ACTINOMYCETE NATURAL METABOLITES TO COMBAT *BATRACHEDRA AMYDRAULA* MEYRICK AND *CADRA* SPP AT KHARGA OASIS, NEW VALLEY, EGYPT

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Abstract

Two years of field trials were conducted to investigate the efficacy of certain bio-insecticides against the lesser date moth *Batrachedra amydraula* Meyrick and the almond moth *Cadra* spp at Kharga oasis, New valley, Egypt in 2005/6.

Based on infestation rate of *B. amydraula*, the two imported Actinomycete metabolites, spinosad (Tracer 24 SC) & abamectin (Vertemic 1.8 EC) performed significantly better than the two Deuteromycete metabolites locally produced (by fermentation of *Metarhizium anisopliae* and *Paecilomyces farcinus*) in 2006.

No significant difference was found among the efficacy of spinosad, abamectin and thiocyclam (Evisect) in 2005 or 2006. Also, no significant difference was noticed among the performance of the two locally Deuteromycete metabolites and *Bacillus thuringiensis* subsp *aegypti* (Agerin). Reduction % due to tracer was significantly greater than Agerin in both years of study.

Based on infestation rate of *Cadra* spp, the two imported Actinomycete metabolites, performed significantly better than the two Deuteromycete metabolites locally produced in 2005/6. Thiocyclam (Evisect 50WP) was also significantly better than the two local Deuteromycete metabolites in 2006.Tracer performed the best overall in 2005 and 2006.

INTRODUCTION

Date palm (*Phoenix dactylifera*) is considered one of the most important cash crop in New Valley Governorate. In this Governorate more than one million date palm trees are grown . Besides the local consumption, dates are also exported to foreign countries. The lesser date moth *Batrachedra amydraula* Meyrick is the most serious early pest on date fruit in the Oases of the New Valley (Saleh 1974 , Badawi *et al* 1977). It also considered as a key insect pest in the surrounding countries eg Israel (Venezian and Blumberg 1982),Iraq (Rae 1921), Iran (Niemann et al 1965) , Yamen (Ba-angood 1978) in addition to Israel (Blumberg 1975). It is also established in Saudi-Arabia and Emirates.The loss due to this pest only could reach to 30 % of the final yield.

The larvae attacks young date fruits and usually stops growing. Larvae of this pest were observed feeding on the flesh along the stone in May and June, causing

most of the fruit to become red-brown and finally drop (Venezian and Blumberg (1982). Badawi *et al* 1977, Venezian and Blumberg 1982 mentioned that considerable fruit drop of dates by *B. amydraula* was observed mainly between April and June in Egypt and Israel, respectively. Saleh (1974) stated that infestation with *B. amydraula* begin from the first of July onwards decreased fairly by the end of August or beginning of September, it almost disappeared in New Vally , Egypt.

Cadra spp. (*cautella* and *C.calidella*) are the most important insect pests that start in the field and continue in storehouses. In this respect, Sayed and El-deeb (1996) indicated that sex pheromones played a significant role inside storehouse and not in the field. Al Jabar 2003 stated that *Ephestia kuehniella* Zell is the most important pest arrived to Al Hassa factory from the field. Essa 2003 reported that satisfactory control was achieved by covering date bunches during the 1st half of July

In Egypt , to control date pests, several control methods have been used i. e. certain insecticides (Abd El-Rahim *et al* 1974, Sayed and Aly 1995), sex phermone (Sayed 2000), Mechanical control (Kamel *et al* 1977, Sayed and Temerak1995), biocide (Sayed and Ali 1995), natural products (Sayed *et al* 2001).

Ministry of Agriculture (Egypt) banned all conventional insecticides from use on dates. They allowed only bio-insecticides or organic products. Current available bio-insecticides are slow acting and not satisfy farmers need.

Actinomycetes are well known to produce by fermentation different natural pesticides according to the genus and species. From Actinomycetes, several products were being derived as insecticides, herbicides , Acaricides , and bactericides (Copping 2003).

Accordingly, field trials were done to evaluate two imported Actinomycete metablolites , two locally Deuteromycete metablolites in addition to *Bacillus thuringiensis* product and Evisect against *B. amydraula* and *Cadra* spp.

