

IMPRESSION OF NATCOM OIL AND *ADHATODA VASICA* NEES EXTRACTS ON HATCHABILITY OF *SPODOPTERA LITTORALIS* (BOISD) EGGS UNDER LABORATORY CONDITIONS

AMANY S. EL-HEFNY, H.A. SALEH. AND SH.S. YACOUB

Plant Protection Research Institute, ARC, Dokki, Giza

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Abstract

The effects of Natcom oil (40% Jojoba oil + 59% mineral oil 1% garlic oil) and *Adhatoda vasica* leaves (water, ethanol, hexane and acetone) extracts were evaluated on hatchability of *Spodoptera littoralis* eggs at different ages (1 & 5 days) under laboratory conditions 27 ± 2 °C and 70 ± 5 RH.

It was found that Natcom 40 at the different tested concentration had the highest effect against all the tested ages of egg, unless the lowest concentration 1% had the best effect of all, causing 94% and 87.4% reduction for 1 and 5 days old of eggs, respectively.

Adahatoda vasica leaves water and ethanol extracts showed also high effect on eggs compared with the remaining solvents (Acetone and Hexane).

Generally, Preparation of plant extracts were relatively more effective against eggs 5 day old than the ones of 1 day old.

INTRODUCTION

The cotton leafworm, *Spodoptera littoralis* (Lep., Noctuidae), is a major pest of cotton and on other cultivated crops in Egypt, (Ahmad, 1988).

Plants are rich sources of natural substances that could be utilized in the development of environmentally safe materials for pest control. The deleterious effects of certain purified phytochemical or crude plant extracts on insects are manifested in several ways, including toxicity (Hiremath *et. al.*, 1997)

Adhatoda vasica Nees (Acanthaceae) plant, is mainly cultivated for pharmaceutical purposes, also its leaves were highly effective against *S. littoralis* (Antonious *et al.*, 1992).

The efficacy of jojoba oil clearly decreases the number of eggs of *Tetranychus arabicus*, (El-Duweini and Sedrak, 1997).

The aim of this work is to evaluate Natcom oil 40, *A. vasica* leaves and a mixture of 1% Natcom oil plus 2% water extract of *A. vasica* leaves on the percentage of hatchability of *S littoralis* eggs of different ages.

MATERIALS AND METHODS

I . Material preparation:

A. vasica leaves were washed by water and then dried in shade under laboratory conditions then ground in a high speed grinder. Extraction in the laboratory by different organic solvents of increasing polarities, water, ethanol, Acetone and hexane at ratio of 1 (gm powder) : 2 (cm³ solvent) in blender for 15 minutes then filtered (Afifi *et al.*, 1988).

A volume of 50 and 100 cm³ of water was added to the former crude extracts to obtain an emulsion of the desired extracts at two concentrations. Also, extracts in boiling water as described by Emara *et al.*, (1994) , then powder of extracts was dissolved / 100 ml water and stirred for 10 minutes then filtered to obtain suspension at 2, 4 and 8% W / V.

Natcom 40 formulation (40% Jojoba oil + 59% mineral oil + 1% garlic oil) was prepared by adding 1,2 and 4 ml / 100 water being 1, 2 and 4% W / V concentrations. Also, a mixture of 1% Natcom oil 40% plus 2% water extract of *A. vasica* leaves were evaluated on eggs of different ages.

II. Laboratory bioassay

Two different ages of *S. littoralis*, egg-masses, newly laid (1 day and 5 days, old) were used. Each age was divided to three replicates, then sprayed with the different concentrations of the forementioned materials. All egg-masses were left in the laboratory to dry using electric fan. Then the egg-masses were kept in glass tube until hatching at 27± 2 °C, 70 ± 5% RH. Percentage of hatchability was calculated by the following formula:

$$\% \text{ hatchability} = \frac{\text{number of hatched eggs}}{\text{total number of eggs in cluster}} \times 100$$

$$\% \text{ reduction} = \frac{\text{No. egg hatchability in check} - \text{No. egg hatchability in treatment}}{\text{No. egg hatchability in check}} \times 100$$

according to Reda (2007).

III. Statistics:

Results were analyzed using two ways, ANOVA and mean separate which was conducted using L.S.D. (P> 0.01) using M stat program.

RESULTS AND DISCUSSION

A-On eggs one day old

As shown in Table (1), the mixture of 1% Natcom oil 40% plus 2% water extract caused the highest toxicity on *S. littoralis* eggs on 1 day old causing 5.4% hatchability

as 94.4% reduction than control (95.8% hatchability) and had a high significant reduction than the remaining treatments.

