

EFFECT OF SOME BIOINSECTICIDES ON SOME BIOLOGICAL ASPECTS OF THE PARASITOID *MICROPLITIS RUFIVENTRIS* KOK.

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Abstract

Laboratory experiments were undertaken to study the relationships between the solitary endoparasitoid, *Microplitis rufiventris* Kok. and the Egyptian cotton leaf worm, *Spodoptera littoralis* (Boisd.) when fed on castor bean leaves treated with the bacterial, *Bacillus thuringiensis* Berl. And the fungus, *Beauveria bassiana* (Bals.) Vuill. with both entomopathogens Total developmental period, longevity of adults, sex ratios and the percent of adults emergence of endoparasitoid, *M. rufiventris* were affected by treating host bacterial, *B. thuringiensis* caused mortality percentage of egg-larvae, using three rates recorded 20, 28 and 40%, respectively, compared with 4.0% in the control. For the fungus, *B. bassiana*, it was 8, 12 and 20%, respectively, compared with 1.0% in the control. But the biocide bioclean, *B. thuringiensis* + *B. bassiana* recorded 12, 28 and 32%, respectively, compared with 2% in the check. Emergence percentage of the parasitoid, *M. rufiventris* males were 32, 44 and 28%, respectively compared with 48% in the control. For females it was 32, 16 and 26%, respectively and 22% in the check. In case of fungus, *B. bassiana* the male's emergence percentage was 40, 52 and 52%, respectively, and 92% in the control. Percentage of Females was 40, 20 and 8% respectively, compared with 44% in the control. For *M. rufiventris* males parasitized the larvae of *S. littoralis* that fed on castor bean leaves and treated with bioclean, *B. thuringiensis* + *B. bassiana* was 66, 48 and 60% respectively, and it was 44% in control. For females it was 18, 12 and 4%, respectively, compared with 46% in the control.

INTRODUCTION

The cotton leaf worm, *Spodoptera littoralis* is the major pest that causes damages to cotton plants as well as other fields and vegetable crops in Egypt. Great efforts have been made to control this pest mechanically and chemically using insecticides belonging to different insecticidal groups that known to endanger man, farm animals and the environment. The solitary endoparasitoid, *Microplitis rufiventris* Kok. (Braconidae: Hymemoptera) was recorded on *S. littoralis* in Egypt (Hegazi *et al.* 1977 and Tawfik *et al.* 1980). Now a day the entomopathogens, *Bacillus thuringiensis* and *Beauveria bassiana* have been used to control the pest, (AL-Tahtaway and Abalees, 1972). The interaction between the host-parasitoid system and the entomopathogenic micro organisms has been paid little attention (El-Sufty 1978, Temerak 1982 and El-Maghraby 1984). There are also reports of indirect effects of

host pathogens on parasitoids where the host dies from an infection before the parasitoid complete their development (Laigo and Tamashiro, 1967). Therefore, the insect-parasitoid-pathogen interactions could be either beneficial or detrimental to ultimate control of the insect, depending upon their effect on each other. The interactions between the host-parasitoid system and the entomopathogenic microorganisms have been paid attention (Bell *et al.*1974, El-Sufty1978, Hamed, 1979, Temark, 1980, Salama *et al.*1982, and El-Maghraby *et al.*1988). Knowledge of interactions among hosts, parasitoid and pathogens is crucial not only for fundamental ecological understanding, but also for attempts to conserve threatened communities or to control pests with natural enemies (Hochberg *et al.*1990). The biological control is one of the most effective means of achieving insect control (Pedigo, 2004). On the other hand Radwan *et al.*(2004) used biocides for control the cotton leaf worm, *Spodoptera littoralis*, these materials may not cause any kind of pollution on the environment.

Therefore, the present investigation aimed to study the effect of the entomopathogens (*B. thuringiensis* and *B. bassiana*) in case it was used alone or as mixture on biological aspects of the parasitoid, *M. rufiventris*, and the biological control agent of *S. littoralis*.

MATERIALS AND METHODS

Bio insecticides formulations:

1- Ecotch-Bio.:

Bacteria: *Bacillus thuringiensis* var- *kurstaki*. Application rate 300g/fedden.

