NATURAL METABOLITES TO COMBAT *VIRACHOLA LIVIA* INHABITED DATE PALM FIELDS AT DAKHLA OASIS, NEW VALLEY, EGYPT

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Abstract

Based on reliable successful penetration % of *Viracola livia*, the two imported Actinomycete metabolites namely Spinosad (Tracer 24 SC) & Abamectin (Vertimec 1.8 EC) demonstrated significantly better infestation level than the two Deuteromycete metabolites locally produced in both 2005 and 2006 . The two local metabolites were produced by fermentation of *Metarhizium anisopliae* and *Paecilomyces farcinus*

Thiocyclam (Evisect 50WP) denostrates significantly infestaion level (low) better than the two local Deuteromycete metabolites in both years. Local Deuteromycete metabolite from *P. farcinus* showed the greatest infestation of *V.livia* at 200 ml/100L.

Corresponded reduction infestation level due to Tracer was significantly greater than that of Agerin or *P. farcinus* product in both years of study. Tracer was the best overall in 2005 and equal to Vertimec in 2006. The low penetration % of alive larvae into the fruits, zero and 0.5 with spinosad treatment in 2005 and 2006 respectively, reflected a high level of ovilarvicidal activity of this product.

INTRODUCTION

Date palm (*Phoenix dactylifera*) is one of the most important cash crops in New Valley Governorate in which arround one million date palm trees are grown . Besides the local consumption, dates are also exported to foreign countries. The pomegranate, *Viracola livia* and *Cadra* spp are considered the most economically important insect pests attacking fruit before harvest.

The pomegranate butterfly *Virachola livia* (Klug.) is a serious pest severly attack date palm as well as pomegranate fruit trees in Egypt. The recorded hosts for this pest were pomegranate (*Punica granatum*), date palm fruit, green pods of Acacia (*Acacia nilotica*), (Gough 1913, Graves 1915) and pods of Sheshalan (*Presopis stifiniana*), (Saleh and Hosny 1981). The following hosts were also mentioned in literature : peach fruits (*Prunus persica*), (Fletcher and Gosh 1919), guava (*Psidium guaiava*), orange (*Citrus sinensis*) and tamarind pods (*Tamarindus indica*), (Pillai 1921). To combat this pest in Egypt, conventional insecticides as malathion or carbaryal were used (Awadalla *et al* 1970, Hussein and Gouhar 1972 and Abd El-

Rahim *et al* 1974). Due to environmental toxicity, Ministry of Agriculture banned all conventional insecticides in 1996. Farmers started using of B. t. bioproducts due to the very poor performance they stopped them. Enclosing date bunches in bags (bagging) received a considerable work and research (Cherian 1942, Awadalla *et al* 1971, and Hussein et al 1994). Also, The proper timing of bagging was a good tool for better control (Sayed 2000). While some farmers of the New Valley used the bagging as a mechanical control specially in Kharga Oasis, some did not specially in Dakhla Oasis due to the change in the fruit microenvironment e. g. light, humidity, and cost.

Ministry of agriculture (MOA) banned all conventional insecticides from use on dates and allowed only bio-insecticides or organic products. Current available bio-insecticides are slowly 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.

Accordingly, field trials were carried out to evaluate the bioeffect of two imported actinomycete metablolites, two local deuteromycete metablolites in addition to *Bacillus thuringiensis* (B.T) product and Evisect.

MATERIALS AND METHODS

Trials were conducted in Balat Village, Dakhla Oasis to evaluate the bioeffect of two actinomycete and two deuteromycete natural products in comparison to *Bacillus thuringiensis* subsp *aegypti* (Agerin) and Thiocyclam (Evisect) to control the pomegranate moth , *Viracola livia* on date palm fruits. The experiments were done during two successive seasons 2005 and 2006 including the following treatments:

1. Tracer 24% SC (Spinosad) at the recommended rate of 20 ml/100L. Tracer, 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. It is a natural product produced by the Actinomycete soil microorganism (Streptomyces avermitilis). It is a trademark of Syngenta Co.
3. Bioranza (0.29%) is a natural metabolite of the Deuteromycete , Metarhizium anisopliae and locally produced by Insect Pathogen Unit, Plant protection Institute, MOA, Egypt.
4. A natural product (0.25 %) (without name yet), is a natural metabolite of the Deuteromycete, *Paecilomyces farcinus*.It is locally produced by Insect Pathogen Unit, Plant Protection Institute, MOA, Egypt.

