CONTROL OF YELLOW SCALE, *AONIDIELLA CITRINA*, ON FLORIDA CITRUS [1]

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Yellow scale, *Aonidiella citrina* (Coquillett), in the past was only occasionally reported on Florida citrus and was found most commonly in the coastal areas, particularly in Pinellas County (Griffiths and Thompson 1957). However, in recent years, it has become established in most of the citrus areas of Florida and is an important pest in numerous groves (Simanton 1965). Although the presence of yellow scale on Florida citrus has long been noted, its control was not investigated.

The experiments reported here were designed to measure the effectiveness of scalicides currently recommended on Florida citrus and of some of the newer insecticides against yellow scale. These experiments were conducted in 1963 and 1964.

METHODS AND MATERIALS

Two different experimental designs were used in the 3 experiments reported here. Experiment 1 was conducted on 3-year-old 'Valencia' orange trees, 6 to 8-ft high, located near Brighton. A randomized block design with 2-tree plots replicated 6 times was used in this experiment. Experiments 2 and 3 were conducted at the Indian River Field Laboratory located near Fort Pierce. A 10 X 10 Latin square design was used in these tests. Two-tree plots of 8 to 10-ft high 'Temple' orange trees were used in Experiment 2 while 1-tree plots of 'Marsh' grapefruit, 15 to 20-ft high, were used in Experiment 3. Yellow scale populations were determined by recording the number of live third-stage female yellow scale on 50 leaves picked at random from around each tree. The data were subjected to analysis of variance and Duncan's New Multiple Range Test at the 5% level.

The treatments were applied with a truck-mounted high pressure sprayer equipped with double Boyce handguns. Treatments in Experiment 1 were applied on 27 August and in Experiment 2 on 3 October 1963. In Experiment 3, applications were made postbloom and repeated in the summer of 1964.

RESULTS

In Experiment 1, all treatments had significantly fewer yellow scale than the plots receiving no scalicide (Table 1). Azinphosmethyl, dimethoate, and Methyl-Ethyl Guthion®, although not significantly better than ethion-oil, malathion-oil, parathion, parathion-oil, 1.3% emulsified oil, Shell SD 8448, and diazinon, were superior to Bayer 41831, malathion, Stauffer N-2404, Union Carbide 21149, and Shell SD 8447.

In Experiment 2, as in Experiment 1, all treatments had significantly fewer yellow scale than the plots receiving no scalicide (Table 2). While azinphosmethyl was not superior to Shell SD 8448 or parathion, it was significantly better than all other treatments. However, Shell SD 8448

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TABLE 1. EFFECTIVENESS OF INSECTICIDES AGAINST YELLOW SCALE AT BRIGHTON, FLORIDA, APPLIED ON 27 AUGUST, 1963.

Scalicide and formulation	Lb actual/ 100 gal	No. of 3rd stage female yellow scale per 100 leaves—days after spraying*		
		60	112	164
Azinphosmethyl (2 lb/gal EC)	0.250	0.7a	0.2a	1.2a
Dimethoate (4 lb/gal EC)	0.250	1.0ab	0.3a	1.3a
Methyl-Ethyl Guthion (2 lb/gal EC)	0.250	0.7a	0.5a	1.7a
Ethion (4 lb/gal EC) + 0.5% oil	0.375	2.8ab	3.3abcd	3.5ab
Malathion (5 lb/gal EC) + 0.5% oil	0.625	2.5ab	1.8ab	4.7ab
Parathion (25% WP)	0.250	3.0abc	4.7bcde	4.8ab
Parathion (25% WP) + 0.5% oil	0.125	4.5abcd	3.7abcde	5.5ab
Emulsified Oil, 1.3%	——	8.8def	6.2cde	5.5ab
Shell SD 8448 (2 lb/gal EC)	0.250	2.2ab	2.5abc	6.8abc
Diazinon (4 lb/gal EC)	1.000	6.2bcde	2.5abc	7.3abc
Bayer 41831 (4 lb/gal EC)	0.250	8.2cdef	5.0bcde	10.0bc
Malathion (5 lb/gal EC)	1.250	3.3abc	2.0ab	10.2bc
Stauffer N-2404 (4 lb/gal EC)	0.250	10.8ef	6.5de	10.3bc
Union Carbide 21149 (1 lb/gal EC)	0.250	10.7ef	6.2cde	13.3c
Shell SD 8447 (1 lb/gal EC)	0.250	12.2b	7.5ef	13.7c
No scalicide	——	17.7g	10.8f	22.2d

*Results of Duncan's Test: Treatment means followed by the same letters are not considered significantly different at the 5% level.

TABLE 2. EFFECTIVENESS OF INSECTICIDES AGAINST YELLOW SCALE AT FORT PIERCE, FLORIDA, APPLIED ON 3 OCTOBER 1963.