2- Biofly: Fungus, *Beavaria bassiana*. Application of rate 300cm /fedden.

3- Bioclean: (Bacteria and Fungi). Application rate 700g /feddan.

(Mixture of 400g *B. bassiana* and 300g of *B. thuringiensis*).

Rearing of *Spodoptera littoralis* and *Microplitis rufiventris*:

1- Rearing of *S. littoralis*:

Egg masses of the cotton leaf worm, *S. littoralis* were collected from the cotton and vegetable fields in Zagazig region. The pest several generations. Larvae were fed on castor bean leaves, *Ricinus communis* according with Abd-El-Atty (1995) under $26.5 \pm 0.5^{\circ}\text{C}$ and $70 \pm 5\%$ R.H. at an incubator.

2- Rearing of *M. rufiventris*:

Larvae of *S. littoralis* parasitized by *M. rufiventris* were collected from the same fields aboe-mentioned. These larvae were placed in cylindrical glass jars (4Kg). The jars were covered by muslin cloth, held with rubber bands and provided with filter

paper at the bottom of the jar to absorb excess moisture. Larvae of *S. littoralis* were reared on fresh castor bean leaves that were provided daily until pupation of the parasitoid. The pupae were kept in clean jars (1Kg) till emergence. Females of *M. rufiventris* (2-5 days) old after copulation were used to parasitize *S. littoralis* larvae. Adult of parasitoids, *M. rufiventris* were provided daily with honey and drops of water. Parasitism of 2nd instar larvae of *S. littoralis* were exposed to individually a female parasitoid. Fifty larvae were used (in five replicates) at each treatment rate from the biocides (half , recommended and double) rates. There after left until pupation and emergence of the parasitoid larvae or death. Were recorded biological aspects points such as:

- Egg-larvae stage of parasitoid, *M. rufiventris*.
- Percent mortality of different stages of parasitoid, *M. rufiventris*.
- Percent pupation of parasitoid, *M. rufiventris*.
- Total developmental period of parasitoid, *M. rufiventris*.
- %Emergence of parasitoid, *M. rufiventris*.
- Longevity period males and females of parasitoid, *M. rufiventris*.
- Sex ratio of males and females of parasitoid, *M. rufiventris*.

3- Statistical analysis:

The obtained data were statistically analyzed according to complete randomized block design. The appropriate methods were used for analysis of data according to Duncan's (1955) and Snedecor (1970) by computer program 3003copyright 1986 Cohort Software P.O.Box.1194,Berkeley CA947s1.(costat program methods).

RESULTS AND DISCUSSION

1- Effect of Bacteria, *Bacillus thuringiensis* Kurstaki on some biological aspects of the parasitoid, *Microplitis rufiventris*:

1- Egg-Larval stage:

Data in Table (1) showed that the duration of egg-larval stage of the parasitoid, *M.rufiventris* was insignificantly affected recording 7.1 ± 0.8 , 7.6 ± 0.3 and 7.8 ± 0.1 days for three rates (half, recommended and double rate) from bacterial biocide, *B.thuringiensis*, respectively compared with that recorded in control 7.6 ± 0.1 days.While, Amira-Ibrahim (1986) fund that the larval developmental period of the parasitoid, *M.rufiventris* parasiting on host, *S. littoralis* after reared on semi-artificial diet was completed in 7.6 ± 0.6 (7-9) days.EL-Maghraby *et al.* (1988) recorded that the duration of egg-larval stage was greatly affected recording 9.1 ± 0.1 days after

the treatment of the host larvae which treated with *B.thuringiensis* as compared with that of control 6.8 ± 0.1 days that reared on artificial diet. But the duration of egg-larval period in control 7.60 ± 0.1 days after the treatment of host larvae which, treated with *B.thuringiensis* as compared with that of the control 6.8 ± 0.1 days that reared on artificial diet. Also, the duration of egg-larval period in control 7.60 ± 0.09 days was relatively shorter than 8.81 ± 0.07 days recorded by Hegazi *et al.* (1977).