The two local products were produced by fermentation of *M. anisopliae* and *P. farcinus* and were used at 200 ml /100L each.

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 and recommended by MOA.
7. All products were applied twice/season, the first was on 30 / 6 and the second was three weeks later. Ground motor of 600L volume was used

Date palm variety is semi dry variety namely Saidi was selected and all trees in all experiments were almost the same height and age. Each treatments was replicated three times i. e three palm trees. Sample size was 10 strands / one date palm (a replicate) taken at random 3 weeks after each spray.

Number of fruits / 30 strands, total no. of eggs on fruits, no. hatched eggs, no. fruits having alive larvae , infestation of fruit % and reduction % were all recorded in each treatment three weeks after spraying as well as before harvest (August 30).

Successful penetration was calculated based on no. of alive larvae succeeded in penetration. Statistical analysis was done for infestation figures which turned thenafter to reduction % based on Abbot formula.

RESULTS AND DISCUSSION

Table 1 & 2 showed the changes in the reduction % of *V.livia* infestation after the treatment by the Actinomycete and Deuteromycete metabolites in addition to Evisect and Agerin in 2005 and 2006 .

Based on the infestation or successful penetration % of *V. livia*, the two imported Actinomycete metabolites, Spinosad & Vertimec performed significantly better than the two Deuteromycete metabolites locally produced in both years.

Thiocyclam (Evisect) was also significantly better than the two local products in both years. The fruits treated with *P. farcinus* product received the greatest infestation in both years. Reduction of infestation due to Tracer was significantly greater than Agerin or *P. farcinus* product in both years of study.

Tracer was the best overall in 2005 but equal to Vertimec in 2006. Successful penetration % in case of spinosad treatment was zero and 0.5 in 2005 and 2006, respectively. This reflected a high level of ovilarvicidal activity although the dose used was the lowest between all doses of the other products. Similar results of Tracer 24SC were published by Temerak and Sayed in 2001 who added that this product can work at 52 ° C without any phytotoxicity on dates.

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 in alternation with Vertimec at 50 ml or Evisect at 100 gm/100l could offer the best integrated program to instead of conventional insecticides, for controlling *V. livia* in palm trees.

Table 1. Reduction% of *Virachola livia* infestation after treatment with different products in New Valley, Egypt, 2005.

Criteria	Treatments / 100 L						
	T 20 ml	A 150 ml	M 200 ml	P 200 ml	V 50 ml	E 100 ml	Cont.
1st Spray	-	-	-	-	-	-	-
Fruits / 30 strands	547	558	641	654	503	583	550
Total no. of eggs	19	20	27	27	32	23	64
Hatched eggs found %	52.6	80	44.4	74	34.3	69.5	71.8
Penetration %	10	43.75	41.66	50	9.09	43.75	100
Fruits having alive larvae	0.18	1.25	0.78	1.52	0.19	1.20	8.36
(Infest.) %	97.84	85.04	90.66	81.81	97.72	85.64	-
Reduction %							
2nd Spray	-	-	-	-	-	-	-
Fruits / 30 strands	558	589	580	586	507	608	568
Total no. of eggs	36	68	32	65	22	58	186
Hatched eggs found %	47.2	39.7	37.5	66.1	86.1	36.2	52.1
Penetration %	41.17	59.25	66.66	76.74	40.0	47.61	98.96
Fruits having alive larvae	1.25	2.71	1.37	5.63	1.18	1.64	16.90
(Infest.) %	92.60	83.96	91.89	66.68	93.01	90.29	-
Reduction %							
Before harvest	-	-	-	-	-	-	-
Fruits / 30 strands	558	508	572	587	465	562	564
Total no. of eggs	9	21	29	41	15	19	165
Hatched eggs found %	77.7	85.7	68.9	85.3	53.3	42.1	99.3
Penetration %	0	88.8	70.0	94.28	50	87.50	100
Fruits having alive larvae	0 *a*	3.14 *c*	2.44 *c*	5.62 *d*	0.86 *b*	1.24 *b*	29.07 *e*
(Infest.) %	100	89.19	91.60	80.66	97.04	95.73	-
Reduction %							
L S D 0.05 : 0.700							