MATERIALS AND METHODS

Trials were conducted in El-Sherka 55 Village, Kharga Oasis to evaluate the effect of 2 actinomycete and 2 Deuteromycete natural products in comparison to *Bacillus thuringiensis* subsp *aegypti* (Agrin) and Thiocyclam (Evisect) to control the lesser date moth *B. amydraula* on date palm fruits. The experiment was done during two seasons 2005and 2006. The following treatments were applied as follows:

1. Tracer 24% SC (Spinosad) at the recommended rate of 20 ml/100L. Tracer 24 SC, is a trademark of the Dow Agrosciences Co. containing 240 active ingredient as spinosad (Spynosin A & D) .It is a natural metabolite of the Actinomycete, *Saccharopolyspora spinosa* Mertz & Yao .

2. Vertimec 1.8 EC(Abamectin) at 50 ml / 100 L. Vertemec is a natural product produced by the actinomycete soil microorganism *Streptomyces avermitilis*. It is a trademark of Syngenta Co.
3. Bioranza (0.29%) at the rate of 200 ml/100 L. It is a natural metabolite of the Deuteromycete , *Metarhizium anisopliae* Sorok and locally produced by Insect Pathogen Unit, Plant protection Institute, MOA, Egypt.
4. A Natural product (0.25 %) (without name yet), at the rate of 200 ml/100 L. It is a natural metabolite of the Deuteromycete , *Paecilomyces farcinus*.It is locally produced by Insect Pathogen Unit, Plant Protection Institute, MOA, Egypt.
5. Evisect 50WP(Thiocyclam) at the rat of 100 gm/100 L. It is a naturally occurring substance in the marine annelid-worm *Lumbrinereis* spp.) . It is a trademark of Novartis Co.
6. Agerin WP(*Bacillus thuringiensis* subsp *aegypti* (32000 Inter. Units) at the rate of 150 gm / 100 L. It is locally produced by MOA. It is recommended and on sale in Egypt

All products were applied twice/season. The first spray was done on the last week of April and the second spray two weeks later. Ground motor of 600L volume was used.

Date palm variety Saidi (Sewi) was used. All treatments were replicated three times. One date palm tree was considered as one replicate. Samples size was 10 strands / one date palm taken at random from each replicate.

Inspection times were conducted at two weeks interval from the beginning of May until 15thof June during the two successive seasons (2005, 2006). In each assessment fruit having alive larvae or symptoms of infestation or those dropped but having the webbing silk and or faces in their places were recorded. Statistical analysis was done for infestation figures which turned then after to reduction % based on Abbott formula (1925). The same trials were done to combat *Cadra* spp. Application was at 30/6 and 21/7 of 2005 and 2006. Evaluation was recorded at mid September of each year. Sample size was 100 date fruits /one date palm taken at random from each replicate. Infested fruit dates were counted. Statistical analysis was done as mentioned above.

RESULTS AND DISCUSSION

Table 1 & 2 showed the reduction % of *B.amydraula* infestation after fruit being treated by the 2 Actinomycete and 2 Deuteromycete metabolites in addition to Evisect and Agerin during 2005 and 2006.

The two imported actinomycete metabolites,. Tracer 24 SC at 50 ml & Vertimec 1.8EC at 50 ml/100L performed significantly better effectiveness than the two Deuteromycete metabolites locally produced, specially in 2006.

No significant difference was found among the efficacy of the three imported products named Tracer, Vertimec and Evisect (at 100 ml/100L) in 2005 or 2006.Also, no significant difference was noticed among the performance of the two locally Deuteromycete and Agerin in both studied years. Reduction % due to tracer at 50 ml was significantly greater than that of Agerin at 100 ml /100L in both years of study.Spinosad represented the lowest dose used among all the studied products.

Agerin (*B.t.* subsp *aegypti*)indicated the lowest effective product .Blumberge *et al* 1977 indicated that Dipel (B. t.) did not give satisfactory results to control the lesser date moth. Sayed et al 2001 recorded that Spinosad, (Tracer 24% SC) showed more than 95% control of *B. amydraula* at 20 ml / 100 L in the two years of studies while the recommended product *B.t* subsp *kurstaki* (Delfin) indicated 76.5 and 69% control at the rate of 150 gm / 100 L of water for 1999 and 2000 respectively.

