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Efficacy of Some Insecticides on White Mango Scale, *Aulacaspis tubercularis* (Hemiptera: Diaspididae) on different cultivars of mango trees

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Abstract

Mango (*Mangiferaindica L.*) has been identified as the most important fruit in commercial and environmental aspects; it is grown in more than 100 countries. The current study evaluates four insecticides, acetamiprid 20%SP (Telfast), chlorfenapyr 24% SC (Challenger super), pyriproxyfen 10% EC (Admiral) and mineral oil 97% EC (Tiger oil) used to control white mango scale *Aulacaspis tubercularis*.The means of the insect reduction percentage were 90.15, 81.95, 85.45 and88.40 in the first season and 89.14, 79.26, 87.68, and 86.74% in the second season for mineral oil, chlorfenapyr, acetamiprid, and Pyriproxyfen, respectively on zebdia cultivar. While the means of the insect reduction percentage were 89.26, 75.70, 74.17 and 85.85%, in the first season and 87.82, 87.08, 81.74 and 86.32 in the second season, respectively, for the four tested insecticides on kit mango cultivar. While the total means of the insect reduction percentage reached to 90.29,84.39,83.02 and 86.57 in the first season and 91.93, 87.58, 89.95 and 90.46% in the second season respectively, for mineral oil, chlorfenapyr, acetamiprid, and Pyriproxyfen, on Tomycultivar for second season. Mineral oil had the highest insect reduction of white mango scale for two consecutive years on zebdia, kit and Tomy mango cultivar, but chlorfenapyr and acetamiprid recorded the lowest reduction for two consecutive years on zebdia and kit cultivar

Keywords: *Aulacaspis tubercularis* - pyriproxyfen - chlorfenapyr–acetamiprid

Introduction

The white mango scale insect, *Aulacaspis tubercular* is New (Hemiptera: Diaspididae), injures mangoes by feeding on the plant sap through leaves, branches, and fruits, causing defoliation, drying up of young twigs, poor blossoming, and so affecting the commercial value of fruits and their export potential, especially to late cultivars where it causes conspicuous pink blemishes around the feeding sites of the scales. In nurseries, severe early stage infestation retards growth. During hot, dry weather, heavily infested premature fruits drop, and mature fruits shrink in size and lack juice. Due to this, photosynthesis is reduced, resulting in a great reduction in the yield and the income of the farmers. Scale insects are covered with a waxy layer, which protects them from contact insecticides (Morsi*et al*. 2002 and Abo-Shanab 2012). The insect attacks the mango plant at all the growth stages, from seedling to maturity, and leaves, twigs, and fruits are attacked, with dieback being observed. (Temesgen,2014; Ofgaa*et al.,* 2019) It causes defoliation, poor blossoming, and decreased fruit bearing, reduces juice in fruits, and can cause death of the whole plant if infestation occurs at the seedling stage (Abo-Shanab, 2012).

The white mango scale infestation can cover about 33% of the mango canopy when severe and thus deprive the plant of active photosynthetic leaf area by causing yellowing and blackening of the leaves. The present work was initiated aiming to evaluate the efficacy of some insecticides for controlling the white mango scale *Aulacaspis tubercularis* during two successive years (Mohamed *et al*., 2012)

Materials and Methods

Field experiments:

Field experiments were carried out for three mango cultivars, Zebdia, Kit and Tomy during 2016 - 2017 and 2017-2018 seasons at El-Delengat, Al-Beheira Governorate. The experimental design was randomized blocks with 3 replicates for each treatment which containing 27 trees for each one. The whole cultivated area was one acre contain 135 trees divided to five groups, four groups for treatment with tested insecticides while the remaining was left untreated as control. Irrigation and fertilization were done according to the crop schedule.

Tow sprayings were applied with tested insecticides for each season in May and September. Population of insects pests were recorded 1day before treatment and then 15, 30, and 45 days after the application. Thirty leaves and five branches were selected from each replicate randomly.

The percentage of the insect reduction was calculated according to the equation of **Stafford and Summers** (1963).

Tested insecticides

Table1. Tested insecticides against *Aulacaspis tubercularis*.

