

## **THE USE OF "ENVIRONMENT FRIENDLY" PESTICIDES IN DEALING WITH AVOCADO MITES (*Oligonychus perseae*) IN ISRAEL**

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The avocado mites (*Oligonychus perseae*) were identified for the first time in avocado orchards in the Western Galilee, Israel, during fall in 2001.

Since the avocado plant protection management in Israel is based on combined-biological management, there was no chance of using conventional acaricides, but only the compounds that do not interfere with the existing biological balance and do not cause any damage or harm to the natural biological enemies.

From the "environment friendly" compounds examined in the field, 'Spirodiclofen' (commercial name "Envidor") and 'Mineral Oil' (commercial name E.O.S.) were found effective based on parameters of natural enemies' viability after spraying with the above mentioned compounds, as well as parasitoids survival tests which had been done in 'Bio-Bee Laboratories'.

These compounds are certified by the European Union regulation for allowable traces of chemicals and were certified also in Israel. The use of 'Envidor' permits the spray to be used at least 28 days and on before harvest whereas it is only a day for the use of 'E.O.S.'

These compounds are now in use in the avocado orchards in Israel according to the thresholds and recommendations from research by Dr. Palevsky et al.

**Key words:** *Oligonychus perseae*, avocado, environment friendly pesticides, Spirodiclofen, E.O.S Abamectin.

## **UTILIZACIÓN DE INSECTICIDAS NO DAÑINOS AL MEDIO AMBIENTE EN EL COMBATE CONTRA EL ÁCARO (*Oligonychus perseae*) DEL AGUACATE EN ISRAEL**

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El ácaro del aguacate (*Oligonychus perseae*) se identificó por primera vez en Israel en el otoño del año 2001 en la zona de la Galilea occidental.

La protección de la sanidad vegetal de los aguacates en Israel se basa en el manejo integral de las plagas y no existió la posibilidad de atacar esta plaga con acaricidas convencionales, solamente se pudo realizar con productos acaricidas que no intervienen o afectan al balance biológico y que no atacan a los enemigos naturales que se encuentran en el terreno.

Entre los productos que se analizaron, el spirodiclofen (de nombre comercial "Envidor") y el aceite mineral (de nombre comercial "E.O.S."), fueron considerados como eficaces para combatir al ácaro, son "ambientalmente

favorables" desde el punto de vista de la presencia de los enemigos naturales después del tratamiento, y por el examen de la supervivencia de paratísoides que se realizó en los laboratorios de "Bio-Bee" en Sde Eliyahu.

Estos insecticidas están autorizados en Europa según las regulaciones de la Unión Europea para partículas químicas permitidas, y también obtuvieron el permiso en Israel para ser utilizados en tratamientos de aguacates hasta 28 días antes de la cosecha en el caso de Spirodiclofen, y hasta 1 día antes de la cosecha en el caso del Aceite mineral (E.O.S).

Estos insecticidas ya se utilizan en Israel según las instrucciones recomendadas por el Dr. Pableski y sus colaboradores.

**Palabras claves:** *Oligonychus perseae*, avocado, environment friendly pesticides, Spirodiclofen, E.O.S. Abamectin.

### **Introduction:**

The avocado mite was first detected in Israel in autumn, 2001. In the course of several years the avocado mite infestation has spread out through all regions of Israel from north to south. At a high infestation level the foliage of all avocado varieties is damaged. This damage will ultimately cause the shedding of leaves, which consequently increases the occurrence of sunstroke to fruit and damage to the mean fruit size and thus, eventually decreases the yield. Varieties that are most sensitive to avocado-mite damage are Haas and Ardite after which in decreasing order of sensitivity: Reed, Nabell, Pino, Pinkerton, Ettinger, and Fuerte.

In Israel, crop protection practices in avocado orchards are based on biological control measures. Therefore, the use of pesticides which might disturb the biological balance in the orchard is avoided. However, when a significant population eruption of avocado mites occurred in an orchard, and thus a real danger for yield reduction was established, we looked for fast mite-control solutions without endangering the delicate biological balance in the orchard.

The objective: efficacy testing of a miticide for controlling the avocado mite that does no damage to the natural enemy fauna in the orchard.

### **Methods and Materials:**

The experiment was carried out in a young avocado (Haas variety) plantation (aged two years). The orchard was found infested by avocado mites (see initial infestation in table 1). The experiment was designed as random blocks with four replicates per treatment. Each replicate consisted of 5 trees in a row, of which the center three trees were used for mite-infestation evaluation. In June 2004 the treatments were applied in using a drawn blow-sprayer with a spray volume of 1500 lit/ha (similar to commercial spray conditions).

