GARDEN SYMPHYLAN (SCUTIGERELLA IMMACULTATA NEWPORT), CONTROL WITH INSECTICIDES

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Garden symphylans (*Scutigerella immaculata* Newport, *GS*) are particularly difficult to manage in hops in part due to inability to till soil near the crowns, lack of effective, persistent soil applied pesticides as well as systems to deliver pesticides through the soil profile where *GS* occur. Our objectives involved 1) evaluation of insecticides with potential for registration as broadcast and incorporated use and 2) investigation of application methods to control *GS* within untilled hills.

Lab Trial

A lab study was used to evaluate the efficacy of a range of potential products in order to select products for field testing. Petri dishes were filled with soil treated with the appropriate rate for each product (Table 1). Maximum labeled rates were used for products tested in order to ensure the greatest possibility for success.

Table 1. Products and rates used in lab study to evaluate and select the best products for the field trial, Corvallis 2005

Product	Active Ingredient (Ai)	Product (oz/A)	Ai (lb/A)
[1] Furadan 4F	Carbofuran	64.00	2.00
[1] Lorsban 4E	Chlorpyrifos	64.00	2.00
[1] MoCap 10G	Ethoprop	42.67	2.00
[2] Discipline 2E	Bifenthrin	6.40	0.10
[2] Baythroid 2	Cyfluthrin	3.20	0.05
[2] Warrior 1	Lambda-cyhalothrin	3.84	0.03
[2] Belay 16WSG	Clothianidin	10.00	0.01
[2] Admire 2F	Imidacloprid	32.00	0.50
[2] Regent 4SC	Fipronil	4.16	0.13
x-utc	---	---	---
[2] Discus	Cyfluthrin + Imidacloprid	244.48	0.11 0.45
[2] Platinum 2	Thiamethoxam	8.00	0.13

[1] Proven Reference Product
[2] Potential New Product

Rates used in the lab were based on the calculated amount of product expected to be present in a soil profile if applied in-furrow over the row in a 4" band and incorporated to a depth of 2 inches (for a crop grown on 30"center rows). Treated soil was added to each of four Petri dishes (reps) per product tested. Following the addition of treated soil to each Petri dish, five vigorous, field collected late-instar *GS* were added. Live *GS* were recorded seven days after treatment.

Field Trial

We evaluated the 3 most promising insecticides from the lab trial (Furadan, Discipline & Warrior) as well as Mocap 10G which served as our "standard." We also included an untreated check. All treatments were

replicated five times. Although Lorsban 4E and Admire 2F preformed better in the lab study than Warrior, they were not selected for field studies due to labeling concerns for Lorsban and erratic results for Admire. Replicates were 1' x 10' rows spaced 84" apart, each containing three young Willamette hop plants spaced 3 ft. apart.

Rates used in the field were based on the calculated amount of product expected to be present in a soil profile when products were applied in a 36" band and incorporated to 2 inches for a crop grown on 7'center rows. Two application methods were used, pre-plant band + incorporate and post-plant injection. Banded applications were made covering the entire 1'x 10' row prior to planting, and hop transplants were planted directly after application. Injected applications were made post planting in 12" x 18" rectangle around each hop plant using a Kyoritz soil injector from Wilbur Ellis. Products applied using the band + incorporate method would give best control when used immediately prior to planting (as a possible replacement for Mocap), or in the spring between the hop rows. Injection equipment would not injure plants and would facilitate placement of liquid products into the root zones of plants where *GS* cause damage. Garden symphylan populations were sampled 7 days after treatment (DAT) with potato baits and soils cores, and plant dry weights were collected 62 DAT.

Results

The four most effective products in the lab study were, Furadan, Lorsban, MoCap and Discipline. Control in these treatments was statistically better than all other treatments including the untreated check. Control from admire was also statistically better than the check but not different than the other treatments (Table 2).

There was no statistical difference between the number of *GS*, or the plant dry weights between the two application methods (banded and injected). Therefore, the data for the two application methods were pooled for analysis (i.e., the mean in the tables are for the banded and injected data combined).

