

**Efficiency and Effectiveness of some Compounds on *Aonidiella aurantii* (Maskell) and its Associated Natural Enemies on Mandarin Trees at Qena Governorate****<sup>1</sup>Salman, A.M.A, <sup>2</sup>M.S, Abd El Wahed,<sup>3</sup>Ekram I. Helmy and <sup>3</sup>Hossam M. Haris**<sup>1</sup> Plant Protection Dept., Fac. of Agric., Sohag Univ., Egypt<sup>2</sup> Plant Protection Dept., Fac. of Agric., Ain-Shams Univ., Egypt.<sup>3</sup> Plant Protection Research Institute, Agricultural Research Centre (ARC), Egypt.**ABSTRACT**

The toxic effect of six compounds were determined on *A. aurantii* different stages attacking mandarin trees in the field at Nag-Hammady, Qena Governorate, during 2010 and 2011 seasons, also their side effect on the associated natural enemies were studied. The compounds used were Super Misrona + Actelic, KZ- Oil + Admiral, KZ- oil, Super Misrona, Actelic and Admiral. Data clearly showed that the differences between treatments were significant in regardless of sampling dates and seasons. Super Misrona+Actelic and KZ-Oil+Admiral were the most effective compound against nymph, young adult female, adult gravid female and total population of *A. aurantii*, while, Admiral recorded the lowest effect during both seasons. In regard of natural enemies, Actelic was found to be the most toxic and harmful one in both seasons. However, the lower toxic effects were found in KZ -Oil and Super Misrona on parasitoid and Admiral on predator.

**Key words:** *Aonidiella aurantii*, *Aphytis chrysomphali*, *Typhlodromus pyri*, Mandarin, Toxicity

**Introduction**

Mandarin fruits are considered from the most important crops for local and exportation, consumed as a good source of vitamins, fibre and carbohydrates in Egypt. The California red scale (CRS), *Aonidiella aurantii* (Maskell) is an important pest in citrus groves worldwide (Eliahu *et al.*, 2007) and causing damages subtracting lymph, determining phytotoxic effects and fruit contamination (Caponero *et al.*, 2012). Many authors studied the effect of insecticides (Vehrs *et al.*, 1994 and Ware and Gouws, 1995) and growth regulators (Grafton and Cardwell, 2002) on *Aonidiella aurantii*. The mineral oils used as alternative control application (Helmy *et al.*, 1997 and Rae *et al.*, 2000). However, insecticide or growth regulator with mineral oil was have attention in IPM programs (Salas *et al.*, 2004 and Grout and Stephen, 2006). The effect of scalicide compounds on natural enemies was reported by many investigators (Hattingh and Tate, 1995; Krishnamoorthy and Rajagopal, 1998 and Dominguez *et al.*, 2003). So, the present work aimed to evaluate the toxicity of some compound to the red scale, *A. aurantii* and its associated natural enemies on mandarin field at Qena Governorate.

**Materials and Methods**

Two field experiments were conducted at Qena Governorate during two successive seasons. The first was carried out in 10/ November 2010 at Nag-Hammady district. The second experiment was conducted in 12/ November 2011 seasons in an orchard located at Farshout district. One feddan at the two cities was divided into 21 equal plots. Seven treatments including the control were carried out in Randomized Blocks Design (each with three replicates). Spraying application was accomplished by means of dorsal motor sprayer at rate of 20 litres insecticide solution to ensure complete coverage of all parts of the tree and all leaves (upper and lower leaf surfaces). The two experiments conducted out at 8.00 am, in moderate temperature and relative humidity. The tested treatments were as follow:

1. Super Misrona (1.5 L/ 100 L water).
2. KZ Oil (1.5 L/ 100 L water).
3. Actelic (150 cm<sup>3</sup>/ 100 L water).
4. Admiral (300 cm<sup>3</sup>/ 100 L water).
5. Super Misrona (1.5 L/ 100 L water) + Actelic (150 cm<sup>3</sup>/ 100 L water).
6. KZ- Oil (1.5 L/ 100 L water) + Admiral (300 cm<sup>3</sup>/ 100 L water).

Thirty infested leaves were randomly picked up from each plot. Samples were taken immediately before treatment, then three post- treatment samples were taken after 2, 4, 6 weeks from application. The taken leaves were transferred to laboratory in labeled paper bags for carefully inspection by means of stereoscopic binocular. The number living nymphs, young adult females and adult gravid females of *A. aurantii* were counted, in addition to the alive numbers of the parasitoid, *Aphytis chrysomphali* and predator, *Typhlodromus pyri* were recorded.