**Preparation tested:** Spirodiclofen SC240 (Commercial name Envidor® - produced by Bayer CropScience) at two dosages of 0.02% and 0.04% in comparison to the standard treatment of Abamectin EC18 (Commercial name Vertimec® - produced by Syngenta) at a rate of 0.5% combined with 1.75%

Lavanola oil. These preparations were compared to control plots that were only sprayed with Lavanola oil at a rate of 1.75% in order to prevent damage to the control trees. Normally such a treatment will show efficacy for a period of one month only under Israeli conditions.

Mite Infestation Evaluation: For each replicate 20 full-grown leaflets were sampled (the fourth or fifth leaflet from the young growth extremity of the branches). Mites from the lower side of the leaflet were counted between the second and third vein of the left-hand side of the leaflet according to Holdle et al. 2000 & Machlitt 1998. All moving mite-development stages were counted. In addition, the quantity of eggs per leaflet was qualitatively evaluated using ranks from 0-3: 0 – no eggs, 1- isolated eggs, 2- many eggs, 3 – enormous amount of eggs. The results were statistically analyzed using a computer program.

## Results:

**Table 1:** Mean number of mites per leaf (all moving stages)

Date	27.6.04	5.7.05	19.7.04	17.10.04	16.11.04
Treatment	0-DAT	8-DAT	22-DAT	90-DAT	120-DAT
Sprodiclofen 0.02%	14.8	0.2 b*	0.9 b	1.7	2.3
Spirodiclofen 0.04%	18.4	0.1 b	0.1 b	1	4.8
Abamectin 0.5%	28.8	0.7 b	0.3 b	1	1.6
Control	27.5	16.0 a	15.4 a	2.1	4.6

\*Values with different letters in the same column differ from each other at a significance level of 0.05

**Table 2:** Mean results for distribution (%) of level of egg infestation per treatment

(0-3: 0 – no eggs, 1- isolated eggs, 2- many eggs, 3 – enormous amount of eggs)

Date	27.6.04			5.7.05			19.7.04			16.11.04		
	0-DAT			8-DAT			22-DAT			120-DAT		
Infestation rank	0	1	2+3	0	1	2+3	0	1	2+3	0	1	2+3
Sprodiclofen 0.02%	15	22.5	62.5	98.8	1.2b	0	82.5	16.3	1.2	87.5	10	2.5
Spirodiclofen 0.04%	15	26.2	58.8	90.0	8.8b	1.2	95.0	3.8b	1.2	95	5	0
Abamectin 0.5%	8.8	21.2	70	78.8	15b	6.2	96.2	3.8b	0	87.5	12.5	0
Control	1.3	12.5	86.2	17.5	56.3	26.2	28.8	53.8	17.5	92.5	5	2.5

\*Values with different letters in the same column differ from each other at a significance level of 0.05

The results in table 1 and 2 show that Spirodiclofen at both rates was as effective as Abamectin for the control of avocado mites. The treatments showed efficacy until November (4 months). Additional efficacy trials with similar results were performed at two different sites in Israel.

### **Summary:**

The use of pesticides that do no harm to natural enemies is of high importance. Therefore there must be a restriction to the use of Abamectin in avocado plantations. Spirodiclofen was found to be as effective as Abamectin for controlling avocado mites in avocado. It does no damage to the natural enemies in the plantation. The product is registered for use in Israel. At a PHI of 28 days Spirodiclofen residues are below the detection level under Israeli conditions. Spirodiclofen interferes with synthesis of lipids for all development stages of mites. This mode of action is new and no cross resistance to other acaricides has been found.

During the last few years a mineral oil preparation (E.O.S.) produced by SK Corporation Korea has also been tested and found effective for the control of avocado mites. Since this is a mineral oil its mode of action is based on physical interference with insects. The oil controls mites that come in direct contact with it. This requires a maximal coverage of the tree canopy which is also this product's disadvantage, in particular for very tall adult avocado trees. In addition, under dry and hot weather conditions the product can have a harmful effect on the tree and its fruit. On the other hand due to its very short PHI (2 days) it can be used until shortly before fruit-picking.

Today in Israel the environmental friendly pesticides are used under the combined conditions of high mite infestation in a young orchard or in an orchard carrying a high fruit yield (year of abundance). Also in orchards that suffer from various growth development stresses, it is preferred to keep the mite populations low using pesticides. Then at a later stage the establishment of natural enemies is encouraged in such orchards.

In short, it is of extreme importance to use environmental friendly pesticides such as Spirodiclofen that do not harm the fauna of natural enemies in the avocado orchard.

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