LABORATORY EXPERIMENTS OF MISCIBLE OILS, IGRS BIO-EFFICACY AND THEIR JOINT EFFECT AGAINST THE SOFT SCALE INSECT *PULVINARIA TENUIVALVATA* (NEWSTEAD) INFESTING SUGARCANE IN EGYPT

HARISS, H. M[2]., EKRAM I. HELMY[2] AND S. M. ABDEL-WAHED[1]

1. *Fac. Agric., Ain – Shams Univ.*
2. *Plant Protection Research Institute, ARC, Egypt*

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Abstract

The mixture of miscible oils, IGRs and the miscible oils alone demonstrate successful performance against *Pulvinaria tenuivalvata* (Newstead) (Hemiptera: Homoptera: Coccidae) infesting sugarcane leaves However, IGRs alone gave moderate effect in this respect .

Reduction % in the red striped soft scale insect individuals two weeks after treatment were 97.9 , 96.5 , 93.4 and 92.8 for of the mixture of Super Misrona and Applaud, Admiral and Super Misrona and Super Royal alone respectively. However, Applaud and Admiral alone demonstrate 66.3 and 64.7%. Results also, Cleary show that, the nymphal stages, harbaured significantly affected by the tested treatments, followed by adult females, females laying eggs came next. No phytotoxicity was observed on the treated sugarcane leaves with the all tested treatments. Whereas, there were different affects on the associated natural enemies, the endoparasitoid : *Coccophagus scutillars* and the predator, *Orius* sp Miscible oils alone and mixture with IGRs can be recommended for IPM program against sugarcane pests to minimize the control costs and environmental pollution. In addition to their safety effect on the beneficial organisms.

INTRODUCTION

Sugar cane, *Sacckarum efficinarum* L. is considered the major source of sugar production in Egypt. Insect pests are one of the main limiting factors affecting sugar production. The red striped soft scale insect, *Pulvinaria tenuivalvata* (Newstead) (Hemiptera : Homoptera : Coccidae) is resently considered as the most serious insect pest infesting sugarcane plants in upper Egypt .

In Egypt the soft scale insect *Pulvinaria elongata* (Newstead) is recorded for the first time in (1992). It attacks the sugarcane leaves in Agricultural Experimental station at Sabahia, Alexandria. Karam and Abu-Elkhair (1992) .

Since 1996 *P. tenuivalvata* emerged as a chronic pest of sugarcane plants at Giza, Beni Suif, El Menia and Qena Governorates. Ali *et al.* (1997), Helmy (2001), Helmy *et al.* (2001 b). *P. tenuivalvata* attacks the sugarcane leaves only causing severe damage, beside the honey dew secretion which causes a sooty moulds covers on the upper surfaces of leaves and prevents the photosynthesis and respiration. Severe infestation resulting serious damage and noticeable reduction in quality and quantity of sugarcane yield. Ali *et al.* (1997), Helmy *et al* (2001 b).

Coccophagus sp is cosmopolitan genus in family Aphelinidae. Many of its species, which are frequently encountered parasitoids of soft scales, which have been used successfully for biological control programs in many sugarcane cultivated areas in the world. Manj and Krishna (1999), and Abdel-Baky *et al.* (2003) .

The aphelinid, *Coccophagus scutillaris* attack coccid, *Pulvinaria tenuivalvata* which considered as one of the most important insect pests of sugarcane in Egypt. Percentage of parasitism reached 95% in the 2nd insects nymph of *P. tenuivalvata.* It can be considered as a potential biological control agent for this pest. Abdel-Samea (2003).

The traditional method for controlling Coccid pests using highly toxic O.P compounds for several times, dimethoat, quinalphos, methyl parathion, diazinon others, according to Gupta and Singh (1988), Srivastava *et al.* (1989) and Gui *et al.*(1997), Considerable problems arose from the continued application of these insecticides, the development of resistance by insects, kill natural enemies, cause environmental pollution with high pesticide residues in the plants. The effectiveness of low toxic compounds, plant extracts, IGRs, liquid soap and the local mineral oils deserve the attention of many investigators in Egypt namely, El-Sebae *et al* (1976) Aly *et al.*(1984), Hassan *et al* (1994), Helmy *et al* (2001a , 2001b) and Kwaiz *et al* (2004) .