Stafford and Summers (1963) equation was chosen to calculate reduction percentages on nymphs, young adult females and adult gravid females of *A. aurantii*, also, for parasitoid and predator:

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$$\% \text{ Reduction} = \left( \frac{\text{Pre treat} - \text{Post treat. Count}}{\text{Pre treat Count}} \right) \times 100$$

Data obtained were analyzed by one – way analysis of variance. Mean values were separated by the least significant difference (L.S.D.) procedure (Snedecor and Cochran, 1980) at P = 5%.

## Results and Discussion

### *Effect of certain compounds on A. aurantii different stages on mandarin trees:*

#### *Nymph stage:*

Data presented in Table (1) show the reduction percentages of certain compound on *A. aurantii* nymphs stage after 2, 4 and 6 weeks from treatment in 2010 and 2011 seasons at Nag-Hammady, Qena Governorate. Results obtained showed that the differences between treatments were significant in regardless of sampling dates and seasons.

After two weeks from treatments, Actelic gave the significantly highest reduction in both seasons of the study, with average reduction of 75.92 and 77.12% in 2010 and 2011 seasons, respectively. However, the lowest reduction was achieved in Admiral treatment with average reduction of 41.65 and 42.94% in 2010 and 2011 seasons, respectively.

After four weeks from treatment, applied by Super Misrona+Actelic, KZ- Oil+Admiral and Actelic recorded the higher reduction comparing with the rest treatments, with insignificant differences between them, with average reduction of 77.94, 78.84 and 78.26%, respectively, in 2010 season, however, KZ- Oil+Admiral recorded the highest reduction in nymphal population in 2011 season, 79.90%. The lowest reduction percentage was recorded in Admiral plots in both seasons, with average reduction of 56.32 and 57.45%, respectively.

After six weeks from treatment, the used scalicides in both seasons, can be arrange in four significantly groups as follow: Super Misrona+Actelic, KZ- Oil+Admiral were in the first and highest one, KZ Oil and Super Misrona were in the second one, however, Actelic and Admiral were in the third and fourth groups, respectively. The reduction values were 91.73, 90.93, 80.82, 81.80, 76.01 and 62.43%, respectively, in 2010 season, and 91.82, 91.63, 81.59, 82.22, 76.65 and 63.67%, respectively, in 2011 season.

Depending on the general mean of reduction, it is clearly that the applied of Super Misrona+Actelic or KZ- Oil+Admiral gave the higher control action in nymph population, with insignificant difference between them in both seasons (Fig. 1). Average reduction of 80.52 and 80.60% were recorded in 2010 season, and 80.90 and 81.26% were recorded in 2011 season for the previous, respectively. In the second order, Actelic and KZ-Oil came in 2010 and 2011 seasons, respectively, with average reduction of 76.73 and 76.06%, respectively, with insignificant difference between the first and Super Misrona in 2010 season. The lowest effect was recorded in Admiral application with average reduction of 53.47 and 54.69% in both years, respectively. Helmy *et al.* (1997) found that Super Misrona Oil when used for control various life stages of *Aonidiella aurantii* and *Dialeurodes citri*, infesting sweet oranges in Egypt, gave sufficient insect control.

#### *Young adult female stage:*

When comparing the effect of application of Super Misrona + Actilic, KZ- Oil + Admiral, KZ- oil, Super Misrona, Actelic and Admiral on population of *A. aurantii* young adult female stage (Table 2), it is clearly that the differences between treatments were significant in the three post-counts in both seasons.

Actilic had the highest effect on population of *A. aurantii* young adult female stage in 2010 season, 69.39%, while, in 2011 season, Super Misrona + Actilic gave the higher reduction followed insignificantly with KZ Oil, with average of 67.96 and 67.54%, respectively after 2 weeks from treatment. On the other hand, Admiral showed the lowest effect with 37.88 and 41.30% in 2010 and 2011 seasons, respectively.