Table 3 & 4 showed the reduction % of *Cadra* spp infestation after fruit being treated by the 2 Actinomycete and 2 Deuteromycete metabolites in addition to Evisect and Agerin in 2005 and 2006 respectively.

Based on infestation of *Cadra* spp, the two imported Actinomycete metabolites, performed significantly better than the two Deuteromycete locally produced in 2005 and 2006. Thiocyclam (evisect 50WP at 50 ml) was also significantly better than the two local Deuteromycete metabolites in 2006. Tracer at 50 ml /100L performed the best overall in 2005 and 2006. Spinosad represented the lowest dose used among all the studied products.

Based on the cancellation of conventional insecticides by MOA ,it is generally recommended that using Tracer 24SC(registered as organic farming in Egypt) at 20 ml /100L in alternation with Vertemec at 50 ml or Evisect at 100g could offer one of the best element for integrated pest program of *B.amydrola* to replace conventional insecticides. The first spray should be applied about after flowering and pollination when the first generation larvae have hatched and the second treatment may be required 2-3 weeks later (Sayed and Aly 1995). Same sequence of the same bio-insecticides could be applied for Cadra spp at 23/7 and 21/ 7.

Table 1. Reduction% of *B. amydraula* infestation after date palm fruits being treated with natural products versus (*B.t.*) product in New Valley, Egypt, 2005

Treatment	Rate ml / 100L	Sampling dates								Mean	
		1 / 5		16 / 5		1 / 6		16 / 6			
		Infes.	Red.	Infes.	Red.	Infes.	Red.	Infes.	Red.	Infes.	Red.
Tracer	20	1.3	90.9	1.0	94.6	0.8	93.1	0.7	94.0	0.9 *a*	93.6
Vertimec	50	1.6	88.8	1.0	94.6	0.7	94.0	0.7	94.0	1.0 *ab*	92.9
Evisect	100	1.9	86.8	1.9	89.7	0.5	95.7	0.8	93.2	1.2 *abc*	91.4
P. farcinus	150	2.4	83.3	2.0	89.2	1.0	91.4	0.9	92.3	1.5 *abc*	89.3
Bioranza	200	2.5	82.6	1.9	89.7	1.1	90.5	1.2	89.8	1.6 *bc*	88.6
Agerin	100	2.7	81.2	2.2	88.1	1.4	88.0	1.0	91.5	1.8 *c*	87.2
Control	-	14.4	-	18.6	-	11.7	-	11.8	-	14.1 *d*	-

- L S D 0.05 Treatments: 0.619
- Figures followed by the same letter are not significantly different

Table 2. Reduction% of *B.amydraula* infestation after date palm fruits being treated with natural products versus (*B.t.*) product in New Valley, Egypt, 2006.

Treatment	Rate ml / 100L	Sampling dates								Mean	
		1 / 5		16 / 5		1 / 6		16 / 6			
		Infes.	Red.	Infes.	Red.	Infes.	Red.	Infes.	Red.	Infes.	Red.
Tracer	20	4.8	64.9	0.6	95.3	0.3	97.0	0.9	90.8	1.6 *a*	86.2
Vertimec	50	3.4	75.1	1.4	89.2	1.5	85.2	0.5	94.8	1.7 *a*	85.3
Evisect	100	5.3	61.3	0.4	96.9	1.4	86.2	0.1	98.9	1.8 *a*	84.4
P. farcinus	150	5.6	59.1	2.5	80.7	0.7	93.1	0.9	90.8	2.4 *b*	79.3
Bioranza	200	3.6	73.2	3.2	75.3	2.3	77.4	0.6	93.8	2.4 *b*	79.3
Agerin	100	5.3	61.3	1.2	90.7	2.3	77.4	1.1	88.7	2.4 *b*	79.3
Control	-	13.7	-	13.0	-	10.2	-	9.8	-	11.6 *c*	-

- L S D 0.05 Treatments: 0.619
- Figures followed by the same letter are not significantly different

Table 3. Reduction% of *Cadra* (*Ephestia*) spp. infestation after date palm fruit being treated with natural products versus (*B.t.*) product in New Valley, Egypt, 2005.