In the same Table (1) data obviously showed that Natcom oil 40% oil came the second in efficacy after the mixture, either with concentration 1 or 4% causing 12.1 and 14.5% hatchability as 87.4 and 84.9% reduction, respectively. While Natcom oil 40% in 2% concentration caused 81.6% reduction than control.

While, *A. vasica* water extract at 8, 4 and 2% concentration and ethanol at 1.6% caused the inter-mediate effect and could be arranged in descendingly order according to percentage of hatchability and reduction than control as follows: (16.1% hatchability, 83.2% reduction), (23.7, 75.3%), (28.7, 70%) and (29.6, 69.1%), respectively.

While, *A. vasica* acetone extract ranked the pre last level with concentration 0.8 and 0.4% achieving 54.9% and 60% hatchability.

Lastly, *A. vasica* hexane extract had a significant reduction with the former treatments having the lowest effect on the percentage of hatchability, being 87.9 and 89.1% resulted from the concentrations 0.8 and 0.4%, respectively.

B-On eggs five days old

Data in Table (2), clearly showed that all the tested extracts and preparations achieved similar results to that obtained on eggs one day old. In which the highest efficacy of extracts on hatchability was for Natcom oil 40% EC at 1 and 4% concentration achieving 5.6 and 5.9% hatchability, respectively, as 94% reduction than control for both concentration.

While the mixture ranked the third level in efficacy against *S. littoralis* eggs, causing 8.6 and 90.7% reduction than control.

The remaining tested extracts could be classified to have an intermediate effect on hatchability including water *A. vasica* extract at 8 and 4% concentration, ethanol *A. vasica* extract at 1.6%, water *A. vasica* extract at 2% and ethanol *A. vasica* extract at 0.8%, respectively, achieving (16.1% hatchability, 87.9% reduction than control), (13.3%, 85.8%), (22.4%, 76%) and (22.4% and 76%), respectively. Followed by acetone *A. vasica* extract at 0.8 and 4% concentration (50.7% hatchability, 45.7% reduction) and (55.7% hatchability, 40.4% reduction), these reductions were significantly with the next treatment.

Lastly, the least effect on the percentage hatchability obtained from hexane *A. vasica* extract 0.8 and 0.4% having insignificant reduction, 85.4 and 88.3% hatchability opposite to 90.7% for the control.

These results may be strikingly the efficacy of solvents having high polarity as water and ethanol in which they are responsible for extracting the active ingredient. Also, the previous results are in agreement with that obtained by Sadek (2003) who illustrated that the extracts of *A. vasica* had a toxic activity against *S. littoralis* larvae and Yacoub (2006) clearly demonstrated that the lowest percentage of hatchability of

eggs recorded from Natcom and methanol *A. vasica* extract against *Sesamia cretica* egg-masses. Also, the results are in harmouny with Abdel Monem *et al* (1995) in which they stated that the impression of plant extracts on hatchability of *S. littoralis* eggs (3days old) was more than on newly laid ones.

Table 1. Effect of Natcom oil and *Adhatoda vasica* leaf extracts 1 – 5 day old eggs of *Spodoptera littoralis* under laboratory conditions.

Extracts	Solvents	Conc. %	Hatchability	% Reduction
<i>A. vasica</i>	water	2	28.7ab	70
		4	23.7ab	75.3
		8	16.1a	83.2
<i>A. vasica</i>	Ethanol	1.6	29.6ab	69.1
		0.8	30.4b	68.3
	Acetone	0.8	54.9c	42.7
		0.4	60c	37.4
	Hexane	0.8	87.9d	8.2
		0.4	89.1d	7
Natcom		1	12.1a	87.4
		2	17.6a	81.6
		4	14.5a	84.9
The mixture		1:2	5.4a	94.4
Control	–	–	95.8d	
F value			47.98	
LSD			17.34	

Table 2. Effect of Natcom oil and *Adhatoda vasica* leaf extracts on 5 days old eggs of *Spodoptera. littoralis* under laboratory conditions.

