DO NEWER PESTICIDE CHEMISTRIES PROVIDE ENOUGH SYMPHYLAN CONTROL IN GRASS SEED CROPS? (YEAR 1)

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Introduction

Symphylans are a soil pest with a broad host range, affecting numerous specialty crops, ranging from strawberry to grass seed to vegetable crops to mint (as many as 100 crops have been reported) in western Oregon, Washington, and California (Umble and Fisher, 2003; Shimat, 2015). Garden symphylan, *Scutigerella immaculata* (Newport) is a soil arthropod, less than 10 mm long, white, centipede-like, and having 15 to 22 body segments. Symphylans feed on plant roots, resulting in stunted growth due to the reduction in the plant's ability to acquire nutrients and water (Burden, 2004). High infestation levels of symphylans can cause poor germination, stunted growth, seedling death, and reduced vigor, resulting in poor stands and reduced yields. Although few estimates of crop yield loss due to symphylans are available, a vast majority of western Oregon grass seed growers report challenges from mitigating symphylans every year, particularly during seedling/stand establishment (personal communication, agricultural industry professionals).

Symphylan control is managed using preventative insecticide application as preplant incorporation (PPI). Limited chemical control options exist for practical management of symphylans after the Lorsban (chlorpyrifos) phaseout. Sampling for symphylans using potato bait or soil sampling methods can indicate whether treatment should be administered (Umble and Fisher, 2003).

Efficacy trials for symphylan control in grass seed production have not been performed until this study. Efficacy data are needed to determine whether the newer pesticide chemistries are viable tools against symphylans. Our research objective was to evaluate the efficacy of new and existing pesticide products representing diverse modes of action for the management of symphylans in tall fescue, *Schedonorus phoenix* (Scop.) Holub, and perennial ryegrass, *Lolium perenne* L., grown for seed.

Materials and Methods

A symphylan-infested site was identified using the potato bait method at the Oregon State University (OSU) Hyslop Research Laboratory near Corvallis, OR. Treatments included five insecticidal products and an untreated control (Tables 1 and 2) during spring and fall of 2022. Spring-planted tall fescue (var. 'Titanium G-LS') and fall-planted perennial ryegrass (var. 'Fastball 3GL') plots were used in this study. Plots were 12 feet x 30 feet and were arranged in a randomized complete block design with four replications each. Each replication was bordered by 30 feet of nontreated buffer planted in the same crop. Treatments were applied PPI.

Spring treatments were made on April 8, 2022, using a CO_2 backpack sprayer calibrated to deliver 20 gal/acre at 22 psi through TeeJet 8002VS nozzles. Treatments were incorporated into the top 2 inches of soil, using a tractor-mounted rotavator, immediately prior to planting tall fescue variety 'Titanium G-LS' at a 9 lb/acre seeding rate with 13-inch row spacing. Seeding depth was approximately 0.5 inch.

Symphylan counts were taken from two randomly deployed potato bait stations per plot. Each bait station consisted of half a potato longitudinally cut, placed cut side down on the soil surface and covered with an 8-inch-wide plastic flowerpot without drain holes. Bait stations were deployed approximately 1 week after insecticide treatment and were checked 24 to 48 hours after placement by lifting the potato bait and counting symphylans under the potato on the soil surface and then counting the number of symphylans on the potato. The total number of symphylans per plot (two bait stations) was recorded at 10, 14, 25, 32, and 39 days after treatment (DAT). After final data collection, plant density was taken for each plot by randomly selecting a 1-meter length of one row within each plot and counting total germinated seeds unaffected by symphylans.

During fall 2022, a nematicidal (Nimitz) and a fungicidal (Velum Prime) product were included along with the three insecticidal chemistries that outperformed the control in the spring trial (Bateman et al., 2023). Fall insecticide application was made on October 20, 2022, using a CO_2 backpack sprayer calibrated to deliver 20 gal/acre at 22 psi through TeeJet 8002VS nozzles. Treatments were incorporated into the top 2 inches of soil, using a tractor-mounted rotavator, immediately prior to planting perennial ryegrass var. 'Fastball

3GL' with a seeding rate of 9 lb/acre and 13-inch row spacing. Seeding depth was approximately 0.5 inch.

Symphylan counts were performed according to the above-mentioned procedure and were recorded at 8, 13, and 33 DAT. No counts were taken between 14 and 30 DAT due to rain events that flooded this site. Plant density counts were taken at 50 DAT for each plot according to the above-mentioned methodology.