1-2-Pupal stage:-

The mean duration of pupal stage of *M.rufiventris* recorded 4.88 ± 0.08 , 4.80 ± 0.12 and 6.57 ± 0.09 days, respectively, for the three tested rates [half, recommended and double recommended] of *B.thuringiensis* as compared with 4.56 ± 0.12 days at the control (able 1).

EL-Maghraby *et al.* (1988) found that the duration of pupal stage was recorded 5.0 ± 0.1 days after the host larvae of *S. littorals* were fed on semi artificial diet treated with *B.thuringiensis*. Also, Amira-Ibrahim (1986) found that the pupal period lasted 4.45 ± 0.64 (4 - 6) days.

3- Total developmental period:

Also, data in Table (1) indicated that, the mean total developmental period of *M.rufiventris* parasitizing larvae of cotton leaf worm, *S. littorals* treated with half, recommended and double recommended rates of Ecotch-bio were 11.96 ± 0.02 , 12.00 ± 0.09 and 12.75 ± 0.22 days, but 12.12 ± 0.10 days in the control. While, EL-Maghraby *et al.* (1988) found the mean total developmental period of the parasitoid, *M.rufiventris* after treated *S. littorals* that parasitizing by the parasitoid above-mentioned with *B.thuringiensis* was 14.1 days and 11.9 that recorded in treatment control.

4- Longevity of males and females:

The mean longevity of *M.rufiventris* males was 5.10 ± 0.15 , 6.68 ± 0.51 and 5.08 ± 0.36 days for the three rates above-mentioned, respectively compared with 5.88 ± 0.13 days in the control (Table 1).

Average longevity period of females resulted from treatment of parasitized larvae by, *M.rufiventris* with the three rates *B.thuringiensis* were 4.94 ± 0.12 , 8.80 ± 0.56 and 6.32 ± 0.38 days, respectively. It was 5.88 ± 0.31 days in the control. High significant differences were recoded among tested concentrations under the laboratory study. (Table, 1).

Table 1. Effect of different rates of *Bacillus thuringiensis* on some biological aspects of *Microplitis rufiventris* under laboratory conditions.

Biological aspects		Application rates of <i>B. thuringiensis</i> (Mean \pm SE/ day)					
		Control	Half	Recommended	double	L.S.D _{0.05}	
Egg-Larval period		7.60 \pm 0.09	7.12 \pm 0.08	7.56 \pm 0.27	7.80 \pm 0.14	0.48	NS
Pupal stage		4.56 \pm 0.12	4.88 \pm 0.08	4.80 \pm 0.12	6.57 \pm .09	2.12	**
Total development		12.12 \pm 0.1	11.96 \pm 0.02	12.00 \pm 0.09	12.75 \pm .22	0.38	**
Longevity	♂	5.88 \pm 0.31	5.10 \pm 0.15	6.68 \pm 0.51	5.08 \pm 0.36	1.07	**
	♀	5.90 \pm 0.31	4.94 \pm 0.12	8.80 \pm 0.56	6.32 \pm 0.38	1.13	**
Life span	♂	18.18 \pm 0.4	15.28 \pm 0.31	18.13 \pm 0.63	18.56 \pm 0.39	1.38	**
	♀	18.22 \pm 0.7	16.18 \pm 0.24	19.30 \pm 0.66	17.72 \pm 0.85	2.02	**

NS=Non Significant

**=Highly Significant

5- Life span of *M.rufiventris*/ males and females:

Data in table (1) showed the mean life span period of *M.rufiventris* males after treatment, the treated host larvae of *S. littorals* recorded 15.28 \pm 0.31, 18.13 \pm 0.65 and 18.56 \pm 0.39 days, respectively as compared with 18.18 \pm 0.42 in the control. And Results at the same table indicated that the Correspondent mean life span period of parasitoid, *M.rufiventris* females was 16.18 \pm 0.24, 19.30 \pm 0.66 and 17.72 \pm 0.85 days as compared with 18.22 \pm 0.77 days in the control.