Extracts	Solvents		Hatchability	% Reduction
<i>A. vasica</i>	water	2	24.4ab	73.9
		4	13.3a	85.8
		8	11.3a	87.9
<i>A. vasica</i>	Ethanol	1.6	22.4ab	76
		0.8	32.6b	65.1
	Acetone	0.8	50.7c	45.7
		0.4	55.7c	40.4
	Hexane	0.8	85.4d	8.7
		0.4	88.3d	5.5
Natcom		1	5.6a	94
		2	9.5a	89.8
		4	5.9a	94
Mixture preparation		00:00	8.6a	90.7
Control			93.4d	
F value			34.98	
LSD			19.77	

REFERENCES

1. Abdel-Monem, Eglal, M. G.A. Khadr, M.F. El-Mitwally and M.A. Taha. 1995. Effect of six plant extracts on hatchability of *Ostrinia nubilalis* (Hubn.) and *Spodoptera littoralis* (Boisd.) eggs in the laboratory J. Appl. Sci 10(3): 304 – 312.
2. Afifi, F.A., A.M. Hekal and M. Salem. 1988. Fenugreek seed extract as protectants of wheat grain certain stored product insects. Annals of Agric. Sc., Fac. Agric., Ain Shams Univ., Cairo, Egypt, 33(2): 1331 – 1344.
3. Ahmad, T.R. 1988. Field studies on pheromone trapping of cotton leafworm *Spodoptera littoralis* (Boisd.) (Lep., Noctuidae). J. Appl. Ent. 105, 212 – 215.
4. Antonious, A.G., G. Aegayy, M.F. Shoarawy, L.A. Youssef. 1992. Reaction of the cotton leafworm *Spodoptera littoralis* (Boisd.), feeding on certain plant leaves: 3. Latent effect of larval feeding mededelingen van de Faculteit landbouwwetenschappen univesiteit Gent 57: 707 – 713.
5. El-Duweini, F.K. and R.A. Sedrak. 1997. Evaluation of Jojoba oil for control of spider mite (Acari: Tetranychidae) in Egypt. Proc. Beltwide cotton Conf. New Orleans, LA: 1060 – 1063.
6. Emara, M.M., A.G. El-Sisi and S.A. Mahmoud. 1994. Formulation and evaluation of certain local natural products against Varroa, a mite infesting bee colonies. J. Agric. Sci. Mansoura Univ., 19(5): 1843 – 1850.
7. Hiremath, I.G., Y.J. Ahn, S.I. Kim. 1997. Insecticidal activity of Indian plant extracts against *Nlaparvata lugens* (Homoptera: Delphacidae) Appl. Entomol. Zool. 32: 159 – 166.
8. Reda, A.M.M. 2007. Effect of certain Bio-insecticides and gama irradiation on some biological aspects of the pink bollworm. J. of Agric. Res., Egypt. 85(4): 1285 – 1301.
9. Sadek, M.M. 2003. Antifeedant and toxic activity of *Adhatoda vasica* leaf extract against *Spodoptera littoralis* (Lep.: Noctuidae). J. Appl. Ent. 127: 369 – 404.
10. Yacoub, Sh. S. 2006. Efficacy of some plant extracts in controlling *Sesamia cretica* Led. and *Ostrinia nubilalis* (Hubn.) in maize fields. Ph. D Thesis, Fac of Agric., Benha University, Egypt.

تأثير زيت ناتكوم ومستخلصات أوراق اداهوتا فازيكا على نسبة فقس بيض دودة ورق القطن عمر ١ ، ٥ ايام تحت الظروف المعملية

أماني سامي الحفنى، حسام أحمد صالح ، شنوده سيد يعقوب

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - دقى - جيزة

تم تقدير تأثير زيت النانكوم (٤٠% زيت جوجوبا + ٥٩% زيت معدنى + ١% زيت ثوم ومستخلص أوراق اداهوتا فازيكا بعدة مذيبات (ماء - ايثانول - هكسان - اسيتون) على نسبة فقس بيض دودة ورق القطن فى أعمار مختلفة (١ يوم - ٥ يوم) تحت الظروف المعملية ٢٧ ° + ، ٧٠% رطوبة نسبية.

حيث حقق زيت النانكوم بمختلف تركيزاته اعلى تأثير على البيض بأعمارهم المختلفة لاسيما ان التركيز ١% حقق أعلى تأثيرا مسببا ٩٤% و ٨٧,٤% خفضا فى نسبة الفقس لاعمار البيض ١ ، ٥ يوم على التوالي كما اظهر مستخلص الايثانول والماء لاوراق الاداهوتا فازيكا تأثيرا واضحا بالمقارنة بباقي المذيبات المستخدمة (الاسيتون والهكسان). وبصفة عامة فان المستخلصات النباتية كان لها تأثير أعلى على البيض عمر (٥ أيام).