Data were analyzed by ANOVA, and means were separated using Fisher's protected LSD ($P \leq 0.05$) (SAS Institute Inc, 2016).

Results and Discussion

Spring 2022

At 10 DAT, symphylans were not detected in plots containing treatments Capture LFR and Torac, indicating significant suppression compared to untreated control plots (an average of 9.25 symphylans) and Vantacor treatments (an average of 4.25 symphylans) (Table 1). At 14 DAT, a similar trend emerged for Capture LFR and A21377X, with no symphylans present and significant suppression compared to Vantacor (an average of three symphylans). At 25, 32, and 39 DAT, no treatment differences were detected compared to the control.

At the end of the spring trial, there was no difference in plant density among treatments (Table 1). However, there seemed to be a weak negative correlation between higher plant densities and lowest symphylan densities in plots treated with Capture LFR (data not shown).

Fall 2022

At 8 DAT, Capture LFR, Warrior II, Velum Prime, Torac, and the untreated control had comparable symphylan counts, and no difference in the mean symphylan counts was observed (Table 2). At 13 DAT, all pesticide treatments suppressed symphylans when compared to that of the untreated control (an average of 10.3 symphylans) and Nimitz plots (an average of 7 symphylans). No differences in mean symphylan counts were found at 33 DAT. At 50 DAT, plant densities of all insecticide treatments were comparable to the untreated control except Nimitz, indicating its poor performance in symphylan control.

References

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Table 1. Trade names, active ingredients (IRAC group), rate in fl oz/acre, mean number of symphylans, and plant density, spring 2022.[1]

Trade name	Active ingredient	Rate/a	Symphylan count per plot[2]					Plant density
		(fl oz)	10 DAT[3]	14 DAT	25 DAT	32 DAT	39 DAT	
Capture LFR	Bifenthrin (Group 3A)	6.50	0.0 b	0.0 b	0.5 a	0.0 a	0.0 a	17.7 a
Torac	Tolfenpyrad (Group 21A)	21.00	0.0 b	0.3 ab	3.0 a	0.3 a	0.8 a	9.5 a
Vantacor	Chlorantraniliprole (Group 28)	2.50	4.3 ab	3.0 a	5.5 a	0.0 a	8.5 a	4.5 a
BAS4007I	Broflanilide (Group 30)	2.40	0.8 b	0.7 ab	5.8 a	1.5 a	9.8 a	7.2 a
A21377X	(Group 30)	10.27	2.5 ab	0.0 b	2.3 a	0.3 a	0.3 a	13.2 a
Untreated control	—	—	9.3 a	0.3 ab	4.3 a	0.5 a	3.5 a	14.0 a
P > *F*			0.006	0.031	0.545	0.582	0.092	0.092

[1]Means within a column followed by the same letter are not significantly different ($P = 0.05$). Treatments were applied prior to planting on the same day.
[2]Symphylan counts were collected from two potato bait stations per plot at 10, 14, 25, 32, and 39 DAT.
[3]DAT = days after treatment

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Table 2. Trade names, active ingredients (IRAC group), rate in fl oz/acre, mean number of symphylans, and plant density, fall 2022.[1]

Trade name	Active ingredient	Rate/a	--- Symphylan count per plot[2] ---			Plant density
		(fl oz)	8 DAT[3]	13 DAT	33 DAT	
Capture LFR	Bifenthrin (Group 3A)	6.50	0.0 b	0.3 b	0.0 a	131.0 a
Warrior II	Lambda-cyhalothrin (Group 3)	1.92	0.3 b	0.5 b	0.5 a	101.5 ab
Velum Prime	Fluopyram (Group 7 fungicide)	6.84	0.3 b	0.8 b	0.3 a	95.5 ab
Torac	Tolfenpyrad (Group 21A)	21.00	0.5 ab	1.3 b	1.5 a	99.5 ab
Nimitz	Fluensulfone (nematicide)	84.00	2.5 a	7.0 ab	1.0 a	60.3 b
Untreated control	—	—	1.0 ab	10.3 a	2.0 a	92.5 ab
P > *F*			0.173	0.055	0.078	0.005

[1]Means within a column followed by the same letter are not significantly different ($P = 0.05$). Treatments were applied prior to planting on the same day.
[2]Symphylan counts were collected from two potato bait stations per plot at 8, 13, and 33 DAT.
[3]DAT = days after treatment