

EVALUATION OF SOME NATURAL AND CHEMICAL PESTICIDES AGAINST THE BLACK CUTWORM *Agrotis ipsilon* (HUFN.)

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ABSTRACT

Experiment to evaluate the effect of jojoba oil crude extract on the black cutworm *Agrotis ipsilon*, was carried out in comparison with mineral oils royal super and capl – 2 and the insecticide Confidor.

All the treatments caused severe reduction in egg hatchability (100, 99.0, 100 and 100%) of jojoba, royal super oil, capl – 2 oil, and the insecticide Confidor, respectively. No reduction was occurred in the percentage of egg hatchability in control.

The recommended rates of the tested substances was more effective, in general, than the double rates on the 2nd instar larvae of *A. ipsilon*, while the double rates were more effective on the 4th instar larvae of the same pest.

INTRODUCTION

Simmondsia chinensis plant, (better known as jojoba) is a hardy shrub that grows arid regions of northern Mexico and southwest United States (Farkas, 1979). However, this plant has also been grown in Southeast Asia, especially in Thailand. Seeds are the most valuable part of this plant, it contains about 40-50% of jojoba oil. The oil has many important properties for industry such as an affected of high degrees of temperature and such containing antioxidants substances call (Tocopherol) give the oil unique ability for storing for long time (more than 25 years) without changed in its properties. Several studies were conducted on jojoba, especially on agronomy (Nzima, 1984) and antimicrobial effect (Zinal abidin *et al.*, 1994), few studies were carried out on its role against insects.

The aim of the present work is to evaluate the efficacy of jojoba oil crude extract on the black cutworm, *Agrotis ipsilon* in comparison with the recommended and double rates of royal super oil, capl-2 oil, and the insecticide confidor.

MATERIALS AND METHODS

Experimental insects:

The black cutworm (BCW), *Agrotis ipsilon* (Hufn.) was used as experimental insects in the present study.

Rearing procedure:

A standard culture of BCW was reared in the laboratory under constant conditions of temperature and relative humidity (27 ± 1 °C and $65 \pm 5\%$ R.H.). The larvae were fed on castor oil leaves (*Ricinus communis*).

Newly moulted 4th instar larvae were reared individually to avoid cannibalistic behavior (Abdel-Hadi, 1968). Ten adults were paired in glass jars (2 L volume) with a sex ratio of 1:1 and fed on 20% honey solution.

Culture and the experimental insects were both incubated under the same condition mentioned above.

Testing oils and insecticide: -

1- JoJoba oil:

- Is extracted from the seed (which is 55% oil). Produced by (Egyptian Natural Oil CO). Specific gravity at 15 °C = 0.86. The tested rats were 1.5 ml / 100 ml water and 3 ml / 100 ml water.

2- Royal Super oil:

- Contained 85.7%(V/ V) base oil which has the following properties:

Unsulfonated residue 95.12(V/ V), specific gravity at 15 °C = 0.8572, 50% distilled at 360 °C, and viscosity at 50 °C (saybolt method) = 64 seconds.

Was tested at rat of 1.5% (Ekram *et al*,2001), 1.5 ml / 100 ml water and 3 ml / 100 ml water.

3- CAPL-2:

-Ec., Mineral oil (Lubrication cut of petroleum oil), prepared as emulsifiable concentrate contained 96.62% (V/ V) base oil. Produced in Central Agricultural Pesticides Lab., A.R.C., EGYPT.was tested at rat of 1% (El-Imery *et al.*,1995), 1 ml / 100 ml water and 2 ml/ 100 ml water.

4- Confidor® :

- 350) C.N.Imidacloprid, Bayer company, was tested at rat of 60 ml /fed (Hernandez *et al.*, 1999), 0.6 ml / 100 ml water and 1.2 ml / 100 ml water.

Treatments:

1-Egg treatment:

A group of 100 fertile eggs each was replicated 10 times (total of 1000 eggs) .The eggs were examined under light microscope before treatments to be sure they are fertile. The recommended rates of the tested materials were, j ojoba at 1.5 ml / 100 ml water and 3 ml / 100 ml water, Royal Super oil at 1.5 ml / 100 ml water and 3 ml / 100 ml water, CAPL-2 at 1 ml / 100 ml water and 2 ml / 100 ml water, and the pesticide Confidor at 0.6 ml / 100 ml water. Water was used as a check sample. The treated eggs were checked after 24 hours under light microscope and the reduction in hatchability was recorded.

