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A COMPARISON OF THREE FORMULATIONS OF CAPTAN FUNGICIDE FOR DISEASE CONTROL AND EFFECT ON MORTALITY OF PREDATORY MITES ON STRAWBERRY

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Abstract. **Captan 50 WP, 80 WP and 75 WG were equally effective at controlling diseases on 'Oso Grande' strawberry, and had no detectable effect on the mortality of predacious mites.**

The production of strawberries in Florida is second to California with the value of the crop in 1991-92 at $94,752,000 (Florida Agri. Statistics, 1991-92). Production in Florida is concentrated in the west-central region of the state, between Tampa and Lakeland. Single-crown transplants are set each October on raised beds. The harvest season begins in December and continues through March. Most of the cultivars used have been University of California cultivars which are susceptible to anthracnose fruit rot (Howard et al., 1985). The spray program to control diseases and insects in Florida is very expensive, and every year the growers have fewer reliable fungicides for use because of the difficulty in getting pesticides Federally registered or re-registered. Therefore the first experiment in this paper evaluated the efficacy of a new formulation of Captan compared to other formulations.

In the second experiment, the same formulations were tested to see if they caused mortality of the beneficial mite, *Phytoseiulus persimilis* (Athias-Henriot). The Florida strawberry industry is beginning to use *P. persimilus* for control of spider mites, so there is a need to determine which pesticides are compatible with this bio-control agent.

Materials and Methods

Experiment 1. Strawberry plants of 'Oso Grande' which were grown in Ghesquiere Nursery, Simcoe, Ontario were planted at the Dover Research Center on 15 Oct. 1992.

Plants were set through black polyethylene mulch on standard two row raised beds that had been fumigated with 400 lbs of MC 98-2 (98% methyl bromide, 2% chloropicrin per bedded hectare). Beds were spaced 4 ft apart (center to center), and were fertilized with 10N-4P-10K at a rate of 2,000 lb/acre before planting. One-fourth of the fertilizer was broadcast before bed preparation; the remainder was banded 1 to 2 inches deep in the bed center. Plant spacing was 12 × 12 inches on the beds.

The treatments were Captan 80WP at 3.75 lbs/treated acre, Captan 50WP at 6.0 lbs/treated acre and Captan 75WG[4] at 4.0 lbs/treated acre compared to an unsprayed control. The Experimental design was randomized complete block with four replications and 10 plants per replication.

The applications were made with a CO_2 backpack sprayer with hollowcone nozzle and size 6 disks. Boom height was 14 inches, width 14 inches and nozzle spacing 14 inches. The treatments were applied at 38 GPA and the pressure was 40 PSI, with application speed of 3 mph.

Application of treatment began 30 Oct. 1992 and treatment were applied an average, once a week in November, December, January, and twice a week in February and March for a total of 28 applications.

Experiment 2. Leaves were cut from 'Sweet Charlie' strawberry plants, and lateral leaflets were removed leaving only the central leaflet on the petiole. Petioles were supported vertically by a wire stand and were placed into a 5.5 inch (14 cm diameter) × 1.5 inch (3.8 cm) deep plastic saucer filled to 0.75 inches (2 cm) with water. Fifteen *Phytoseiulus persimilis* predators were placed on each leaf with their prey, 50 *Tetranychus urticae* (Koch) spider mites. Eight replications of captan treatments were applied to all surfaces of leaves as aqueous sprays at (3 lb a.i./100 gal) 3.59 g a.i./liter and (100 gal per acre) 935 liters/ha. Untreated checks were provided. Saucers were kept in a rearing room maintained at 26.7C (80 F) and provided lights 12 h each day. After 48 h all live and dead predator mites were counted and the percent mortality was calculated. Data were subjected to an analysis of variance and significant differences among means were tested by Duncan's multiple range test (SAS Institute).

Fruit evaluation. Strawberry fruit were harvested twice weekly from 23 Dec. 1992 to 2 Apr. 1993. Fruit were graded into marketable and cull yield. Marketable fruit were counted and weighed. Cull fruit were also counted, weighed, and then further graded. Fruit rated cull due to small size or poor shape were discarded. Rotten fruit were sorted by type of rot and counted and weighed. At the beginning of the season only ripe fruit were harvested, but as the occurrence of disease increased, green fruit showing lesions were also picked and treated as above.

Table 1. Cumulative yield of strawberries for December through March treated with three formulations of captan.

Treatment and rate (formulation) per acre	Fruit weight (g/plot)		
	Marketable	Cull	Anthracnose[z]
Captan 50 WP, 6.00 lbs.	3818 a[y]	2661 a	2201 a
Captan 80 WP, 3.75 lbs.	4214 a	2252 a	1907 a
Captan 75 WG, 4.00 lbs.	3309 a	2406 a	2101 a
Unsprayed control	1151 b	2085 b	1873 a

[z]Weight of green and ripe fruit showing symptoms of anthracnose rot. (Anthracnose rot was by far the most predominate rot observed in this trial.)
[y]Mean separation within columns by Fisher's LSD, P =0.05.