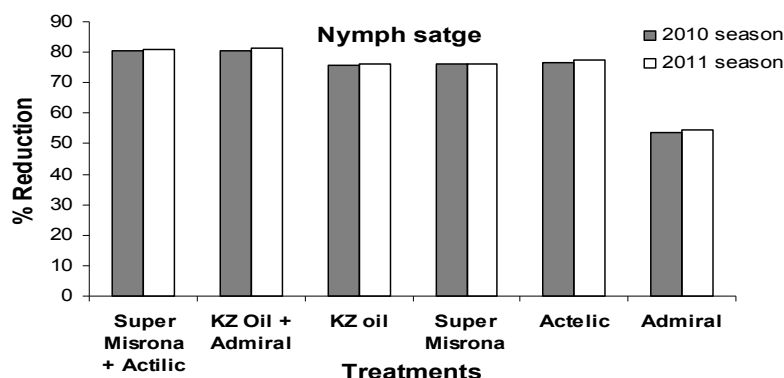
After 4 weeks from treatment, three groups could be discriminated, the highest included Super Misrona+Actilic and KZ- Oil+Admiral, and the second included KZ oil, Super Misrona and Actelic, while the lowest represented by Admiral in 2010 season, with average reduction of 77.45, 77.29, 73.89, 74.60, 72.93 and 44.06%, respectively. Also, Misrona+Actilic and KZ- Oil+Admiral gave the higher reduction in 2011 season, with average reduction of 79.60 and 79.24%, respectively, moreover, Admiral still the lowest one with 47.28% reduction.

After 6 weeks from application, data revealed that the highest and the lowest reduction were observed in KZ- Oil+Admiral and Admiral treatments, respectively, in both seasons. Average reduction of 87.71 and 89.17% were recorded in 2010 and 2011 seasons, respectively for the application of KZ -Oil+Admiral, however, average reduction of 55.69 and 55.97% were recorded in 2010 and 2011 seasons, respectively for the application of Admiral.

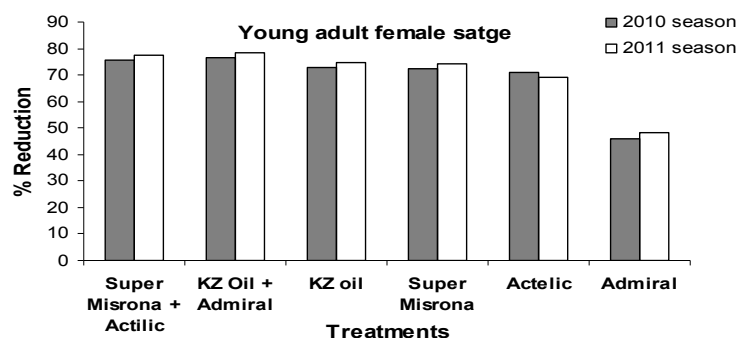
Depending on the general mean, Fig. (2) revealed that the application with Super Misrona+Actilic and KZ Oil+Admiral recorded the higher reduction percentages in both seasons of the study, with 75.78 and

**Table 1.** Effect of certain compounds on *A. aurantii* nymph on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

Treatments	% Reduction							
	2010 season				2011 season			
	2 weeks	4 weeks	6 weeks	Mean	2 weeks	4 weeks	6 weeks	Mean
Super Misrona + Actelic	71.87	77.94	91.73	80.52	72.58	78.30	91.82	80.90
KZ Oil + Admiral	72.02	78.84	90.93	80.60	72.25	79.90	91.63	81.26
KZ oil	70.07	76.03	80.82	75.64	71.04	75.57	81.59	76.06
Super Misrona	73.81	73.15	81.80	76.25	73.16	72.48	82.22	75.95
Actelic	75.92	78.26	76.01	76.73	77.12	78.79	76.65	77.52
Admiral	41.65	56.32	62.43	53.47	42.94	57.45	63.67	54.69
L.S.D.	1.30	1.52	1.27	0.73	1.13	0.94	0.78	0.53
F. value	976.84	321.18	717.65	196.14	122.12	794.07	178.49	350.65

**Fig. 1.** Effect of certain compounds on *A. aurantii* nymph on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.**Table 2.** Effect of certain compounds on *A. aurantii* young adult female on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

Treatments	% Reduction							
	2010 season				2011 season			
	2 weeks	4 weeks	6 weeks	Mean	2 weeks	4 weeks	6 weeks	Mean
Super Misrona + Actelic	66.48	77.45	83.42	75.78	67.96	79.60	84.68	77.41
KZ Oil + Admiral	64.10	77.29	87.71	76.36	66.18	79.24	89.17	78.20
KZ oil	65.17	73.89	79.82	72.96	67.54	75.35	81.12	74.67
Super Misrona	64.07	74.60	78.35	72.34	65.69	76.90	80.18	74.26
Actelic	69.39	72.93	70.81	71.04	66.18	73.60	68.20	69.32
Admiral	37.88	44.06	55.69	45.88	41.30	47.28	55.97	48.18
L.S.D.	2.18	2.42	2.65	1.45	1.78	2.13	2.19	1.00
F. value	280.37	279.69	184.84	629.49	338.69	331.30	311.33	126.17