Criteria	Treatments / 100 L						
	T 20 ml	A 150 ml	M 200 ml	P 200 ml	V 100 ml	E 50 ml	Cont.
During harvest (15/9/2003):	-	-	-	-	-	-	-
Infestation %	5.33 *a*	11.33 *d*	10.0 *c*	10.0 *c*	6.66 *b*	9.66 *c*	20.66 *e*
Reduction %	74.20	45.15	51.59	51.59	67.76	53.24	-
L S D 0.05 : 1.128							

T:Tracer24SC A: Agerin (*B.t.*) M: Bioranza P: *P. farcinus* V: Vertimec1.8EC E:Evisect 50WP . Infestation followed by the same letter is not significant

Table 4. Reduction% of *Cadra* (*Ephestia*) spp. infestation after date palm fruits being treated with natural products versus (*B.t.*) product in New Valley, Egypt, 2006.

Criteria	Treatments / 100 L						
	T 20 ml	A 150 ml	M 200 ml	P 200 ml	V 100 ml	E 50 ml	Cont.
During harvest (15/9/2004):	-	-	-	-	-	-	-
Infestation %	2.33 *a*	4.33 *c*	5.66 *d*	6.33 *d*	3.33 *b*	3.33 *b*	13.66 *e*
Reduction %	82.94	68.30	58.56	53.66	75.62	75.62	-
L S D 0.05 : 0.720							

T:Tracer24SC A: Agerin (*B.t.*) M: Bioranza P: *P. farcinus* V: Vertimec1.8EC E:Evisect 50WPInfestation followed by the same letter is not significant

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استخدام النواتج الطبيعية لبعض الأكتينومايسيت فى مقاومة حشرة الباتراشيدرا أميدرولا وحشرة الكادرا على ثمار نخيل البلح بالواحات الخارجة ، محافظة الوادي الجديد ، مصر

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- تم أجراء هذه الدراسة بالحقل لدراسة تأثير بعض المبيدات الحيوية على كل من حشرة فراشة البلح الصغرى (باتراشيدرا أميدرولا) وفراشة اللوز(الكادرا) بالواحات الخارجة بمحافظة الوادي الجديد بمصر عامي ٢٠٠٥ و ٢٠٠٦.
- استنادا إلى نسبة الإصابة بحشرة الباتراشيدرا أميدجرولا لثمار نخيل البلح تبين أن عدد ٢ من نواتج الأكتينومايسيت المستوردين من الخارج وهما الأسبينوساد (تريسر ٢٤ SC) والأباماكتين (فيرتيميك ١,٨ EC) أظهروا تفوقا واضحا وبفارق معنوي في تقليل نسبة الإصابة بهذه الحشرة عن عدد ٢ من نواتج الديترومتيسيت المنتجين محليا عن طريق تخمر كل من *Metarhizium anisopliae* و *Paecilomyces farcinus*.
- كما تبين أنه لا يوجد فرق معنوي فى تأثير كل من الأسبينوساد والأبامكتين والثيوسيسلام (الأفيسيكت) خلال عامي ٢٠٠٥ و ٢٠٠٦. وأيضا لا يوجد فرق معنوي فى تأثير عدد ٢ من نواتج الدينرو مايسيت المنتجين محليا ومركب الباسيللاس ثرورينجينسيس أيجيبتى (الأجرين). مركب التريسر أظهر خفض واضح فى نسبة الإصابة وبفارق معنوي عن مركب الاجرين على مدى سنوات الدراسه.
- واستنادا الى نسبة الإصابة بحشرة الكادرا تبين أن عدد ٢ من نواتج الأكتينومايسيت المستوردين من الخارج وهما الأسبينوساد (تريسر ٢٤ SC) والأباماكتين (فيرتيميك ١,٨ EC) أظهروا تفوقا واضحا وبفارق معنوى فى تقليل نسبة الأصابه عن عدد ٢ من نواتج الديترومتيسيت المنتجين محليا خلال عامي ٢٠٠٥ و ٢٠٠٦. وأيضا مركب الأفيسيكت كان أفضل وبفارق معنوي عن عدد ٢ من نواتج الديترومتيسيت المنتجين محليا خلال عامى ٢٠٠٥ و ٢٠٠٦. كما تبين تفوق مركب التريسر فى الفعالية والتأثير على هذه الحشرة على جميع المركبات المستخدمة فى هذه الدراسة خلال عامي ٢٠٠٥ و ٢٠٠٦.