Effect of *B.thuringiensis* on some biological parameters of *M.rufiventris*:

1-Mortality percentage at egg- larvae period:-

Mortality percentage of egg-larvae period recorded 20, 28 and 40%, respectively compared with 4.0% in control. (Table, 2). EL-Maghraby *et al.* (1988) found that the infection with bacterial, *B.thuringiensis* alone caused 41.67 % mortality in parasitized host larvae of *S. littorals* that reared on semi artificial diet, but the same authors (2000) found that the bacterial, *B.thuringiensis* caused lower mortality in four days old second instar larvae of *S. littorals* parasitized with *M.rufiventris* that fed on castor bean leaves, dipped in different concentrations. Shalaby *et al.* (2004) found that

the lowest concentration of the biocide, xentari, (*B.thuringiensis*) caused 16.67% mortality of parasitized, *S. littorals* larvae that fed on castor bean.

2-Pupation percentage:

Data in the same table (2) showed that pupation percentage of *M.rufiventris* recorded 64, 60 and 60%, respectively for the three treatments, as compared with 96% in the control. Mortality percentage of pupal stage was 16, 12 and 8%, respectively, resulted in the treatments as compared with 4% in the control (Table 2).

Table 2. Effect of different rates of *B.thuringiensis* on some biological parameters of *M.rufiventris* under laboratory conditions.

Rate of application of <i>Bacillus thuringiensis</i>	Mortality rate										
	egg-larvae		Pupation		pupal stage		Adults emergence				Sex ratio
							♂		♀		
	No.	%	No.	%	No.	%	No.	%	No.	%	♂ : ♀
Half	10	20	32	64	8	16	16	32	16	32	1 : 1
Recommended	14	28	30	60	6	12	22	44	8	16	2.8 : 1
Double	20	40	30	60	4	8	12	28	14	26	0.9 : 1
Control	2	4	48	96	2	4	24	48	22	44	0.9 : 1

No. = Number

% = percentage

3- Emergence percentage adults:

Data in table (2) showed that, emergence percentage of *M.rufiventris* of males in the treatments was 32, 44 and 28%, respectively while, it was 48% in the control. As shown in the same table it was *M.rufiventris* 32, 16 and 26%, respectively in compared with 22% in the check.

Π- Effect of fungus, *Beauveria bassiana* on some biological aspects of parasitoid, *M. rufiventris* under laboratory conditions.

1- Egg-Larval period:

Data presented in table (3) indicated that the duration of egg-larval development of the parasitoid, *M.rufiventris* parasited the larvae of cotton leaf worm, *S. littorals* was 7.04 ± 0.03 , 7.21 ± 0.10 and 7.11 ± 0.22 days at the three rates (half, and double recommended), respectively of *B.bassiana* as compared with 7.60 ± 0.09 days recorded

in the control. Also, data in the same table showed that, L.S.D._{0.05} value (0.39) indicated a significant difference found among all different tested rates of the fungus and control.

Table 3. Effect of different rates of the fungus, *Beauveria bassiana* on some biological aspects of the parasitoid, *Microplitis rufiventris* under laboratory conditions.

Biological aspects	Application rates of <i>Beauveria bassiana</i> Mean \pm SE/ day				L.S.D _{0.05}		
	control	Half	Recommended	Double			
Egg-Larval period	7.60 \pm 0.09	7.04 \pm 0.03	7.21 \pm 0.10	7.11 \pm 0.22	0.39	*	
Pupal stage	4.56 \pm 0.12	4.69 \pm 0.11	4.96 \pm 0.16	4.59 \pm 0.06	0.35	**	
Total developmental period	12.12 \pm 0.1	9.92 \pm 0.73	12.16 \pm 0.13	11.81 \pm 0.07	1.13	**	
Longevity of	♀	5.88 \pm 0.31	9.05 \pm 0.72	5.81 \pm 0.20	6.38 \pm 0.22	1.25	**
	♂	5.90 \pm 0.31	4.87 \pm 0.09	5.80 \pm 0.51	6.00 \pm 0.45	1.13	NS.
Life span	♀	18.18 \pm 0.42	20.52 \pm 0.42	16.79 \pm 0.27	18.22 \pm 0.44	1.38	**
	♂	18.22 \pm 0.7	15.35 \pm 0.09	26.20 \pm 0.49	18.00 \pm 0.45	2.02	**