- T:Tracer A: Agerin M: Bioranza P: *P. farcinus* V: Vertimec E: Evisect
- Numbers followed by the same letter are not significantly differed

Table 2. Reduction% of *Virachola livia* infestation after treatment with different products 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.
1st Spray	-	-	-	-	-	-	-
Fruits / 30 strands	594	551	605	632	649	540	667
Total no. of eggs	132	92	88	166	59	95	227
Hatched eggs found %	45.4	79.3	73.8	48.1	45.7	30.5	59
Penetration %	10	86.30	61.53	61.25	25.92	44.82	100
Fruits having alive larvae	1.01	11.43	6.61	7.75	1.07	2.40	20.08
(Infest.) %	94.97	43.07	67.08	61.4	94.67	88.04	-
Reduction %							
2nd Spray	-	-	-	-	-	-	-
Fruits / 30 strands	677	528	530	660	714	524	602
Total no. of eggs	505	78	180	307	146	202	309
Hatched eggs found %	69.1	79.4	60	56.3	82.8	42.5	81.8
Penetration %	1.71	56.45	62.96	52.60	0	22.09	96.44
Fruits having alive larvae	0.88	6.62	12.83	13.78	0	3.62	40.53
(Infest.) %	97.82	83.66	68.34	66.0	100	91.06	-
Reduction %							
Before harvest	-	-	-	-	-	-	-
Fruits / 30 strands	567	583	520	646	590	639	726
Total no. of eggs	260	88	135	169	49	94	217
Hatched eggs found %	75.7	85.2	72.5	91.1	77.5	85.1	100
Penetration %	0.50	89.33	51.02	61.03	7.89	41.25	100
Fruits having alive larvae	0.17 *a*	11.49 *d*	9.61 *c*	14.55 *e*	0.50 *a*	5.16 *b*	29.88 *f*
(Infest.) %	99.43	61.54	67.83	51.30	98.32	82.73	-
Reduction %							
L S D 0.05 : 0.834							

- T:Tracer A: Agerin M: Bioranza P: *P. farcinus* V: Vertimec E: Evisect
- Numbers followed by the same letter are not significantly differed

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استخدام النواتج الطبيعية لبعض الأكتينو مايسيت فى مقاومة حشرة الفيراكولا ليفيا على ثمار نخيل البلح بالواحات الداخلة ، محافظة الوادي الجديد ، مصر

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- إستادا الى الاختراق الناجح لبرقات الفيراكولا ليفيا 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 فى تقليل نسبة الإصابة عن عدد ٢ من نواتج الديترومتيسيت المنتجين محليا على مدى سنوات الدراسه ٢٠٠٥ و ٢٠٠٦. نـواتج الديترومتيسيت المنتجين محليا تم عن طريق تخمر كل من *Metarhizium anisopliae* و *Paecilomyces farcinus*.
- كما تبين أن نواتج الثيوسيسلام (الافيسيكت 50WP) أظهر تفوق واضح وبفارق معنوى فـى تقليل نسبة الإصابة بهذه الحشرة عن عدد ٢ من نواتج الديترومتيسيت المنتجين محليـا علـى مدى سنوات الدراسة. كما تبين أن الديترومايسيت الناتج محليا من *P. farcinus* أظهر أعلى نسبة أصابه بحشرة أبو دقيق الرمان عند استخدامه بمعدل ٢٠٠ مللي / ١٠٠ لتر.
- كما تبين أن التريسر أظهر خفض واضح فى نسبة الإصابة وبفارق معنوي كبير عن كل من مركب الاجرين والمركب الناتج من *P. farcinu* على مدى سنوات الدراسة. كمـا تبـين أن مركب التريسر تفوق على جميع المركبات المستخدمة فى هذه الدراسة ومساويا فى التأثير مع مركب الفرتيميك خلال عام ٢٠٠٦. أقل اختراق لليرقات للثمار كان صفرا و ٠,٥ % علـى مدى سنوات الدراسة ٢٠٠٥ و ٢٠٠٦ على التوالي نتيجة استعمال مركب الأسبينوساد كما تبين أن مركب التريسر كان له تأثير واضح على البيض واليرقات الحديثة الفقس لهذه الحشرة.