**Fig. 2.** Effect of certain compounds on *A. aurantii* young adult female on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

76.36% reduction, respectively, in 2010 season, and 77.41 and 78.20% reduction, respectively, in 2011 season. The previous two followed significantly by KZ oil and Super Misrona with insignificant difference between them in both seasons, with average reduction of 72.34 and 71.04%, respectively, in the first season, and 74.67 and 74.26%, respectively, in the second season. Actelic came after, 71.04 and 69.32% reduction in both seasons, respectively, with insignificant difference with Super Misrona in the first season. The least one was Admiral with average reduction of 45.88 and 48.18% in both seasons of the study, respectively. Caponero *et al.* (2008) conducted two *A. aurantii* control strategies, based of an insecticide containing spiroticlofen, and were compared with two treatments, respectively, pyriproxyfen and chlorpyrifos-methyl on citrus in South Italy. They found that all the treatments showed a good efficacy, controlling *A. aurantii* damage on fruits.

#### **Adult gravid female stage:**

Table (3) represent the effect of application of Super Misrona+Actelic, KZ Oil+Admiral, KZ- oil, Super Misrona, Actelic and Admiral on population of *A. aurantii* adult gravid female stage on mandarin trees after 2, 4 and 6 weeks from treatment during 2010 and 2011 seasons. Data showed evidently that the previous treatments varied significantly regardless to sampling date and season.

After 2 weeks from treatment, Actelic was the most effective on *A. aurantii* adult gravid female population in both seasons, with average reduction of 66.50 and 67.41% in both seasons, respectively. The lowest effect was found in Admiral plots with average reduction of 35.34 and 36.15% in both seasons, respectively.

It can be arrange the effect of the previous treatments on *A. aurantii* adult gravid female population in both seasons depending on four weeks count into four significantly groups. Super Misrona+Actelic and KZ-Oil+Admiral were in the 1<sup>st</sup> group, Actelic and KZ- oil were in the 2<sup>nd</sup> group, Super Misrona was in the 3<sup>rd</sup> group and Admiral was in the 4<sup>th</sup> group. Average reduction percentages of 73.65, 74.31, 70.66, 67.61, 71.21 and 44.62% were recorded for Super Misrona+Actelic, KZ- Oil+Admiral, KZ -oil, Super Misrona, Actelic and Admiral, respectively, in 2010 season, and 74.84, 74.93, 71.73, 68.48, 73.20 and 46.06% were recorded for the previous, respectively, in 2011 season.

According to 6 weeks count, the different treatments arranged in four significantly groups in 2010 season, Super Misrona+Actelic and KZ Oil+Admiral were in the 1<sup>st</sup> group, KZ- Oil and Super Misrona were in the 2<sup>nd</sup> group, Actelic was in the 3<sup>rd</sup> group and Admiral was in the 4<sup>th</sup> group, with average reduction of 79.71, 80.69, 76.71, 75.88, 69.79 and 53.71%, respectively. In 2011 season, KZ Oil+Admiral recorded the highly significant reduction, 81.25% followed with Super Misrona+Actelic, 78.03% with insignificant difference between the last and KZ- Oil, 77.54%, however, the least effect was recorded in Admiral, 54.09% reduction.

Carefully examination of the mean reduction percentages of the six scalicides on *A. aurantii* adult gravid female stage on mandarin trees showed that five and four significantly groups of effect were found in 2010 and 2011 seasons, respectively (Fig. 3). In 2010 season, Super Misrona+Actelic and KZ Oil+Admiral were in the 1<sup>st</sup> group, KZ Oil was in the 2<sup>nd</sup> group, Actelic was in the 3<sup>rd</sup> group, Super Misrona was in the 4<sup>th</sup> group and Admiral was in the 5<sup>th</sup> group, however, the 1<sup>st</sup> group included Super Misrona+Actelic and KZ -Oil+Admiral, the 2<sup>nd</sup> group included KZ- Oil and Actelic, the 3<sup>rd</sup> group included Super Misrona and the 4<sup>th</sup> group included Admiral in 2011 season. Average reduction percentages of 71.71, 72.02, 69.68, 68.60, 69.17 and 44.56% in 2010 season, and 71.68, 72.23, 70.50, 69.33, 70.51 and 45.43% in 2011 season were recorded for Super Misrona+Actelic, KZ Oil+Admiral, KZ oil, Super Misrona, Actelic and Admiral treatments, respectively. Rae *et al.* (2000) reported that the orange trees sprayed with any type of oil had lower pest numbers (including chaff scale, *Parlatoria pergandii*) than unsprayed trees on sweet orange.