NS=Non Significant

**=Highly Significant

Hegazi *et al.* (1977) recorded 10.1 \pm 0.1 days as the duration of egg-larval period in the control. Also, the same authors found that, differences in the duration of egg-larval period may be due to the host food, host instars and temperature prevailing in host rearing room. While, El-Maghraby *et al.* (1988) found that the duration of egg-larval period was 10.4 \pm 0.1 days after the treatment of host larvae, *S. littorals* with *B. bassiana* as compared with 6.8 \pm 0.1 days in the control.

2-Pupal stage:

Data presented in table (3) indicated that the mean duration pupal stage of *M.rufiventris* was 3.63 \pm 0.11, 4.96 \pm 0.16 and 4.59 \pm 0.06 days at the three tested rates (half, recommended and double recommended) of biocide fungus, *B. bassiana*

respectively, as compared with 4.56 ± 0.12 days which recorded in control. L.S.D. value=0353 showed a highly significant differences among all tested rates of the biocide and untreated check.

El-Magrhabby *et al.* (1988) found that the duration of pupal stage recorded 5.3 ± 0.1 days after feeding parasitized larvae of *S. littorals* with *M. rufiventris* on semi artificial diet treated with the fungus, *B. bassiana*.

3-Developmental period:

Results in table (3) indicated that the mean total developmental period of *M. rufiventris* parasitizing larvae of *S. littorals* that treated with three rates of biocide, biofly (half recommended and double recommended) fungi, and *Beauveria bassiana* were 9.92 ± 0.37 , 12.16 ± 0.13 and 11.81 ± 0.07 days respectively, compared with 12.12 ± 0.10 days that recorded in check. There are significant difference found only between half rate of fungi and control. The L.S.D._{0.05} = 1.13. El-Magrhabby *et al.* (1988) found that the total developmental period of parasitoid, *M. rufiventris* recorded 15.7 days after treatment the host larvae of *S. littorals* with biocide fungi, *B. bassiana* while it was 11.9 days in control.

4- Longevity period of males and females:-

Data at the same table (3) showed that the average longevity of adult males of *M. rufiventris* parasitized larvae of *S. littorals* treated with three rates of *B. bassiana* recorded 9.05 ± 0.72 , 5.81 ± 0.20 and 6.38 ± 0.22 days, respectively, compared with 5.88 ± 0.31 days in the control. While, the mean longevity period of females of *M. rufiventris* recorded was 4.87 ± 0.09 , 5.80 ± 0.51 and 6.00 ± 0.45 days respectively, for that the rates above-mentioned compared with 5.90 ± 0.31 days in the control.

5-Life span of adult males and females:

Results summarized in Table (3) showed that the mean life span of adult males of *M. rufiventris* resulted from treated larvae of *S. littorals* recorded 20.52 ± 0.42 , 16.79 ± 0.27 and 18.22 ± 0.44 days, respectively, compared with 18.18 ± 0.42 days in the control. L.S.D. values revealed that there was slight significant differences among the three rates of fungus. Data in the same Table indicated that the average life span of females of *M. rufiventris* was 15.35 ± 0.09 , 26.20 ± 0.49 and 18.00 ± 0.45 days, respectively, compared with 18.22 ± 0.77 days in the control. Also, slight significant differences among the three rates of fungus were recorded.

6-Effect of the fungus, *B. bassiana* on some biological parameters of *M.rufiventris* under laboratory conditions.

6-1-Mortality at egg-larval period:

Data in Table (4) indicated that, mortality percentage of *M.rufiventris* due to parasitizing larvae of cotton leaf worm treated with different rates of fungus *B. bassiana* was 8,12 and 20%, respectively, as compared with 1.0% in the control. In this respect, El-Maghraby *et al.* (1988) found that percentage mortality of egg-larval period of *M.rufiventris* parasitized larvae *S. littorals* treated with biocide fungus, *B. bassiana* caused mortality percentage 42.20%.