2- larval treatment:

the 2 nd and 4Th instar larvae of BCW were used in four treatments with the four substances maintain above.

A – Second instar larvae :

Five replicates (20 larvae each) were used in both of recommended and double rate of each tested oil and the pesticide as well. Castor oil leaves were dipped in the respective rate of each substance for 5 seconds. Ten minutes latter, the treated leaves were transferred to plastic vials (10 Cm in diameter), the larvae were fed on the treated leaves for 24 hours only. Control larvae were fed on treated leaves with water only.

Treated leaves were continuously renewed with untreated one till pupation. Vials were daily inspected, larval mortality, percent of pupation, adult deformation, adult emergence and sex ratio were recorded.

Pairs of adults male and female at each rate of each substances were introduced into Lb glass jar provided with a piece of cotton wool wetted with honey solution (20 %) as a food supply. The sides and cover were lined with sheets of waxy paper to serve as an egg – laying substrate. All jars were daily inspected and number of eggs/female was recorded.

B – Fourth instar larvae:

Five replicates (20 larvae each) were used with each rate of each substance. The same procedure was used as mention above with 2nd. instar larvae treatment.

Treated larvae were kept under a constant temperature of 27 ± 1 oC and $65 \pm 5\%$ R.H. for 24 hrs. Fresh untreated leaves were offered daily and larvae were checked every day to determine the mortality percentage, the sex ratio, number of eggs deposited per female, adult emergence and adult deformation.

RESULTS AND DISCUSSION

Data concerning the effect of jojoba oil, royal super oil, capl – 2 oil, and the pesticide Confidor on some parameters of different stages of the black cutworm (BCW), *Agrotis ipsilon* are represented in tables (1-3).

1-Egg treatment:

Data clarify that the tested substances caused several effects when applied as foliage sprays to eggs of *A. ipsilon*, three days after treatment as shown in (Table 1). The three tested oils jojoba, royal super, capl – 2, and the pesticide Confidor induced nearly a complete reduction in eggs hatchability (100%) while it was zero in the control sample (eggs spray with water). So the fertility of treated eggs manifested severe reduction due to the oils and pesticide administration. In addition, the results also indicate that as the concentration of the tested substances increases the rate of egg hatching decreases.

Table (1): Efficiency of recommended rates of jojoba oil, royal super oil, capl – 2 oil, and the pesticide Confidor as foliage sprays applied to Eggs of black cutworm *Agrotis ipsilon*

Treatments	jojoba oil	royal super oil	capl –2 oil	Confidor	Control
Rate of application/ ml water	1.5 ml	1.5 ml	1 ml	0.6 ml	water
% of reduction in Egg hatchability	100	99.0	100	100	0.0

2- larvae treatment

A – The second larval instar:

Table (2) show that the tested agents (jojoba oil, royal super oil, capl – 2 oil, and the pesticide Confidor) gave different percent mortality. In case of Confidor the highest effect (72.0 and 90 %) was achieved with recommended and double rate. The least percent of mortality caused by super royal oil (43.0

% and 20.0%) with recommended and double rates, respectively. JoJoba oil and capl – 2 oil caused nearly similar percent mortality (51.0 % and 65.0%) with recommended and double rates, respectively. The double rates had higher mortality percent of larvae than the recommended rates for all the tested agents, the mortality in control was 5.0%.

Percentage of pupation of *A. ipsilon* larvae which treated at 2nd instar with jojoba oil, royal super oil, capl – 2 oil, and the pesticide Confidor was reduced. The highest recorded reduction (40.0%) at double rate of royal super oil was obtained, while the recommended rate of the same oil resulted 26.0 % reduction. The least reduction percentage was obtained 10.0% at treatment with Confidor at double rate. Treated larvae with capl – 2 oil at recommended rate resulted 12.0 % reduction in pupation as showed in table (2).