#### **Total population:**

The effect of Super Misrona+Actelic, KZ- Oil+Admiral, KZ oil, Super Misrona, Actelic and Admiral on total population of *A. aurantii* on mandarin trees after 2, 4 and 6 weeks from treatment during 2010 and 2011 seasons was summarized in Table (4). Significantly differences were found between treatments in all counts and in both years of the study (2010 and 2011).

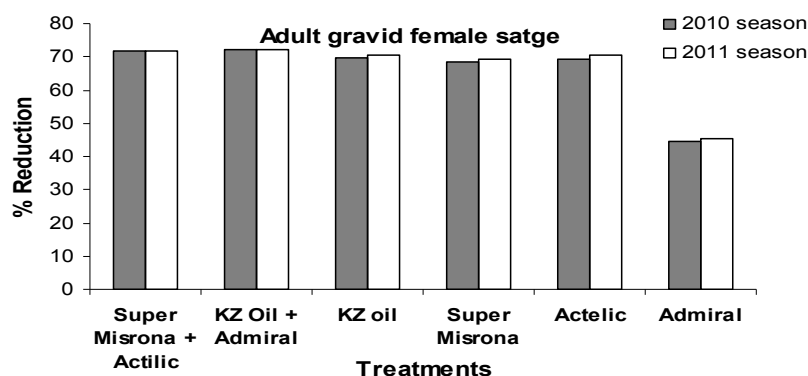
The highest reduction percentages, 72.54 and 72.79% in 2010 and 2011 seasons, respectively were recorded in Actelic treatment after 2 weeks from application. On the other hand, Admiral treatment had the lowest effect on population of *A. aurantii* with average reduction of 39.54 and 41.19% in 2010 and 2011 seasons, respectively.

After 4 weeks count, Super Misrona+Actelic and KZ- Oil+Admiral treatments gave the higher reduction percentages comparing of the rest treatments with averages reduction of 76.92 and 77.53%, respectively, in 2010 season. However, in 2011 season, KZ -Oil+Admiral treatment had the highly significant effect on *A. aurantii* total population, 78.71%. Admiral treatment recorded the lowest effect with 51.33 and 52.96% reduction in 2010 and 2011 seasons, respectively.

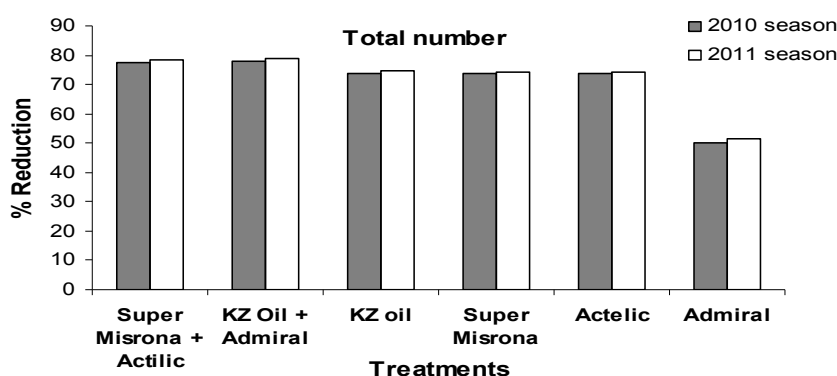
According to 6 weeks count, the different treatments arranged in four significantly groups in 2010 season, Super Misrona+Actelic and KZ Oil+Admiral were in the 1<sup>st</sup> group, KZ- Oil and Super Misrona were in the 2<sup>nd</sup>

**Table 3.** Effect of certain compounds on *A. aurantii* adult gravid female on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

Treatments	% Reduction							
	2010 season				2011 season			
	2 weeks	4 weeks	6 weeks	Mean	2 weeks	4 weeks	6 weeks	Mean
Super Misrona + Actelic	61.76	73.65	79.71	71.71	62.17	74.84	78.03	71.68
KZ Oil + Admiral	61.05	74.31	80.69	72.02	60.51	74.93	81.25	72.23
KZ oil	61.68	70.66	76.71	69.68	62.23	71.73	77.54	70.50
Super Misrona	62.31	67.61	75.88	68.60	63.20	68.48	76.31	69.33
Actelic	66.50	71.21	69.79	69.17	67.41	73.20	70.92	70.51
Admiral	35.34	44.62	53.71	44.56	36.15	46.06	54.09	45.43
L.S.D.	0.92	2.02	1.25	0.36	1.90	1.53	1.40	0.73
F. value	149.36	306.74	646.09	841.98	347.02	521.09	493.12	203.51