The present laboratory investigation was carried out to evaluate the efficacy of two local miscible oils and two IGRs and the joint effect of IGRs with Super Misrona oil against *Pulvinaria tenuivalvata* (Newstead) infesting sugarcane leaves. The side effect of the tested treatments on sugarcane leaves and their deleterious effect on the associated natural enemies, the endoparasitoid, *Coccophagus scutillaris* and *Orius* sp predator were also investigated .

MATERIALS AND METHODS

Laboratory experiment was conducted in May 2002 at plant protection research Institute, PPRI, in Dokki, Giza, Egypt. The efficiency of two local miscible oils namely, Super Royal, Super Misrona, two IGR, Applaud, Admiral and their mixed with Super Misrona oil, as lab. spraying against the red striped soft scale insect, *Pulvinaria tenuivalvata* (Newstead) infesting sugarcane leaves. Seven treatments were tested including the untreated check (control) .

1- The tested treatments were as follows :

- Super Royal oil : produced by petroleum corporation society consist of 95% local mineral miscible oil + 5% emulsifier, the rate of use was 1.5%.
- Super Misrona oil : produced the Misr petroleum Co. Egypt. Contain 95% local mineral Miscible oil + 5% emulsifier, the tested rate was 1.5% .

- Applaud (buprofezin) developed by Nihon Nohyaku Co. Tokyo, Japan. The tested rate was 0.5% .
- Admiral (pyriproxyfen) 10% EC produsedby Sumitomo Chemical Co. Osaka, Japan. The tested rate was 0.5 % .
- Super Misrona oil 1.5 % + Applaud 0.5% .
- Super Misrona oil 1.5 % + Admiral 0.5% .
- (control) Sprayed with water .

Samples: about 150 infested leaves were riched from sugarcane field in Nagh-Hammady district, Qena Governorate. were transferred to the laboratory in paper bags carefully examintions. Samples of five leaves replicated four times per treatment were picked at random from the field sample .

Laboratory spraying : was conducted by one litter plastic sprayer on the both upper and underside sugarcane leaves Whereas, the laboratory conditions was under 24 °C ± 1 and 64 ± 1 % R.H.

Laboratory examinations were carried out by means of a stereo binocular microscope before laboratory treatment to keep index of pre treatment count and 3 , 7 , 10 and 14 day after as post treatment counts. All alive *P. tenuivalvata* (Newstead) different stages, nymphs, adult females and the ovipositing females were counted and recorded per leaf.

The statistical analysis adopted: percentage of reduction in *P. tenuivalvata* different stages was calculated according to Stafford and Summers (1963) equation. The least significant difference (L.S.D.) between treatments efficacy and between the different stages affect was considered when "F" value was significant .

For the phytotoxicity of the tested treatments on the treated sugarcane leaves and along with the combined deleterious effect on the most effective parasitoid, *Coccophagus scutillaris* and the *Orius* sp predator were also. Investigated .

RESULTS AND DISCUSSION

The bio-residual activity of the tested treatments:

The careful examination data tabulated in table 1 & 2 for the red striped soft scale insect, *Pulvinaria tenuivalvata* (Newstead) infested the sugarcane leaves collected from Nagh-Hammady district, Qena Governorate to evaluate the efficacy of six different treatments are tabulated in tables (1 & 2) .

Table (1) showed that, the average number of alive *P. tenuivalvata* different stages per leaf for both the pre-treatment count and four post-treat. counts 3, 7, 10 and 14 days after applicaton. In addition to the average number of alive both , *Coccophagus scutillaris* in all stages and *Orius* sp associated with this pest .