Table 4. Effect of different of fungus, *B. bassiana* rates on mortality percentage of egg-larvae period, pupation percentage, and mortality percentage of pupal stage, emergence of adult stage and sex ratio of *M.rufiventris* under laboratory conditions.

Rate application of <i>Beauveria bassiana</i>	Mortality rates						% of Adults emergence				Sexratio
	% Of egg-larvae		%Pupation		% of pupal stage		Males		Females		
	No.	%	No.	%	No.	%	No	%	No.	%	
	♂: ♀										
Half	4	8	46	92	6	12	20	40	20	40	1:1
Recommended	6	12	44	88	8	16	26	52	10	20	2.6: 1
Double	10	20	40	80	10	20	26	52	4	8	2.6:1
Control	1	2	49	98	4	8	23	46	22	44	0.95:1

No. =Number

%=percentage

6-2-Pupation percentage:

Data in the same Table, indicated that, the percentage of pupation of *M.rufiventris* resulted from treatments was estimated as 92, 88 and 80%, respectively, as compared with 98% in the control.

6-3-Mortality percentage of pupal stage:

Data in Table (4) showed that, the mortality percentage of *M.rufiventris* pupae parasitized larvae, *S. littorals* treated with three rates from biocide fungus recorded 12, 16 and 20%, respectively as compared with 8% in check treatment.

6-4-Adult emergence percentage of males and females:

Data in Table (4) indicated that, the percentage of adult male's emergence of *M.rufiventris* was 40, 52 and 52%, respectively and 92% in the control. Data in the

same table indicated that females of *M.rufiventris* was 40, 20 and 8%, respectively, compared with 44% in the control.

6-5-Sex ratio:

Also, data in the same table showed that, the sex ratio of *M.rufiventris* adults resulted from *S. littorals* larvae treated with three rates of the fungus *B. bassiana* recorded (1:1),(2.6:1) and (2.6:1), respectively, compared with (0.95:1) in the check.

III- Effect of biocide, bioclean (*Bacillus thuringiensis* + *Beauveria bassiana*) on some biological aspects of parasitoid, *M.rufiventris* under laboratory conditions.

1- Egg-Larval period:

Data in Table (5) showed that, the mean period of egg-larval development *M.rufiventris* parasitized larvae of *S. littorals* ,treated with rates (half, and double recommended rates (half, recommended and double recommended of biocide, bioclean was 7, 48 ± 0.05 , 7.04 ± 0.02 and 7.12 ± 0.05 days, as compared with highly significant differences between the 7.60 ± 0.09 days in untreated check.

El-Magrhaby *et al.* (1988) found that the duration of egg-larval period was 11.2 ± 0.2 days after the treatment of host larvae with *B. thuringiensis* + *B. bassiana* as compared with 6.8 ± 0.1 days in the control. It was shorter 8.81 ± 0.7 days than that recorded by El-Magrhaby (1984) and El-Magrhaby *et al.* (1977). The differences in the duration of egg-larval period may be due to the host food, host instars and the temperature prevailing in host rearing room.

2-Pupal stage:

Results in Table (5) indicated that, the mean duration of pupal stage of the parasitoid, *M.rufiventris* resulted from the host larvae, *S. littorals* that treated with three rates of biocide bioclean, *B. thuringiensis* + *B. bassiana* was 4.75 ± 0.15 , 4.91 ± 0.06 and 4.83 ± 0.05 days respectively, and 4.56 ± 0.12 days in the check. L.S.D. = (0.302) showed that non significant effect between the three tests on the pupal stage and the control. El-Magrhaby *et al.* (1988) found that, the duration of pupal stage was not affected when larvae treated with bioclean, *B. thuringiensis* + *B. bassiana* compared with 5.1 ± 0.1 days in the control.

Data recorded in Table (5) clear that the effect of the three rates (half, recommended and double recommended of the biocide bioclean, *B. thuringiensis* + *B. bassiana* on total developmental period of the parasitoid, *M.rufiventris* were 11.91 ± 0.22 , 11.96 ± 0.05 and 11.81 ± 0.05 days respectively, as compared with 12.12 ± 0.10 days in control once. Also, L.S.D. = 0.38 value indicated no significant difference between the three rates above- mentioned from biocide bioclean and check treatment

on total developmental period of the parasitoid, *M.rufiventris*. But, El-Magraby *et al.* (1988) found that the total developmental period was 16.4 days resulted from treatment the host larvae, *S. littorals* treated with bioclean, *B. thuringiensis* + *B. bassiana* compared with 11.9 days in control treatment.