**Fig. 3.** Effect of certain compounds on *A. aurantii* adult gravid female on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.**Table 4.** Effect of certain compounds on *A. aurantii* total population on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

Treatments	% Reduction							
	2010 season				2011 season			
	2 weeks	4 weeks	6 weeks	Mean	2 weeks	4 weeks	6 weeks	Mean
Super Misrona + Actelic	68.57	76.92	87.42	77.64	69.39	77.83	87.39	78.20
KZ Oil + Admiral	67.97	77.53	88.02	77.84	68.51	78.71	88.92	78.71
KZ oil	67.22	74.42	79.72	73.79	68.42	74.71	80.63	74.59
Super Misrona	69.36	72.30	79.84	73.83	69.55	72.62	80.59	74.25
Actelic	72.54	75.63	73.59	73.92	72.79	76.54	73.67	74.33
Admiral	39.54	51.33	59.20	50.02	41.19	52.96	60.07	51.41
L.S.D.	0.77	1.16	1.07	0.44	1.06	0.69	0.90	0.47
F. value	252.07	734.52	982.02	563.35	121.60	196.19	137.47	467.54

**Fig 4.** Effect of certain compounds on *A. aurantii* total population on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

group, Actelic was in the 3<sup>rd</sup> group and Admiral was in the 4<sup>th</sup> group, with average reduction of 87.42, 88.02, 79.72, 79.84, 73.59 and 59.20%, respectively. Also, in 2011 season, Super Misrona+Actelic still in the 1<sup>st</sup> group, however, KZ- Oil+Admiral found as 2<sup>nd</sup> one, KZ- Oil and Super Misrona were in the 3<sup>rd</sup> group, Actelic was in the 4<sup>th</sup> group and Admiral was in the 5<sup>th</sup> and the least one with average reduction of 87.39, 88.92, 80.63, 80.59, 73.67 and 60.07%, respectively.

In regard to general mean of reduction, data showed that the different treatments could be arranged in three and four significant groups in 2010 and 2011 seasons, respectively (Fig. 4). The groups of 2010 season were Super Misrona+Actelic and KZ -Oil+Admiral in the 1<sup>st</sup> one, KZ- Oil, Super Misrona and Actelic in the 2<sup>nd</sup> one and Admiral in the last one with average reduction of 77.64, 77.84, 73.79, 73.83, 73.92 and 50.02%, respectively. Mean while, KZ Oil+Admiral was in the 1<sup>st</sup> group, Super Misrona+Actelic in the 2<sup>nd</sup> group, KZ- Oil, Super Misrona and Actelic were in th 3<sup>rd</sup> group and Admiral was in the 4<sup>th</sup> group with average reduction of 78.71, 78.20, 74.59, 74.25, 74.33 51.41%, respectively, in 2011 season. These finding is in partial agreement with Ware and Gouws (1995), who found that Methomyl, in combination with either narrow distillation range oil (0.5% or the surfactant Bladbuff 5 at 150 ml/hl), was the only treatment which could be considered effective against *Aonidiella aurantii* in orange orchards in the Eastern Transvaal, South Africa.

***Effect of some compounds on natural enemies associated with A. aurantii on mandarin trees:***  
***Aphytis chrysomphali parasitoid:***

Results in Table (5) summarize the side effect of Super Misrona+Actelic, KZ Oil+Admiral, KZ- oil, Super Misrona, Actelic and Admiral on total population of *A. chrysomphali* parasitoid associated with *A. aurantii* on mandarin trees after 2, 4 and 6 weeks from treatment during 2010 and 2011 seasons. In regardless to sampling dates and seasons, the differences between treatments were significant.

Data revealed that KZ- Oil and Super Misrona had a poor effect on the parasitoid population comparing with the rest compounds after 2 weeks from treatment in both seasons, with average reduction of 22.85 and 24.01%, respectively, in 2010 season, and 24.30 and 25.52%, respectively, in 2011 season, with insignificant difference between them. The highest effect on the parasitoid population was recorded in Actelic plots with average reduction of 81.28 and 82.83% in 2010 and 2011 seasons, respectively.

Also, the same trend was found after 4 weeks from treatment in both seasons of the study. Average reduction of 33.89, 35.19 and 81.28 in 2010 season, and 36.31, 35.45 and 82.83% in 2011 season were recorded in plots of KZ Oil, Super Misrona and Actelic, respectively.