Scalicide and formulation	Lb actual/ 100 gal	No. of 3rd stage female yellow scale per 100 leaves-days after spraying*		
		67	130	204
Azinphosmethyl (2 lb/gal EC)	0.25	6.7a	3.9a	3.7a
Shell SD 8448 (2 lb/gal EC)	0.25	5.8a	4.4a	6.1ab
Parathion (15% WP)	0.25	6.4a	4.7a	6.1ab
Methyl-Ethyl Guthion (2 lb/gal EC)	0.25	8.1ab	5.6ab	8.5bc
Emulsified Oil 1.0%	——	8.2ab	9.6bc	8.9bcd
Perthane (4 lb/gal EC)	1.00	13.7cd	13.0cd	9.5bcd
Union Carbide 21149 (1 lb/gal EC)	0.25	17.4d	14.1de	9.9bcd
Niagara 9203 (25% WP)	0.25	11.0bc	14.4de	12.5cd
Stauffer N-2404 (4 lb/gal EC)	0.25	11.5bc	17.7e	12.9cd
No scalicide	——	12.5c	17.0de	17.7e

*Results of Duncan's Test: Treatment means followed by the same letters are not considered significantly different at the 5% level.

and parathion were superior only to Niagara 9203 and Stauffer N-2404. No significant difference occurred among the remaining treatments.

The results of Experiment 3 are shown in Table 3 and again the untreated plots had significantly more yellow scale than the treated plots. Azinphosmethyl and Polybutene LS-0811 were superior only to oxydemeton-methyl. There was no significant difference among the other treatments.

TABLE 3. EFFECTIVENESS OF INSECTICIDES FOR THE CONTROL OF YELLOW SCALE AT FORT PIERCE, FLORIDA, APPLIED ON 5 MAY AND 23 JULY 1964.

Scalicide and formulation	Lb actual/ 100 gal	No. of 3rd stage female yellow scale per 100 leaves*—days after 2nd application		
		34	91	172
Azinphosmethyl (2 lb/gal EC)	0.25	0.4a	1.2a	1.1a
Polybutene LS-0811, 1%	—	1.4a	3.0a	1.2a
Dimethoate (4 lb/gal EC)	0.25	2.0ab	3.8ab	1.4ab
Ethion (4 lb/gal EC) + 0.5% oil	0.25	2.2ab	4.4ab	2.2ab
Parathion (15% WP)	0.25	0.9a	2.8a	2.4ab
Mobil Oil MCA-600 (50% WP)	1.00	0.7a	2.0a	3.0ab
Union Carbide 21149 (50% S)**	0.25	2.4ab	4.8ab	3.4ab
Emulsified Oil 98%, 1%	—	4.0b	4.2ab	3.6ab
Oxydemetonmethyl (2 lb/gal EC)	0.25	3.7b	7.2b	4.2b
No scalicide	—	9.6c	16.8c	12.6c

*Results of Duncan's Test: Treatment means followed by the same letters are not considered significantly different at the 5% level.

**Formulated as a 50% soluble material and packaged in water soluble bags.

DISCUSSION

Although yellow scale has increased in importance as a pest to Florida citrus over the past few years, most of the materials currently recommended as scalicides are adequate for its control. The results of the 3 experiments reported here show that azinphosmethyl, parathion, 1.3% emulsified oil, and the combinations of emulsified oil with parathion, ethion, and malathion effectively control this pest. However, azinphosmethyl provided significantly better control than either malathion or 1.0% emulsified oil. Some of the experimental materials that also provided good control were dimethoate, Methyl-Ethyl Guthion, Shell SD 8448, diazinon, Polybutene LS-0811, Mobil Oil MCA-600, and Union Carbide 21149.

The chemical names of proprietary materials mentioned in this article are:

Bayer 41831—*O,O*-dimethyl *O*-4-nitro-*m*-totyl phosphorothioate

Methyl-Ethyl Guthion®—equal parts of azinphosmethyl and azinphosethyl

Mobil Oil MCA-600—4-benzothienyl-N-methyl carbamate

Niagara 9203—O,O-dimethyl S- [(benzoxazolin-2-on-3-yl)methyl] phosphorothiolate

Perthane®—mixture of 1,1-dichloro-2,2-bis(*p*-ethylphenyl)ethane (95%) and related reaction products (5%)

Polybutene LS-0811—American Oil Co. emulsifiable concentrate of H-120 (viscosity 1163 SSU at 210° F.)

Shell Development 8447—2-chloro-1-(2,4,5,trichlorophenyl)vinyl dimethyl phosphate

Shell Development 8448—2-chloro-1-(2,4,5-trichlorophenyl)vinyl diethyl phosphate.

Stauffer N-2404—O-(2-chloro-4-nitrophenyl) O-isopropyl ethyl-phosphorothiolate

Union Carbide 21149—2 methyl-2-(methylthio) propionaldehyde *O*-(methylcarbomoyl) oxime

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