Table 5. Effect of different application rates of biocide, bioclean (bacterial, *Bacillus thuringiensis* + fungi, *Beauveria bassiana*) on some biological aspects of parasitoid, *Microplitis rufiventris* under laboratory conditions.

Biological aspects	Application rates of <i>B. bassiana</i> + <i>B.bassiana</i> Mean \pm SE/ day				L.S.D _{0.05}		
	Control	Half	Recommended	Double			
Egg-Larval period	7.60 \pm 0.09	7.48 \pm 0.05	7.04 \pm 0.02	7.15 \pm 0.05	0.19	**	
Pupal stage	4.56 \pm 0.12	4.75 \pm 0.15	4.91 \pm 0.06	4.83 \pm 0.05	0.30	NS	
Total developmental period	12.12 \pm 0.1	11.91 \pm 0.22	19.96 \pm 0.05	11.81 \pm 0.05	0.38	NS	
Longevity	♂	5.88 \pm 0.31	4.59 \pm 0.35	6.03 \pm 0.18	6.52 \pm 0.43	0.99	**
	♀	5.90 \pm 0.31	4.00 \pm 0.00	5.13 \pm 0.13	5.00 \pm 0.00	0.50	**
Life span	♂	18.18 \pm 0.42	16.24 \pm 0.31	18.14 \pm 0.32	18.89 \pm 0.32	1.16	**
	♀	18.22 \pm 0.77	17.33 \pm 0.00	17.04 \pm 0.04	17.00 \pm 0.45	1.15	NS

NS=Non Significant * = Significant **=Highly Significant

3- Total developmental period:

4-Longevity period of adults of males and females:

Data in the same Table(5) the average longevity period of adult males of *M.rufiventris* parasitized of *S. littorals* treated with three rates from biocide bioclean, *B. thuringiensis* + *B. bassiana* was 4.59 \pm 0.33, 6.03 \pm 0.18 and 6.52 \pm 0.43 days, respectively, and 5.88 \pm 0.31 in the control. L.S.D. value (0.99) indicated highly significant differences in longevity of *M.rufiventris*. In same table the longevity of

M.rufiventris was 4.00 ± 0.00 , 5.13 ± 0.13 and 5.00 ± 0.00 days, respectively, as compared with 5.90 ± 0.31 days in the control.

5-Life span of adult males and females:

Results showed that in Table (5) the mean life span of adult males of *M.rufiventris* resulted from larvae, *S. littorals* treated with three rates from the biocide bioclean, recorded 16.24 ± 0.31 , 18.14 ± 0.32 and 18.89 ± 0.32 days, respectively, compared with 18.18 ± 0.42 days in the control (Table 5). These results revealed that the effect of the rates of the tested compound bioclean was highly significant effect on life span of the parasitoid, *M.rufiventris* males. Data in the same table, indicated that the average life span of females of *M.rufiventris* was 17.33 ± 0.00 , 17.04 ± 0.04 and 17.00 ± 0.00 days, respectively, compared with 18.22 ± 0.77 days in the control. Also, non significant differences among the effects of three rates of bioclean on the life span of parasitoid, *M.rufiventris* females.

6-Effect of biocide, bioclean (bacterial, *Bacillus thuringiensis* + fungi, *Beauveria bassiana*) on some biological parameters of *M.rufiventris* under laboratory conditions.

6-1-Mortality at egg-larval period:

Data presented in Table (6) indicated that mortality percentage of the egg-larval period of *S. littorals* parasitized by the parasitoid, *M.rufiventris*, treated with rates of biocide bioclean, *B. thuringiensis* + *B. bassiana* recorded 12,28 and 32%, respectively, compared with 2% recorded in control once. While, El-Magrhaby *et al.* (1988) found that *S. littorals* treated with *B. thuringiensis* + *B. bassiana* caused a mortality percentage of 6.38%, *M.rufiventris*.