The data in table (2) demonstrate the reduction percentage in *P. tenuivalvata* different stages after laboratory experiment to evaluate the efficacy of six treatments. Also, the rate of parasitism and predacity, results could be summarized as follows .

Excellent results were recorded in case of Super Misrona oil when mixed with Applaud and Admiral. Reduction % being (65.6 & 63.9) and (97.9 & 96.5) after 3 and 14 days of application respectively. Also, Super-Royal and Super Misrona oils alone demonstrate excellent bio-effect results. The reduction % were (63.3 & 61.8), (77.9 & 75.2) and (92.8 & 93.4) after 3 , 7 and 14 days of application, respectively. However, applaud and Admiral showed significant poor efficacy 3 and 7 days after treatment the reduction % being (37.6 & 38.1) and (42.2 & 43.8), respectively .

Whereas, they harbaur moderate mortality values after 10 and 14 days, there reduction % were (53.8 & 54.5) and (66.3 & 64.7), respectively .

The statistical analysis of data was carried out and yielded highly significant differences between the first four treatments and the last two treatments, Applaud and Admiral. Slight differences was obtained between the mixture of oil and miscible oils alone .

Concerning the simultaneous effect of the tested treatment on the *P. tenuivalvata* different stages, was estimated, data in table (2) revealed that nymphal stages showed highly significant affect to the tested treatments. Females without and with eggs came next in this respect with significant affect between each other .

No phytotoxic symptoms were recorded for the infested and treated sugarcane leaves two weeks after spraying under the laboratory conditions 24°C ± 1 and 64 % ± 1 R.H.

Data presented in Tables (1 & 2) revealed that, no deleterious effect on the most effective parasitoid i.e, *Coccophagus scutillaris* (Dalman) (Hymenoptera : Aphelinidae) two weeks after treatment. The pre mature stages numbers ranged between (11-15) individuals per leaf in case of the miscible oils alone and mixed with IGRs and (8-9) ind. / leaf in case JGRs alone, Admiral and Applaud respectively. However, the rate of parasitism was between (61.1 & 83.3) with the first case and (44.4 & 50) in the second .

Data tabulated in the same tables demonstrate that, the mean number of the most important associated predator, *Orius* sp (Hemiptera : Anthocoridae) ranged between (9-12) ind. per leaf when used mineral miscible oils alone or mixed with the IGRs and (5-7) in case of Admiral and Applaud two weeks after laboratory testing, respectively. Reduction % were between (60-80) for the first case and between (33.3 – 46.7) for the second .

The results obtained of this investigation are in agreement with those obtained by Aly *et al,* (1984), Hassan *et al* (1994), Mni and Krishnam (1999), Helmy (2001), Helmy *et al* (2001), Abdel-Samea (2003), and Kwaiz *et al* (2004). They recorded that spray oils were successfully used for about twenty years against hard and soft scale insects, mealy bugs, thrips, whiteflies and mites on different crop and fruit trees .

The previous mentioned results could be concluded that, the summer mixable oils, Super Royal and Super Misrona alone or mixed with IGRs, Applaud or Admiral were more efficient on various developmental stages of the soft striped scale insect, *P. tenuivalvata* (Newstead) infesting sugarcane plants in addition to their quite safety effect on the associated natural enemies. They can be recommend in any integrated control program against this pest from early February till late May in Qena Governorate. Whereas, the sugarcane plants are not exceeded one meter high to achieve excellent results.