After 6 weeks from treatment, the different compounds could be arranged in three significant groups, Actelic and Admiral were in the 1<sup>st</sup> group, Super Misrona+Actelic and KZ- Oil+Admiral were in th 2<sup>nd</sup> group and KZ- Oil and Super Misrona were in the 3<sup>rd</sup> group in both seasons. Average reduction of 80.43, 78.48, 66.08, 67.63, 53.65 and 54.30% were recorded for the previous treatments, respectively, in 2010 season. In 2011 season, Average reduction percentages were 81.23, 81.04, 67.05, 69.24, 55.42 and 55.98% for the previous treatments, respectively.

Depending on general mean, Fig. (5) indicated that Actelic treatment recorded the highest reduction in parasitoid population, 76.54 and 77.59% in 2010 and 2011 seasons, respectively, followed significantly by Admiral, 68.29 and 71.02% reduction in both seasons, respectively. Treatments of Super Misrona+Actelic and KZ- Oil+Admiral came next with average reduction of 36.79 and 37.83%, respectively, in 2010 season, and 55.19 and 55.56%, respectively, in 2011 season. The lower effects were found in KZ- Oil and Super Misrona plots with average reduction of 36.79 and 37.83%, respectively, in 2010 season, and 38.68 and 38.98%, respectively, in 2011 season. Krishnamoorthy and Rajagopal (1998) mentioned that all insecticides except neem oil were highly toxic to the parasitoid, *Aphytis melinus* associated with *Aonidiella aurantii* in a citrus orchard in Bangalore, Karnataka, India. Also, Grafton and Cardwell (2002) showed that the use of insect growth regulators allowed more parasitoids associated with California red scale (*Aonidiella aurantii*) to survive and assist with biological control.

***Typhlodromus pyri predator:***

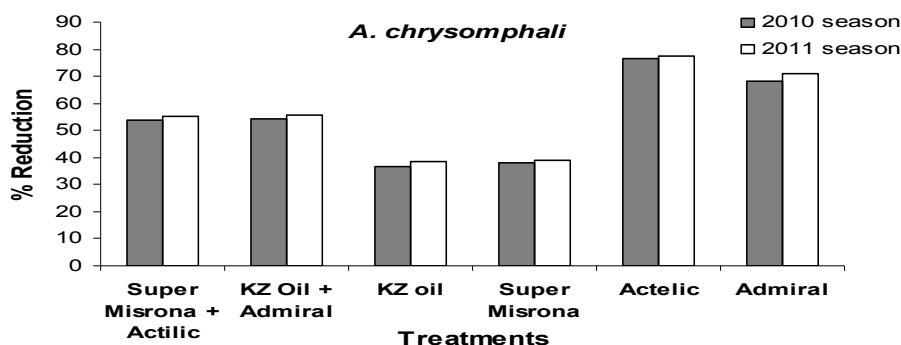
The side effect of Super Misrona+Actelic, KZ- Oil+Admiral, KZ -oil, Super Misrona, Actelic and Admiral on total population of *T. pyri* predator associated with *A. aurantii* on mandarin trees after 2, 4 and 6 weeks from treatment during 2010 and 2011 seasons was presented in Table (6). In regardless to sampling dates and seasons, the differences between treatments were significant.

The highest effect was recorded in Actelic treatment with average reduction of 64.09 and 62.02% in both seasons, respectively, after 2 weeks count. The lowest effect was found in Admiral treatment, 12.68 and 6.29% reduction in both seasons, respectively.

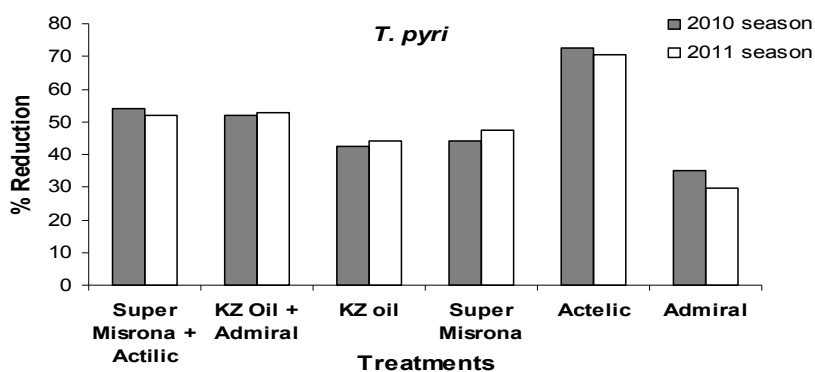
After 4 weeks from application, the highest and the lowest effect determined as average reduction were found in plots of Actelic and Admiral, respectively, in both seasons of the study. The average reduction percentages of 73.21 and 62.02% were recorded for Actelic and 30.20 and 25.52% were recorded for Admiral in 2010 and 2011 seasons, respectively.