Trade name	Common name	Chemical group	Type of compound	Rate/L water	Company
Tigger oil	Mineral oil 97 % EC	Mineral oil	Mineral oil	1L/100L	Elhelbinsecticdes
Challengersuper	chlorfenapyr 24% sc	Pyrrol	Chemical	50cm/ 100L	Benefits
Admiral	Pyriproxyfen10% EC	Juvenile hormone	IGR	75cm/100L	Sumitomo Chemical Co. Ltd.
Telfast	Acetamiprid 20% SP.	Neonictinoids	Chemical	25g/ 100L	King quenson

Results and Discussion

Efficacy of insecticdes against white mango scale (*Aulacaspis tubercularis*) on the mango Zibdia cultivar during two seasons 2016/2017 and 2017/2018.

Data in Table 2 showed the efficacy of the four tested insecticdes acetamiprid 20% SP, (Telfast), chlorfenapyr 24% sc (Challenger super), pyriproxyfen10% EC (Admiral) and mineral oil 97% EC (Tigger oil) on the reduction of white mango scale, *Aulacaspis tubercularis* during the first season 2016/2017 on the Zibdia mango cultivar after two spraying .

After the first and second sprayings with mineral oil, the mean percentages of reduction for White Mango scale (*Aulacaspis tubercularis*) were 89.67 and 90.15 %, respectively. The means of the insect reduction percentage recorded after treatment with pyriproxyfen were 90.19 and 88.40% after first and second sprayings, respectively. While the reduction percentages reached to 88.37 and 85.45% for acetamipride after first and second sprayings, respectively. On the other hand, challenger show the lowest reduction percentage of infestation reached to 81.88, and 81.95% after first and second sprayings, respectively.

Data in Table 2 indicated that the same results occurred in the second season, mineral oil had the highest reduction of white mango scale, *Aulacaspis tubercularis*, with 88.98 and 89.14 percent after the first and second sprayings, respectively, followed by pyriproxyfen (86.63 percent and 86.74 percent), but chlorfenapyr had the lowest reduction (75.79 percent and 79.26 percent) after the first and second sprayings, respectively.

Table 2. Efficiency of tested insecticides against White mango scale (*Aulacaspis tubercularis*) expressed as percentages of population reduction on mango Zibdia cultivar trees during two seasons 2016/2017 and 2017/2018.

Season	insecticide	Population reduction of *Aulacaspis tubercularis*							
		First spray after (days)			Mean	Second spray after (days)			Mean
		15	30	45		15	30	45	
First season	Mineral oil (97%)	84.16	90.49	94.37	**89.67**	84.52	92.93	94.95	**90.15**
	chlorfenapyr(24%)	88.31	79.62	77.73	**81.88**	86.08	80.22	79.86	**81.95**
	Acetamiprid (20%)	90.74	88.61	85.77	**88.37**	84.39	81.56	78.72	**85.45**
	Pyriproxyfen(10%)	81.37	93.14	96.08	**90.19**	72.65	90.56	94.81	**88.40**
Second season	Mineral oil (97%)	79.86	91.57	95.24	**88.89**	83.38	90.36	94.69	**89.14**
	chlorfenapyr(24%)	80.60	74.13	72.64	**75.79**	88.48	82.52	80.67	**79.26**
	Acetamiprid (20%)	91.14	87.46	85.61	**88.07**	90.94	87.17	83.39	**87.68**
	Pyriproxyfen(10%)	73.43	90.83	95.65	**86.63**	76.78	88.63	95.27	**86.74**

Efficacy of insecticdes against white mango scale (*Aulacaspis tubercularis*) onmango Kit cultivar during two seasons 2016-2017 and 2017-2018.

Data in Table 3efficacy of the four tested insecticides acetamiprid 20% SP. (Telfast), chlorfenapyr 24% sc (Challenger super), pyriproxyfen10% EC (Admiral) and mineral oil 97% EC (Tigger oil) on the reduction rates White mango scale (*Aulacaspis tubercularis*) during the first seasons 2016/2017 on Kit mango cultivar.

Data in Table 3 indicated the reduction percentages of infestation with White mango scale (*Aulacaspistuber cularis*) in first seasonafter spray with the four tested insecticides, as the result after the first and second sprayings with mineral oil were89.25 and 89.26 % after 1st and 2nd sprayings, respectively. The reduction percentages for chlorfenapyr were 78.01 and 75.70 % after first and second sprayings, respectively. While acetamiprid the reduction percentages were 80.16and74.17 % after the first and second sprayings. The reduction percentage recorded after treatment with pyriproxyfen lasted 86.66 and 85.85 %. This data showed that the mineral oil had the highest reduction percentage follow by pyriproxyfen, chlorfenapyr and acetamiprid in the first season.