REFERENCES

1. Abdel-Baky, N. F., A. H. Abdel-Salam and H. A. El-Fadaly. 2003. *Pulvinaria tenuivalvata* (Newstead) and its natural enemies on ratoon sugarcane in Dakahlia. J. Agric. Sci. Mansoura Univ., 28, 7 : 5699 – 5712 .
2. Abdel El-Samea, Saadia A. 2003. Laboratory studies on *Coccophagus cutellaris* (Dalman) (Hymenoptera : Aphelinidae), parasitoid of the soft scale insect, *Pulvinaria tenuivalvata* (Newstead), a pest at sugarcane in Egypt, Egypt. J. Agric. Res., 81 (3) 967 – 980 .
3. Ali, M. A, A. S. El-Khouly, El-M. F. El-Metwally and M. I. S. Shalaby. 1997. First record of the sugarcane scale *Saccharolecanium krugeri* (Zehntner) in Giza, Egypt. (Bull. Ent. Soc. Egypt, 75: 156 – 159) .
4. Aly, A. G., Z.M. El-Attal and Ekram I. Helmy. 1984. Efficiency of some local spray oils as summer applications against *Pulvinaria psidii* (Mask) on Guava trees. Agric. Res. Rev., 62 (1) : 163 – 167 .
5. Gui, S., Y. Zhao and Q. Zhiguang. 1997. Study on persimmon scale and its control. Forest – Research China 10 : 5, 514 – 518 .
6. El-Sebae, A. H, F. A. Hossam El-Deen, M. Abo-Elamayem and A. El- Marie. 1976. Studies on chemical structure and insecticidal activity of local spray oils 2nd Arab Conf. Petrochem, Abu-Dhebi, no. 5 p. 4 .
7. Gupta, B. and J. Singh. 1988. Mango scale insect – occurrence in western Uttar pradesh and their control. Progressive – Horticvlture., 20 : 3-4 , 357 – 361 .
8. Hassan, N. A., M. A. El-Hamaky, S. M. El-Imery , Ekram I. Helmy and E. Gommae. 1994. Chemical control of the purple scale insect *Cornuaspis beckii* (Newmen) by

miscible oil and liquid soap and its effect on the parasitoid *Apytis lepidosaphes* Comp. On orange trees. Bull. Entomol. Soc., Egypt. Ser., (21) : 121 – 126 .

9. Helmy, Ekram I. 2001. Efficiency of certain alternative pesticides, local mineral oils against the soft scale insect infesting sugarcane at Giza, Egypt. Assiut Univ., Egypt, 91 – 89 .
10. Helmy, Ekram I., Nagwa A. Hassan, S.M. El-Imery and Fayza A. Kwaiz. 2001 a. Efficacy of certain miscible oils and liquid soap against the most important scale insect and terrestrial snail on apple trees in Egypt. J. Agric. Sci. Mansoura Univ., 26 (5) : 3165-3170 .
11. Helmy, Ekram I., Nagwa A. Hassan, S.M. El-Imery and H. M. Haris. 2001 b. Miscible oils, IGR and their joint effect as promising safe alternative pesticides control against *S. krugeri* (Zehntner) infesting sugarcane at Qena Gover., Egypt. Assiut Univ., Egypt, 99 – 105 .
12. Karam, H. H. and S. S. Abou El-Keir. 1992. First record of *Pulvinaria elogata* (Newstead) (Homoptera : Coccidea, Coccidae). (Alex. J. Agric Res. 37 (1) : 587 – 594) .
13. kwaiz, fayza, A., Nagwa A. Hassan and Ekram I. Helmy. 2004. Efficacy of local mineral oils on controlling *pulvinaria psidii* (Mask) infesting guava trees at Qaluobiya, Egypt, Egypt. J. Appl. Sci, 19 (2) 262 – 268 .
14. Mani, M. and A. Krishnam. 1999. Suppression of green shield scale, *Pulvinaria psidii* (Maskell) with Australian ladybird beetle on. Lemon. Insect. Environment. 4 : 4, 116 – 117 .
15. Srivastava, R., S. Abbas, S. Sharma and M. Fasih. 1989. Field evaluation of insecticides for the control of mango scale *Pulvinaria polygonata* cockere. India, Jurnal, of , Entomology, 51 : 4 , 470 – 471 .
16. Stafford, E. M. and F. M. Summer. 1963. Evaluating control of San Jose scale. Hilgardia, 35 (2) : 13 – 32 .

