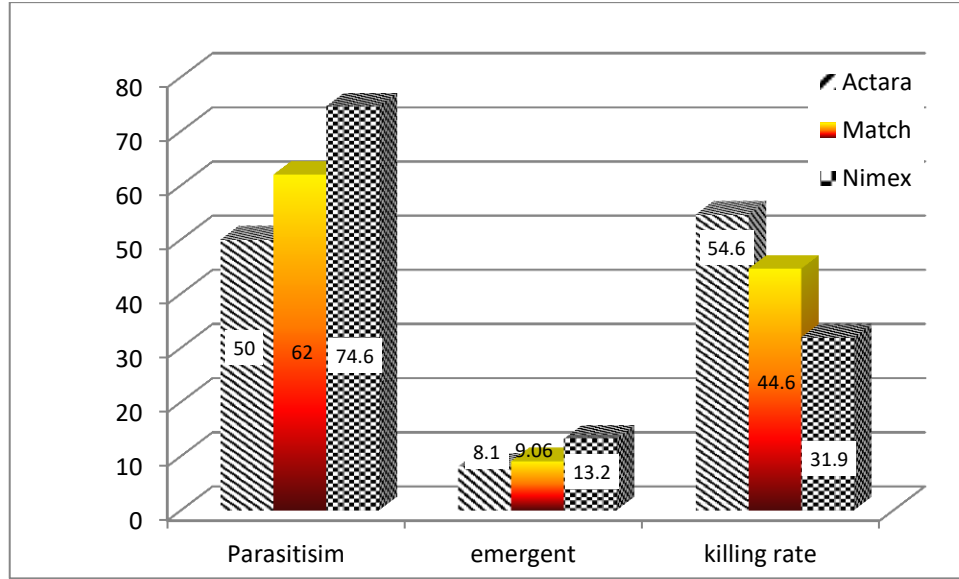


Figure (5): The effect of the interaction between the treatment with the three pesticides and their effect on the vital characteristics of the parasite from the parasitism of emerging individuals and the parasite killing rates.

دراسة تأثير بعض المبيدات الشائعة الاستخدام لمكافحة المن على بعض اعدائها الحيوية الطفيلية  
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### الخلاصة

هدفت الدراسة الى تحديد التأثير لكل من مبيدات اكتارا وماتشو ونيمكس والتي تستخدم في مكافحة حشرات مختلفة ومنها المن *Myzus persicae* على اعدائها الحيوية الشائعة والمنتشرة كالطفيل الداخلي لحشرة المن *Aphidius matricariae* و المفترسين الدعسوقة ذات السبع نقاط *Coccinella septempunctata* والدعسوقة ذات التسع نقاط *Coccinella novemnotata*، اذ تبينت كفاءة نسب التطفل ونسب البزوغ ونسب الموت في بالغات الطفيل الداخلي، اثر المبيد نيمكس على حشرات من الخوخ الاخضر *Myzus persicae* فبلغت نسب القتل 73-98 واثرت المبيدات الثلاث المستخدمة ( ماتش واكتارا ونيمكس ) على الكفاءة الافتراضية بعد التعرض المباشر للمبيدات ، في حين سجلت تأثيرات اقل في الكفاءة الافتراضية لكل من اناث وذكور المفترسين (الدعسوقة ذات السبع نقاط *Coccinella septempunctata* والدعسوقة ذات التسع نقاط *Coccinella novemnotata* ولنفس المبيدات عند العاملة غير المباشرة.  
الكلمات المفتاحية : الدعسوقة ذات السبع نقاط والدعسوقة ذات التسع نقاط، المبيدات الحشرية (اكتارا، ماتش، نيمكس).

استلام البحث: / / 2019 ، وقبوله: / / 2020

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