Data in table (3) showed that the reduction percentage of infestation of White mango scale (*Aulacaspis tubercularis*) by these insecticides on the mango cultivar Kit trees, that the mean reduction percentage of infestation by White mango scale reached 86.92 and87.82 % (mineral oil), 88.64 and 87.08 % (chlrofenapyr), 78.29 and 81.74% (acetamiprid) and86.02 and 86.32%(Pyriproxyfen) after 1st and 2nd sprayings during the second season.

Table 3. Efficiency of tested insecticides against White mango scale (*Aulacaspis tubercularis*) expressed as percentages of population reduction on the mango cultivar Kit trees during two seasons 2016/2017 and 2017/2018**.**

Season	insecticides	Population reduction of *Aulacaspis tubercularis*							
		First spray after (days)			Mean	Second spray after (days)			Mean
		15	30	45		15	30	45	
First season	**Mineral oil (97%)**	83.88	90.00	93.88	**89.25**	82.73	91.66	93.45	**89.26**
	chlorfenapyr (24%)	80.85	80.85	72.35	**78.01**	75.31	73.46	69.13	**75.70**
	Acetamiprid (20%)	86.51	82.83	71.16	**80.16**	71.32	64.34	62.93	**74.17**
	Pyriproxyfen (10%)	76.78	88.39	94.83	**86.66**	73.58	87.85	92.86	**85.85**
Second season	**Mineral oil (97%)**	80.66	89.51	90.60	**86.92**	80.69	91.48	94.89	**87.82**
	chlorfenapyr (24%)	92.86	89.01	84.06	**88.64**	91.96	86.43	82.92	**87.0 8**
	Acetamiprid (20%)	82.58	77.98	74.32	**78.29**	88.56	86.75	83.73	**81.74**
	Pyriproxyfen (10%)	76.46	88.24	93.38	**86.02**	78.19	87.98	93.98	**86.32**

Mineral oil and chlrofenapyr show high reduction percentage of infestation the mango cultivar Kit trees White mango scale reached to 87.82 and87.0 8%, respectively. While acetamipride show low reduction percentage of infestation the mango cultivar Kit trees White mango scale reached to 81.47%.

Efficacy of tested insecticides against infestation of White mango scale (*Aulacaspis tubercularis*) on mango Tomy cultivar during tow seasons 2016/2017and 2017/2018.

Data in Table 4 showed the efficacy of the four tested insecticides acetamiprid 20% SP. (Telfast), chlorfenapyr 24% sc (Challenger super), pyriproxyfen10% EC (Admiral) and mineral oil 97% EC (Tigger oil) on the reduction rates of White mango scale (*Aulacaspis tubercularis*) during two seasons 2016/2017 and 2017/2018 on Tomy mango cultivar.

Data in Table 4 indicated the reduction percentage of infestation with White mango scale (*Aulacaspis tubercularis*) after the 1st and 2nd sprayings with the four tested insecticides in the first season. The mean reduction with mineral oil were 90.67and 90.29% after the 1st and 2nd sprayings, respectively. While the mean reduction percentages reached to 84.10, and 84.39 % by chlorfenapyrafter the 1st and 2nd spraying, on the other hand the mean reduction percentages for acetamiprid were 81.35 and 83.02 % after the 1st and 2nd spraying. After the first and second sprayings, pyriproxyfen achieved a mean reduction percentage of 90.21 and 89.57 %, respectively. These findings showed that mineral oil and pyriproxyfen treatment resulted in the highest percentage decrease after 2ndspraying, whereas chlorfenapyr and acetamiprid treatment resulted in the lowest percentage reduction after 2ndspraying in the first season.

Table 4 showed the results of the second season spray with the same four insecticides yielded different decrease percentages than the first season, with mineral oil the mean reduction percentages reached to 91.44 and 91.93 % after the first and second sprayings, respectively.

Table 4. Efficiency of tested insecticides against White mango scale (*Aulacaspis tubercularis*) expressed as percentages of population reduction on mango cultivar Tomy trees during two seasons 2016/2017 and 2017/2018.