6-2-Pupation percentage:

Data in the same table indicated that, the percentage of pupation of *M.rufiventris* was estimated as 88,72 and 68%, respectively, compared with 98% in the check .

6-3-Mortality percentage of pupal stage:

Mortality percentage of *M.rufiventris* pupae was 4, 12 and 4%, respectively, while, it was 4% in the check (Table 6).

6-4-Adult emergence percentage:

Data in Table (6) showed that emergence rate males of *M.rufiventris* of parasitized larvae of *S. littorals* that fed on castor bean leaves treated with three rates of biocide bioclean, *B.thuringiensis* + *B. bassiana* was 66,48 and 60%, respectively, while it was 44% in the control.

Table 6. Effect of different rates of biocide, bioclean (bacterial, *Bacillus thuringiensis* + fungi, *Beauveria bassiana*) on some biological parameters Of *M.rufiventris* under laboratory conditions.

Rate of application	% Mortality Egg-Larvae		% pupation		% Mortality pupal stage		% Adults Emergence				Sex ratio
							Males		Females		
	No.	%	No.	%	No.	%	No	%	No.	%	♂ : ♀
Half	6	12	44	88	2	4	33	66	9	18	3.7 : 1
Recommended	14	28	36	72	6	12	24	48	6	12	4 : 1
Double	16	32	34	68	2	4	30	60	2	4	15 : 1
Control	1	2	49	98	4	8	22	44	23	46	0.95 : 1

No. =Number

%= percentage

Correspondent percentages in females 18, 12 and 4%, respectively, compared with 46% in the control.

6-5-Sex ratio:

Data in the same Table showed that, the sex ratio of emerged adults of *M.rufiventris* recorded (1:1), (4:1) and (1.5:1), respectively, compared with (0.95:1) in the check.

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تأثير بعض المبيدات الحيوية على بعض الصفات البيولوجية

لطفيل *Microplitis rufiventris*

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أجري هذا البحث بغرض دراسة تأثير المبيدات الحيوية على بعض الصفات البيولوجية

لطفيل *Microplitis rufiventris* :-

لوحظ أن بكتيريا *Bacillus thuringiensis* قد أثرت على فترة النمو الكلية، فترة طول العمر لكل من الذكور والإناث والنسبة الجنسية ونسبة خروج الحشرات الكاملة للطفيل . وسببت البكتيريا *Bacillus thuringiensis* نسبة موت لكل من طور البيض واليرقات بإستعمال معدلات التركيزات (الموصى به والنصف نصف وضعف التركيز حيث سجلت ٢٠, ٢٨ , ٤٠٪، على التوالي، مقارنة مع ٤٠٪ في المقارنه. اما فى حالة الفطر *Beauveria bassiana* كانت نسبة الموت ٨ , ١٢ , ٢٠٪ على التوالي، مقارنة مع ١٠٪ فى الكنترول تكل من التركيزات الثلاث سابقة الذكر .

بينما فى حالة إستخدام المبيد الحيوى بكتيريا (*Beauveria + Bacillus thuringiensis*) فى صورة خلط بلغت نسبة الموت خلال طور بيضة- يرقة على الترتيب ١٢ و ٢٨ و ٣٢٪ بالمقارنة ٢٪ فى الكنترول . و كانت نسبة خروج الذكور نتيجة المعاملة بالمبيد الحيوى بيوكلين بالمعدلات سالفة الذكر ٦٦ و ٤٨ و ٦٠٪ على الترتيب بينما ٤٤٪ فى الكنترول ونسبة الإناث ١٨ و ١٢ و ٤٪ على الترتيب بينما ٤٦٪ فى المقارنة .

والخلاصة يجب إستخدام المبيدات الحيوية فى صورة منفردة وليس فى صورة خليط فى برامج مكافحة الأفة لما لها تأثير آمن على الاعداء الحيوية كذلك تؤدى إلى نسبة خروج للحشرات الكاملة للطفيل عالية .