Table 1. Average No. of alive *P. tenuivalvata* (Newstead) different stages on the sugarcane leaves based on pre and post treatment counts after laboratory treatment in May 2002 .

Treatments and rate of use	Average No. alive *P. tenuivatvata* different stages / leaf																		Mean No. of parasite and predator / leaf	
	Pre. Treat. count			1st post treat. Count (3 days)				2nd post treat. Count (7 days)				3rd post treat. Count (10 days)				4th post treat. Count (14 days)				
	* Nym.	Ad. fem.	Fem. + eggs	Nym.	Ad. fem.	Fem. + eggs	Mean	Nym.	Ad. fem.	Fem. + eggs	Mean	Nym.	Ad. fem.	Fem. + eggs	Mean	Nym.	Ad. fem.	Fem. + eggs	Mean	**C. *scutillaris*	*** *Orias* sp.
1- Super Royal oil (95%) 1.5%	47	13	10	13.4	4.5	4.7	7.5	8.1	2.8	2.7	4.5	4.2	1.7	1.8	2.6	1.4	0.9	1.2	1.2	14	10
2- Super Misrona oil (95%) 1.5%	45	11	9	13.4	4.8	4.3	7.5	9	4	2.6	5.2	4.8	1.4	1.8	2.7	1.6	0.6	1	1.1	15	12
3- Applaud 25Sc 0.05%	48	14	9	27	8.6	6.3	13.4	25.2	7.9	5.8	12.9	17.6	6.7	4.9	9.7	13.9	4.6	3.5	7.3	9	7
4- Admiral 10% Ec 0.05%	45	15	11	26	9	7.4	14.1	23.2	8.3	6.8	12.8	15.9	7.3	5.8	9.7	13.4	5.2	4.6	7.7	8	5
5- Super Mis. 1.5% + Applaud 0.05%	48	12	8	11.7	4.1	3.5	6.4	7.3	2.2	2	3.8	2.1	1.4	1.1	1.5	0	0.2	0.3	0.2	11	9
6- Super Mis. 1.5% + Admiral 0.05%	46	13	11	12.5	4.3	5.2	7.3	6.6	2.8	2.9	4.03	1.7	1.5	1.5	1.6	0.2	0.5	0.7	0.5	13	11
7- Control	45	11	8	48	13	9	23.3	43	17	11	23.7	47	14	13	24.7	51	18	17	28.7	18	15

* Nym. = Nymphs . Ad. Fem.= Adult females Fem. + Eggs = Females laying Eggs.

** *Coccophagus scutillaris* in all stages; larvae, pupae and emerged halls

Table 2. Reduction percentage in *P. tenuivalvata* (Newstead) infesting sugarcane leaves and their side effect on the associated parasite and predator after Lab. testing of certain safe scalicides in May 2002 .

Treatments and rate of use	Reduction % in the alive *P. tenuivalvata* different stages / leaf days after treatment																% Parasitism and predacity	
	1st post treat.				2nd post treat.				3rd post treat.				4th post treat.					
	Count (3 days)				Count (7 days)				Count (10 days)				Count (14 days)					
	Nym.	Ad. fem.	Fem. + eggs	Mean %	Nym.	Ad. fem.	Fem. + eggs	Mean %	Nym.	Ad. fem.	Fem. + eggs	Mean %	Nym.	Ad. fem.	Fem. + eggs	Mean %	*C.scutillaris* all stages	** *Orias* sp. L. stage
1- Super Royal oil (95%) 1.5%	71.4	65.2	53.3	63.3 a	82.8	78.4	72.5	77.9 a	91	86.6	82.5	86.7 b	96.9	93.3	88.2	92.8 b	77.78	73.33
2- Super Misrona oil (95%) 1.5%	70.3	63.3	51.8	61.8 ab	80.1	74.8	70.7	75.2 ab	89.3	87.1	80.1	85.5 b	96.5	94.7	89	93.4 b	83.33	80
3- Applaud 25Sc 0.05%	43.8	38.5	30.5	37.6 c	47.5	43.8	35.3	42.2 a	63.3	52.2	45.6	53.8 c	71	67.2	61.1	66.3 c	50	46.67
4- Admiral 10% Ec 0.05%	42.2	39.8	32.3	38.1c	48.5	44.7	38.2	43.8 c	64.6	51.3	47.6	54.5 c	70.3	65.5	58.3	64.7 c	44.44	33.33
5- Super Mis. 1.5% + Applaud 0.05%	75.6	65.5	55.7	65.6 a	84.7	81.7	74.5	80.3 a	95.6	88.1	85.7	89.8 a	99.9	98	95.8	97.9 a	61.11	60
6- Super Mis. 1.5% + Admiral 0.05%	72.8	66.6	52.3	63.9 a	85.6	78.6	73.4	79.2 a	96.2	88.8	86.5	90.3 a	99.6	96.2	93.7	96.5 a	72.22	66.67
Mean % of stages	62.7 a	56.5 b	46.0 c		71.5 a	67 b	61.3 c		84 a	75.69 b	71.33 c		89 a	85.8 b	81 c			