**Table 5.** Effect of certain compounds on *A. chrysomphali* parasitoid associated with *A. aurantii* on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

Treatments	% Reduction							
	2010 season				2011 season			
	2 weeks	4 weeks	6 weeks	Mean	2 weeks	4 weeks	6 weeks	Mean
Super Misrona + Actilic	38.68	56.01	66.08	53.59	40.68	57.85	67.05	55.19
KZ Oil + Admiral	39.87	54.93	67.63	54.14	41.51	55.94	69.24	55.56
KZ oil	22.85	33.89	53.65	36.79	24.30	36.31	55.42	38.68
Super Misrona	24.01	35.19	54.30	37.83	25.52	35.45	55.98	38.98
Actelic	67.91	81.28	80.43	76.54	68.71	82.83	81.23	77.59
Admiral	57.15	69.25	78.48	68.29	60.54	71.47	81.04	71.02
L.S.D.	4.78	4.52	2.21	2.55	4.08	2.38	2.99	1.83
F. value	139.58	168.27	265.04	388.53	194.17	623.02	144.32	759.46

**Fig. 5.** Effect of certain compounds on *A. chrysomphali* parasitoid associated with *A. aurantii* on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.**Table 6.** Effect of certain compounds on *T. pyri* predator associated with *A. aurantii* on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

Treatments	% Reduction							
	2010 season				2011 season			
	2 weeks	4 weeks	6 weeks	Mean	2 weeks	4 weeks	6 weeks	Mean
Super Misrona + Actilic	36.88	50.44	75.04	54.12	33.23	48.82	73.29	51.78
KZ Oil + Admiral	35.19	47.70	73.28	52.06	35.88	47.92	74.50	52.77
KZ oil	24.26	38.67	63.99	42.31	25.49	40.79	66.42	44.23
Super Misrona	26.24	40.50	65.48	44.07	29.00	41.74	71.74	47.49
Actelic	64.09	73.21	80.41	72.57	62.02	72.43	77.55	70.67
Admiral	12.68	30.20	62.14	35.00	6.29	25.52	57.54	29.79
L.S.D.	3.12	3.92	5.40	1.88	6.57	6.25	4.48	3.29
F. value	310.62	141.53	17.89	478.66	75.02	59.66	25.61	161.91

**Fig. 6.** Effect of certain compounds on *T. pyri* predator associated with *A. aurantii* on mandarin leaves at Qena Governorate in 2010 and 2011 seasons.

The higher reduction percentage was found in Actelic treatment by insignificant differences with Super Misrona+Actilic in 2010 season and Super Misrona+Actilic and KZ Oil+Admiral in 2011 season after 6 weeks count. Average reduction of 80.41 and 77.55% were recorded for Actelic in both seasons, respectively. On the other hand the least harmful effect was found in Admiral plots, 62.14 and 57.54% in both seasons, respectively, with insignificant differences between the last and both of KZ- oil and Super Misrona in the first season.

Depending on the general mean, Actelic gave the highest effect on predator population, 72.57% in 2010 season, Super Misrona+Actilic came after, 54.12% reduction, followed significantly by KZ Oil+Admiral, 54.12% reduction, followed significantly by KZ- oil, 42.31% reduction and Super Misrona, 44.07% reduction with insignificant difference between them, then the last one was Admiral, 35.00% (Fig. 6). Also, in 2011 season, Actelic gave the highest effect on predator population, 70.67%, followed significantly by Super Misrona+Actilic, 51.78% reduction and KZ- Oil+Admiral, 52.77% reduction with insignificant difference between them. KZ- oil, 44.23% reduction and Super Misrona, 47.49% reduction came next with insignificant differences between them. Admiral, 29.79%, reduction was the least one. Jacas and Garcia (2001) demonstrated that pesticides applied against citrus pests included *Parlatoria pergandei*, *Cornuaspis beckii* and *Aonidiella aurantii* in Spain effected on natural enemies, *Rodolia cardinalis*, *Cales noacki*, *Euseius stipulatus*, *Cryptolaemus montrouzieri*, and *Leptomastix dactylopii*.

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