Season	insecticides	Population reduction of *Aulacaspis tubercularis*							
		First spray after (days)			Mean	Second spray after (days)			Mean
		15	30	45		15	30	45	
First season	**Mineral oil (97%)**	85.21	91.64	95.18	**90.67**	82.99	91.50	94.90	**90.29**
	chlorfenapyr (24%)	88.46	82.69	81.16	**84.10**	88.16	84.32	81.89	**84.39**
	Acetamiprid (20%)	84.37	79.69	80.00	**81.35**	86.55	84.59	84.59	**83.02**
	Pyriproxyfen (10%)	82.59	92.15	95.90	**90.21**	79.90	91.33	94.97	**89.57**
Second season	**Mineral oil (97%)**	83.22	95.07	96.05	**91.44**	88.07	92.91	96.78	**91.93**
	chlorfenapyr (24%)	**90.00**	**87.14**	**82.50**	**86.54**	**90.94**	**88.85**	**87.11**	**87.58**
	Acetamiprid (20%)	**93.02**	**91.92**	**87.50**	**90.81**	**91.89**	**88.19**	**86.35**	**89.95**
	Pyriproxyfen (10%)	**82.63**	**91.55**	**95.77**	**89.98**	**85.52**	**91.41**	**96.38**	**90.46**

The mean reduction percentages for acetamiprid were 90.81 and 89.95 %, for pyriproxyfen, the mean reduction percentages were 89.98 and 90.46%, and finally, the mean reduction percentages for chlorfenapyr were 86.54 and 87.58 % after the first and second sprayings, respectively. After two sprays during the second season, treatment with mineral oil and pyriproxyfen yielded the maximum reduction percentage for White mango scale (*Aulacaspis tubercularis*) on mango Tomy cultivar, whereas chlorfenapyr yielded the lowest reduction percentage.

These results are consistent with recent findings that an interesting extension of the use of mineral oils against homopterous insects is encouraged. Mineral oils are valuable insecticide materials because they have little residual toxicity for beneficial insects, as mentioned by Mousi*et al*., 1991; Abo-Shanab, 2005; Helmy*et al*., 2006; and ElHalawany*et al.*, 1987). Potenza *et al.* (1993) described field studies of a range of insecticide and mineral oil combinations against *A. tubercularis* in mango orchards in Brazil.

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فعالية بعض المبيدات على الحشرة القشرية البيضاء(Hemiptera: Diaspididae) *Aulacaspis tubercularis* على الاصناف المختلفة لاشجار المانجو.

محمد فؤاد الجمال ,عزت فرج الخياط ,تهانى رشدى عبدالظاهر وامانى رشوان مرسى

قسم وقاية النبات –كلية الزراعة–جامعة بنها

تعرف المانجو *Mangifera indica* L على أنها الفاكهة الأكثر أهمية في الجوانب التجارية والبيئية وتزرع في أكثر من 100 دولة0 تهدف الدراسة الحالية الى تقييم أربعة مبيدات حشرية تستخدم لمكافحة الحشرة القشرية البيضاء (*Aulacaspis tubercularis*) وهي

acetamiprid 20%SP (Telfast), chlorfenapyr 24% SC (Challenger super), pyriproxyfen 10% EC (Admiral)

, mineral oil 97% EC (Tiger oil) , كان متوسط نسبة الخفض 90.15 و 81.95 و 85.45 و 88.40 في الموسم الأول و 89.14 و 79.26 و 87.68 و 86.74٪ في الموسم الثاني للزيوت المعدنية والكلورفينابير والأسيتاميبريد والبيربروكسيفين على التوالي على صنف الزبديا. بينما كانت متوسط نسبة الخفض 89.26 و 75.70 و 74.17 و 85.85٪في الموسم الأول و 87.82 و 87.08 و 81.74 و 86.32 في الموسم الثاني على التوالي للمركبات الأربعة المختبرة على صنف كيت مانجو. بينماوصل متوسط نسبة الخفض إلى 90.29.84.39.83.02 و 86.57 في الموسم الأول و 91.93 و 87.58 و 89.95 و 90.46٪ في الموسم الثاني على التوالي للزيوت المعدنية والكلورفينابير والأسيتاميبريد والبيربروكسيفين على صنف تومي للموسم الثاني.سجل الزيت المعدني أعلى نسبة خفض في الحشرة القشرية البيضاء لمدة عامين متتاليين على اصناف الزبديا وكيت وتومى لاشجار المانجو. بينما حقق chlorfenapyr و acetamiprid أقل نسبة خفض للحشرة القشرية البيضاء لمدة عامين متتاليين على صنف الزبديا والكيت لاشجار المانجو.