L.S.D. at 0.05 between stages : = 1.097 = 1.928 = 1.126 = 1.029

L.S.D. at 0.05 between treatments : = 2.014 = 2.536 = 2.018 = 2.940

تقييم معملى للزيوت القابلة للإستحلاب ومنظمات النمو الحشرية ومخاليطها على حشرة القصب الرخوة(Newstead) *Pulvinaria Tenuivalvata* بمصر

حسام محمد حارس[٢] ، إكرام إسماعيل حلمى[٢] ، سالم محمد عبد الواحد[١]

١. *كلية الزراعة جامعة عين شمس.*

٢. *معهد بحوث وقاية النباتات. مركز البحوث الزراعية دقى، جيزة. مصر*

سجلت أفضل النتائج عند إستخدام الزيوت القابلة للإستحلاب المخلوطة مع منظمات النمو الحشرية وكذلك عند إستخدام الزيوت منفردة. بينما إستخدام منظمات النمو الحشرية منفردة كان لها تأثير متوسط فى مكافحة حشرة القصب الرخوة التى تصيب أوراق القصب .

كانت نسبة الخفض فى التعداد ٩٧,٩ ، ٩٦,٥ ، ٩٣,٤ ، ٩٢,٨% فى حالة زيت سوبر مصرونا مخلوط مع كل من منظم النمو أبلود ، أدميرال وفى حالة زيت سوبر مصرونا وزيت سوبر رويال منفرداً على التوالى. بينما حقق كل من الأبلود والأدميرال منفردين نسبة خفض قدرها ٦٦,٣ و ٦٤,٧ من مجموع الحشرات ، وذلك بعد أسبوعين من التقييم المعملى. أوضحت النتائج كذلك شدة حساسية الأطوار غير الكاملة للمعاملات المستخدمة يليها بفرق معنوى كل من الإناث البالغة والإناث الواضعة للبيض .

لم تظهر أى آثار جانبية على أوراق القصب التى تم معاملتها حتى نهاية التجربة كذلك سجل تفاوت فى كل من نسبة التطفل بطفيل *Coccophagus scutillars* حيث كانت أقل النسب فى حالة منظمات النمو الحشرية المنفردة .

نفس النتائج سجلت مع بقة *Orius* sp المفترسة للحشرة القشرية الرخوة التى تصيب أوراق القصب . وبناءاً على هذا التقييم فيمكن التوصية بإستخدام الزيوت القابلة للإستحلاب منفردة أو مخلوطة مع منظمات النمو الحشرية ؛ الأدميرال و الأبلود فى برامج المكافحة المتكاملة لهذه الآفة الخطيرة وذلك بهدف تقليل تكاليف المكافحة والتلوث البيئى هذا بالإضافة إلى قلة سميتها على الأعداء الحيوية المصاحبة لحشرة القصب المخططة الرخوة التى تصيب أوراق قصب السكر فى مصر .