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[4]The 3 formulations of Captan were supplied to us by ICI Agricultural Products.

Table 2. Summary of yield and rot on strawberries treated with 3 formulations of Captan compared to untreated control.

Treatment	Mkt.		Culls		Botry[z]		Anthr[y]		Dendro[x]		Rhiz[w]		Alter	
Rep	No	Wt	No	Wt	No	Wt	No	Wt	No	Wt	No	Wt	No	Wt
50 WP														
1	117	2055	179	1840	2	44	144	1556	9	103	0	0	0	0
2	164	3412	227	3202	3	49	198	2752	9	187	4	97	1	29
3	233	5060	192	2737	3	33	148	2326	2	34	2	43	2	60
4	215	4746	206	2866	5	97	153	2171	6	158	4	57	1	15
Totals	729	15273	804	10645	13	223	643	8805	26	482	10	197	4	104
80 WP														
1	59	1336	131	1606	1	12	120	1491	5	77	5	71	0	0
2	230	4937	204	2839	8	113	157	2392	0	0	5	80	0	0
3	262	5561	183	2395	1	24	137	1990	0	0	4	74	0	0
4	245	5022	162	2166	5	80	124	1755	2	37	8	141	0	0
Totals	796	16856	680	9006	15	229	538	7628	7	114	22	366	0	0
75 WG														
1	43	930	109	1218	3	32	100	1165	1	5	2	12	0	0
2	181	3704	209	2574	1	25	176	2308	3	55	0	0	0	0
3	203	4114	235	3192	6	76	197	2679	9	164	8	120	0	0
4	228	4486	212	2639	2	49	166	2252	4	64	5	54	0	0
Totals	655	13234	765	9623	12	182	639	8404	17	288	15	186	0	0
Control														
1	18	395	122	1238	2	6	117	1197	1	17	0	0	0	0
2	49	1081	163	2013	4	79	146	1825	2	37	1	11	0	0
3	64	1453	157	2274	10	185	134	1872	5	122	3	41	0	0
4	73	1673	242	2815	12	197	218	2598	3	51	5	54	1	9
Total	204	4602	684	8340	28	467	615	7492	11	227	9	106	1	9

[z]Botrytis caused by *Botrytis cinerea* Pers. ex Fr.
[y]Anthracnose caused by *Colletotrichum acutatum* Simmonds.
[x]Dendrophoma caused by *Phomopsis obscurans* (Ell. & Ev.) Sutton.
[w]Rhizopus caused by *Rhizopus stolonifer* (Ehrenb. ex Fr.) Vuillemin.

Results and Discussion

Experiment 1. Plants sprayed with captan produced three to four times as much marketable fruit as plants left unsprayed, but marketable fruit yield among the captan treatments did not differ significantly at P = 0.05 (Table 1). The weight of unmarketable (but mature) fruit did not differ significantly among any of the treatments, indicating that captan may be providing more protection to flowers or young fruit than it is to mature or nearly mature fruit. Several rot fungi are known to infect flowers and young fruit, preventing them from developing to a harvestable stage (Maas, 1984).

Weight and number of marketable and culled fruit and type of rot for each treatment by replicate is summarized in Table 2. Anthracnose, caused by *Colletotrichum acutatum simmonds,* was the predominate fruit rot observed in this trial. *C. acutatum* can be the most aggressive and difficult species in the *Colletotrichum* complex to control on strawberry in Florida (Howard et al., 1992).

Experiment 2. Captan 50 WP, 80 WP, and 75 WG (75 WG is currently not available for use on strawberries, H. Yonce, ICI Agricultural Products, personal communication) did not cause mortality of *P. persimilis* (Table 3), indicating that these formulations were not acutely toxic to the predator mite. Our study does not, however, rule out the possibility of long-term, chronic effects such as reduction in egg laying.

Table 3. Percent mortality among *Phytoseiulus persimilis* predatory mites treated with various formulations of captan at 3.59 g ai/liter and 947 liters/ha.[1]

Treatment	% Mortality
Untreated check	3.1 a
Captan 50W	13.8 a
Captan 75WG	6.7 a
Captan 80W	3.3 a

[1]Values followed by the same letter are not significantly different (P = 5%) by Duncans multiple range test.

Since Captan 50 WP, 80 WP, and 75 WG appear to be equally effective at controlling diseases on strawberries, and are not detrimental to predaceous mites, growers may want to base their decision of which formulation to use on other factors, such as price, amount of visible residue, or ease of handling.

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