After pooling the data, both the potato bait *GS* numbers and the plant dry weight treatments for MoCap were statistically better than the untreated check. No other treatment performed better than the check in the field (Tables 3, 4 & 5).

Table 2. Garden Symphylan lab product study 7 DAT percent control from each chemical

Product	Ai (lb/A)	7 day % Control
Furadan 4F	2.00	100 a
Lorsban 4E	2.00	100 a
MoCap 10G	2.00	100 a
Discipline 2E	0.10	85 a
Admire 2F	0.50	45 b
Warrior 1	0.03	35 bc
Belay 16WSG	0.01	35 bc
Baythroid 2	0.05	35 bc
Discus (cyfluthrin) +	0.11	25 bc
(imidacloprid)	0.45	
Regent 4SC	0.13	20 bc
Platinum 2	0.13	15 bc
x-utc	---	5 c

Means followed by the same letter within a column do not differ significantly at P<0.05 (Tukey ANOVA analysis)

Table 3. Potato Bait *GS* numbers 7 DAT

Treatment	Application	Rate (lb ai/A)	I	II	III	IV	V	Total	Mean
Mocap 10G	B		15	0	0	0	24		
	I	3.00	1	1	0	3	2	46	4.60 a
Discipline 2E	B		37	3	31	0	6		
	I	0.10	3	30	15	1	34	160	16.00 ab
Furadan 4F	B		0	0	3	1	29		
	I	2.00	37	9	35	0	2	116	11.60 ab
Warrior 1	B		27	3	34	8	1		
	I	0.03	0	39	0	43	1	156	15.60 ab
UTC	B		0	52	26	25	7		
	I	---	36	27	30	44	0	247	24.70 b

Means followed by the same letter within a column do not differ significantly at *P*≤0.05 (Tukey ANOVA analysis)

Table 4. Soil Core (2.5" diameter) *GS* numbers 7 DAT

Treatment	Application	Rate (lb ai/A)	I	II	III	IV	V	Total	Mean
Mocap 10G	B		5	4	0	0	1		
	I	3.00	0	1	2	0	1	14	**1.40 a**
Discipline 2E	B		7	4	4	1	2		
	I	0.10	1	27	1	4	10	61	**6.10 a**
Furadan 4F	B		2	0	7	1	2		
	I	2.00	3	5	3	0	1	24	**2.40 a**
Warrior 1	B		2	3	5	2	1		
	I	0.03	0	7	0	6	0	26	**2.60 a**
UTC	B		0	3	15	5	1		
	I	---	1	3	7	6	0	41	**4.10 a**

Means followed by the same letter within a column do not differ significantly at $P \leq 0.05$ (Tukey ANOVA analysis)

Table 5. Hop dry weights 62 DAT

Treatment	Application	Rate (lb ai/A)	I	II	III	IV	V	Total	Mean
Mocap 10G	B		4.40	15.14	41.11	107.31	2.67		
	I	3.00	39.70	115.87	68.46	179.14	28.58	602.38	**60.24 a**
Discipline 2E	B		7.28	51.80	4.56	75.29	8.04		
	I	0.10	35.53	13.81	47.06	188.57	10.47	442.41	**44.24 ab**
Furadan 4F	B		50.40	33.70	40.74	47.06	4.18		
	I	2.00	2.67	5.51	0.32	150.69	27.11	362.38	**36.24 ab**
Warrior 1	B		2.31	80.25	0.20	1.01	33.65		
	I	0.03	181.49	1.36	108.71	2.52	90.48	501.98	**50.20 ab**
UTC	B		102.02	0.70	0.25	0.65	0.61		
	I	---	2.17	0.00	3.29	4.23	58.93	172.85	**17.29 b**

Means followed by the same letter within a column do not differ significantly at $P \leq 0.05$ (Tukey ANOVA analysis).
Data were log-transformed to stabilize the variance, means presented are originals