Although at recommended rates moth emergence was more with Confidor (80.0%) than capl –2 (50.0%), it was similar at double rates (100%). The double rate of jojoba caused higher percent of moth emergence (80.0%) than the recommended rate (58.0 %), and the vice versa in case of by royal super oil, the recommended rate caused more (57.0%) and the double rate caused less (25.0%).

Data of the present work clear that the adult deformation was more at double rate of the tested agents, while at the recommended rate, the least was 6.0% with Confidor and the highest was 33.0% with royal super oil. Oils caused more adult deformation than the pesticide as shown in table (2).

The influence of oils and pesticide on the sex ratio as it cleared in table (2) where the number of emerged females was more than males in jojoba treatment at both of recommended and double rates, it was (2♀ :1♂) and (3♀ :1♂) respectively. The double rate of capl –2 caused similar effect as jojoba (3♀:1♂) while it was as the control at the recommended rate Table (2).

Female fecundity was markedly affected by the applications. The least no. of laid eggs was (10 eggs) with jojoba at the recommended rate and (411 eggs) with Confidor at double rate, while the highest number was found at the treatment with the recommended rate of Confidor (816 eggs), but the double rate of the same substance resulted less number of laid eggs (637 eggs), as shown in table (2).

B - The fourth larval instar:

Table (3) cleared that capl –2 caused the highest mortality at the recommended rate (95 %), while no mortality was detected at royal super oil treatment. JoJoba oil and Confidor caused similar reduction (93.0% mortality) as shown in table (3).

The larval mortality increased by using the double rates of tested agents. It was (65.0%) with Confidor, while it was (30.0% and 20.0%) with jojoba and royal super oil respectively. more reduction in larval mortality was observed at the recommended rates of the tested substances than the double rates.

Royal super oil was the most effective oil on the percentage of pupation of treated 4th instar larvae at recommended rate, it resulted only 32.0% pupation in comparison with Confidor as a chemical pesticide which

Table (2): Efficiency of some oils and a pesticide at recommended and double recommended rates on some bioagents of cutworm *Agrotis ipsilon*, treated at 2nd instar larvae

Treatments	Tested Rate / 100 cm ³ water	No. of alive larvae			% of Pupation	% Adult emerged.	% Adult deforms.	sex ratio		No. of Egg/ female
		Pre, T.	Post T.	% Of red.				♀	♂	
jojoba	1.5cm ³	100	49	51.0	21.0	58.0	11.0	2	1	10.0
super royal	1.5cm ³	100	79	43.0	26.0	57.0	33.0	1	2	50.0
capl 2	1 cm ³	100	49	51.0	12.0	50.0	30.0	1.5	2	458.0
Confidor	0.6 cm ³ /1000 cm ³ w	100	28	72.0	18.0	80.0	6.0	2	1	816.0
jojoba	3 cm ³	100	35	65.0	25.0	80.0	0.0	3	1	572.0
super royal	3 cm ³	100	80	20.0	40.0	25.0	0.0	0.0	2	0.0
capl 2	2 cm ³	100	35	65.0	20.0	100.0	0.0	3	1	637.0
Confidor	1.2 cm ³ /1000 cm ³ w	100	10	90.0	10.0	100.0	0.0	2	0.0	411.0
control	water	100	95	5.0	55.0	88.0	3.0	1	2	823.0

Table (3): Efficiency of some oils and a pesticide at recommended and double recommended rates on some bioagents of cutworm *Agrotis ipsilon*, treated at 4Th. instar larvae

Treatments	Tested Rate / 100 cm ³ water	No. of alive larvae			% of Pupation	% Adult emerged.	% Adult deforms.	sex ratio		No. of Egg/ female
		Pre, T.	Post T.	% Of red.				♀	♂	
jojoba	1.5cm ³	100	7	93.0	35	86.0	0.0	2	1	185
super royal	1.5cm ³	100	100	0.0	32	80.0	0.0	1	2	213
capl 2	1 cm ³	100	5	95.0	87	84.0	0.0	1.5	2	678
Confidor	0.6 cm ³ /1000 cm ³ w	100	7	93.0	33	80.0	0.0	2	1	171
jojoba	3 cm ³	100	70	30	30	83.0	0.0	1.5	1	68
super royal	3 cm ³	100	80	20	25	80.0	0.0	1	3	0.0
capl 2	2 cm ³	100	75	25	60	83.0	8.0	1.3	1	958
Confidor	1.2 cm ³ /1000 cm ³ w	100	35	65	20	100.0	10.0	3	1	0.0
control	water	100	95	5	55	88.0	3.0	1	2	823

