

Investigating Novel Control Options for Symphylan Management in Specialty Seed Crops in Oregon- Year 2

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Various grower cooperators and crop consultants throughout the Willamette Valley, including Jon Umble, Fall Creek Farm, and Nurseries, Inc.

Background

Symphyllans (*Scutigerella immaculata* Newport) are a persistent soil pest that affects many seed crops in Oregon's Willamette Valley, resulting in poor stand establishment and economic damage. This project will demonstrate the potential of a few high-value solanaceous crops to serve as viable rotation or cover crop options under Oregon conditions. Research at OSU (Umble and Fisher 2003a, Umble and Fisher 2003b) showed that symphyllan populations drop significantly after potato crops. Cultivation of potatoes was found to cause a 2- to 4-fold reduction in pest populations over a broad range of conditions, with populations remaining low into the following cropping cycle. In greenhouse trials, the population decreased in 6 potato varieties with different alkaloid profiles. These plant protection benefits were attributed to the presence of α -chaconine and α -solanine, two major glycoalkaloids in commercial potatoes (Friedman and Dao 1992).

What is the potato effect? In general, potato roots and leaves tend to have much higher concentrations of glycoalkaloids that are toxic to symphyllans than tubers. Thus, potatoes can become good rotation crops where symphyllan pressure is high. Ideally, late- or no-tuber-forming varieties can be a suitable pest-management cover crop on farms that aren't interested in growing and selling potatoes. Preliminary discussions with the OSU potato breeder, Dr. Sathuvalli, and Dr. Jim Myers, OSU vegetable breeder, suggested that short-day potatoes or non-tuber-forming wild types could avoid the potential side effect of volunteer potatoes becoming weeds. Other Solanaceous crops (litchi, tomatoes, peppers, ashwagandha, etc.) with high levels of α -chaconine and α -solanine could also serve as cover crops or rotation crops.

During the first year, we observed some tolerance attributes in certain crop species in greenhouse experiments, including reduced symphyllan survival and higher root biomass in exposure experiments. In this study, we intend to continuously measure the effects on symphyllan survival and population densities when symphyllans are reared on crops with high α -chaconine and α -solanine content, and to assess their potential as cover crops or rotational options in Oregon. In this study, we aim to conduct the following

Objectives

1. Investigate the suitability of various solanaceous crops with high glycoalkaloid contents for symphyllan survival under greenhouse conditions.

Procedures

An initial round of greenhouse suitability test was concluded in Spring 2026 following the general approach of Umble and Fisher (2003b). Crop species and varieties were evaluated for their effects on the population development of the garden symphyllan, *Scutigerella immaculata*, and plant performance under greenhouse conditions. Crop species and cultivars were selected based on previous research and observations suggesting that certain solanaceous crops may influence symphyllan abundance and feeding behavior.

Each crop or cultivar was established in PVC pots with six replicates per treatment and infested with 35 adult symphyllans. Symphyllan population development was assessed by comparing initial infestation levels with final population densities after seven to eight weeks. Plant performance was evaluated by measuring root biomass and overall root health.

Results

The highest garden symphytan mortality was observed in *Solanum tuberosum* cv. Snowden ($81.9 \pm 4.8\%$), followed by *Capsicum chinense* (Habanero) ($70.5 \pm 8.3\%$) and *S. tuberosum* cv. Yellow Finn ($61.9 \pm 7.7\%$). These three treatments formed the highest statistical group and resulted in significantly greater mortality than the other crop species and cultivars evaluated (Tukey's HSD, $P < 0.05$).

The remaining treatments produced intermediate to low mortality, ranging from 32.9 to 43.8%, and did not differ significantly from one another.

Table 1. Mean ($\pm$ SE) mortality of *Scutigerella immaculata* following exposure to selected crop species and cultivars under greenhouse conditions.

Crop species / cultivar	Common name	Mortality (%)
<i>Solanum tuberosum</i> cv. Snowden	Snowden potato	$81.9 \pm 4.8a$
<i>Capsicum chinense</i>	Habanero pepper	$70.5 \pm 8.3a$
<i>Solanum tuberosum</i> cv. Yellow Finn	Yellow Finn potato	$61.9 \pm 7.7a$
<i>Withania somnifera</i>	Ashwagandha	$43.8 \pm 8.2b$
<i>Capsicum annuum</i>	Cayenne pepper	$42.9 \pm 5.4b$
<i>Solanum melanocerasum</i>	Garden huckleberry	$36.4 \pm 5.2b$
<i>Cucurbita pepo</i>	Ornamental gourd	$36.2 \pm 7.8b$
<i>Solanum lycopersicum</i> var. <i>cerasiforme</i>	Cherry tomato	$36.2 \pm 2.8b$
<i>Solanum habrochaites</i>	Wild hairy tomato	$33.8 \pm 9.8b$
<i>Solanum scabrum</i>	Garden huckleberry	$32.9 \pm 9.2b$

Means followed by the same letter are not significantly different according to Tukey's HSD test ($P < 0.05$).

The high mortality observed in Snowden and Yellow Finn potato and Habanero pepper suggests that certain members of the Solanaceae may possess characteristics that negatively affect garden symphytan survival. One working hypothesis is that these effects are associated with bioactive plant secondary metabolites, particularly glycoalkaloids and other root-associated compounds.

Preliminary laboratory assays support this hypothesis: commercial standards of the potato glycoalkaloids α -chaconine and α -solanine caused measurable mortality in garden symphytans. The consistently high mortality observed with the two potato cultivars in the greenhouse screening further justifies investigating whether naturally occurring glycoalkaloid concentrations contribute to crop-mediated suppression.

An M.S. student is currently screening additional replicated greenhouse experiments to confirm the suppressive potential of the most promising crops and cultivars and further characterize their effects on garden symphytan survival. Promising entries will subsequently be evaluated to determine whether the greenhouse response can be translated into practical crop-rotation strategies under field conditions.

In parallel, Dr. Aymeric Goyer's lab will conduct in-house analytical studies to quantify glycoalkaloid concentrations in selected plant tissues. These data will be compared with symphytan mortality to determine whether variation in glycoalkaloid concentration is associated with differences in suppressive activity. Together, the greenhouse, laboratory, and biochemical studies will help clarify the mechanisms

underlying crop-mediated suppression and guide selection of candidate crops for future field demonstrations and rotation-based management strategies.

References

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