resulted 33.0% pupation. The least percentage of pupation at all was found at the treatment with double rate of Confidor (20.0%) while the highest was 87.0% at recommended rate of capt-2, then decreased to 60.0% at double rate of the same oil, while 85.0% at control (Table 3).

JoJoba oil, royal super oil, capt - 2 oil, and the pesticide Confidor showed similar effect on adult emergence when 4th instar larvae of BCW treated with both the recommended and the double rate table (3). Also, no adult deformations was obtained when using both the recommended and the double rates of tested agents except with Confidor and capt -2 (10.0 and 8.0%) respectively.

The effect on sex ratio as shown in table (3) cleared that the rate of (female : and male) in case of jojoba and Confidor was similar (2:1) at the recommended rates, while it was similar to the control (1:2, 1.5:2, respectively) with royal super oil and capt - 2. The double rates of tested agents caused little differ. It was noticed that using JoJoba oil and Confidor produced more females while using royal super oil produced more males at both the recommended and the double rate.

The tested agents at both the recommended and the double rate remarkably affected the number of eggs/ female. It was 171,185,213 and 0.0,68,0.0 for Confidor, JoJoba oil and royal super oil at both the recommended and the double rate, respectively. While capt -2 was similar to the control (678,958,823) respectively.

In conclusion treatment of the 2nd instar larvae with recommended rates increased the mortality percentages, the highest was achieved with Confidor and the lowest was detected with royal super. Similar result obtained when used the double rates. Jojoba and capt -2 caused similar percent mortality at both tested rates. The above result agree with (Badr, *et al.*, 1995) who found that the percent mortality increased as concentration of petroleum oils increased when larvae of *Spodoptera littoralis* was treated.

The highest reduction in pupation caused by royal super at recommended and double recommended rates and the least by capt -2 at recommended rate and confidor at double rate. It could be concluded that, oils gave pest control judged by moth emergence, adult deformation effects, the sex ratio and the number of deposited eggs / female. These results are matched with those obtained by (Mata (1996), Zhang *et al.* (1992), El - Imery *et al.* (1995), Harris *et al.* (1977)).

Data obtained also indicated that 4th instar larvae of *A. ipsilon* were more susceptible to the toxicity of all tested substances.

From the forgoing results it could be concluded that jojoba oil gave similar effect as capt -2 and have the same mortality effect of the pesticide confidor with slightly differ with recommended and double recommended rates.

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فاعلية بعض المبيدات الطبيعية والكيميائية على الدودة القارضة السوداء هدى عبد الفتاح سالم – محاسن محمد أحمد الشرشابي – فائزة أحمد كوير معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى

تم تقييم مستخلص زيت الجوجوبا على الالاعمار الغير كاملة للدودة القارضة السوداء (البيض – العمر اليرقى الثانى – العمر اليرقى الرابع) مقارنة ببعض الزيوت المعدنية (royal super oil, cap1 – 2 oil, ومبيد الكونفيدور (Confidor).

تم استخدام كلا من الجرعة الحقلية الموصى بها لكلا من الزيوت المعدنية ومبيد الكومفيدور وكذلك مضاعف الجرعة الحقلية.

وجد ان استخدام الجرعة الحقلية الموصى بهامن الزيوت المعدنية ومبيد الكومفيدور وزيت الجوجوبا ادى الى انخفاض فى نسبة فقس البيض وصل الى ١٠٠% بالمقارنة بعينة المقارنة.

كما وجد ان نسبة تآثر العمر اليرقى الثانى بزيت الجوجوبا كانت اعلى من تآثر العمر اليرقى الرابع، كذلك وجد ان الجرعة الحقلية كانت اكثر فاعلية من الجرعة الضعف حقلية عند استخدامها على كلا من العمر اليرقى الثانى و العمر اليرقى الرابع.