Habits and Life Cycle of *Herpetogramma thestealis* on American Ginseng

[1] Amber Witley, [1] Melanie Filotas, [2] Hannah Fraser, [3] Amy Shi, [1] Sean Westerveld

[1] Ontario Ministry of Agriculture, Food, and Agribusiness, Simcoe, ON; [2] Ontario Ministry of Agriculture, Food and Agribusiness, Guelph, ON; [3] Ontario Ginseng Growers Association, Simcoe, ON

Background

Leaf folders have long been a pest in ginseng gardens in Ontario, but it was not until 2016 that the species was identified as *Herpetogramma thestealis*. Little is known about this pest's life cycle and habits in Ontario, as ginseng is its only commercial crop host in the province. In the wild, previous research suggests hosts for *H. thestealis* include woody plants in forests or bogs (1). It is known that *H. thestealis* larvae, zigzag *Herpetogramma* leaf folders, create leaf rolls using ginseng leaflets and feed on the leaflets inside the roll as they develop (Figure 1). Inside the leaf rolls, the caterpillars are protected from chemical management applied by growers, making them difficult to control and increasing the susceptibility of the leaves to foliar disease. Some research on other *Herpetogramma* species as pests has been conducted, but information on *H. thestealis* eggs and life cycles as pests on ginseng has not been documented (2). In this study, a ginseng garden untreated with insecticides was observed from the emergence of ginseng in the spring, continuing to August, for the habits of leaf folders in a ginseng garden. The development of the zigzag *Herpetogramma* leaf folders was tracked to attempt to gain information on the pest's life cycle and gain knowledge that may help to improve the control of this pest in Ontario.

Objectives

The purpose of the study is to track and monitor *H. thestealis* on ginseng in Ontario to:

1. Observe their larval habits
2. Learn about their life stages
3. Discover where and when they lay their eggs

Figure 1. *H. thestealis* plant damage on the edge of a ginseng bed.

Methods

In a four-year-old ginseng research garden where *H. thestealis* was observed in the prior growing season and was not treated with insecticides during the 2025 growing season, leaf folder habits and life cycle were observed through several different methods from May 2025 through to August 2025. *H. thestealis*, including eggs, larvae, pupae, and adults, were observed and tracked in the ginseng garden to determine their life cycle on ginseng in Ontario. A section of the ginseng garden with 20 plants containing leaf rolls or where *H. thestealis* larvae were present was marked, and each plant was flagged. The growth of the leaf rolls was measured and documented weekly to assess their larval habits. Any other leaf rolls that appeared in the marked plot, apart from the 20 selected, were counted each week. Along with this, 5 leaf rolls were collected from outside of the marked plot, and the life stage of the *H. thestealis* inside was documented to determine the timing of their life stages. Any *H. thestealis* larvae collected were measured for their body length, head capsule length, and head capsule width to determine their larval instar.

Results & Discussion

In early May, it was discovered that early-stage *H. thestealis* larvae, the first instar to emerge in the spring, abandon their first single leaflet leaf rolls and create new ones (Figure 2). Due to this habit, the original method of tracking the growth of leaf rolls was changed to track the number of leaf rolls in the plot for the rest of the larval stage. This knowledge informs ginseng growers that there is a longer period to apply control methods. This also suggests the control applied could be more effective since the early-stage *H. thestealis* larvae will feed on the chemically protected leaflets when they leave their initial rolls.

It was discovered that there is only one generation of *H. thestealis* in Ontario ginseng gardens, based on the absence of caterpillars that develop beyond the second instar in late summer (Figure 3). *Herpetogramma* species are known to have either one or two generations in a season (1). This information gave new insight into the life stages of the pest and will help growers determine when to apply controls.

H. thestealis eggs were discovered on the underside of the leaves on July 24, 2025, and were present in the garden until August 21, 2025 (Figure 2). This discovery will allow ginseng growers another opportunity to apply controls against the next year's generation of *H. thestealis* and to scout to determine what the next season's numbers will look like to prepare accordingly.

What do the life stages look like?

Herpetogramma thestealis go through several larval instars, pupate, and then emerge as adults to finally lay eggs on the underside of ginseng leaflets (Figure 2). *H. thestealis* eggs are laid either singly or in clusters of two or three. These eggs are approximately 0.8mm in diameter and begin completely clear until they develop further and the black head capsule of the larva is visible through the eggs (Figure 2).

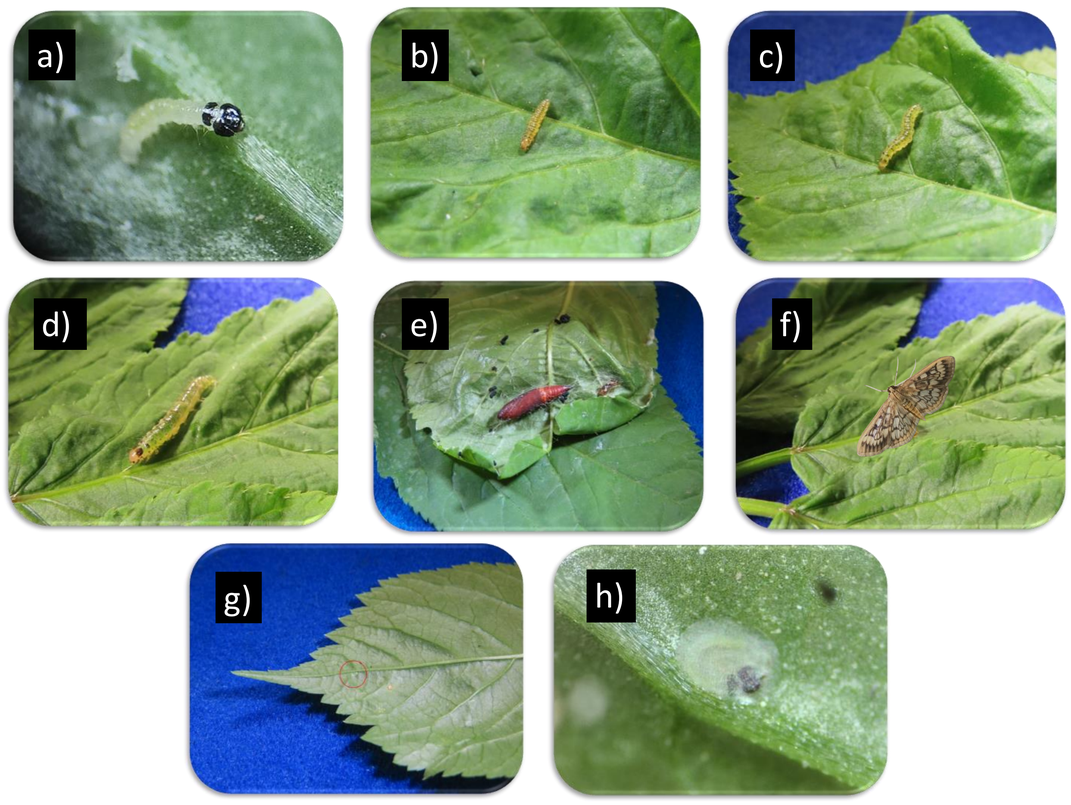

Figure 2. Close-up images of different life stages of *H. thestealis* on ginseng leaves, including a) first instar, b) second instar, c) third instar, d) fourth instar, e) pupa, f) adult, g) egg and h) zoomed-in image of an egg. Instar stages are preliminary based on observations.

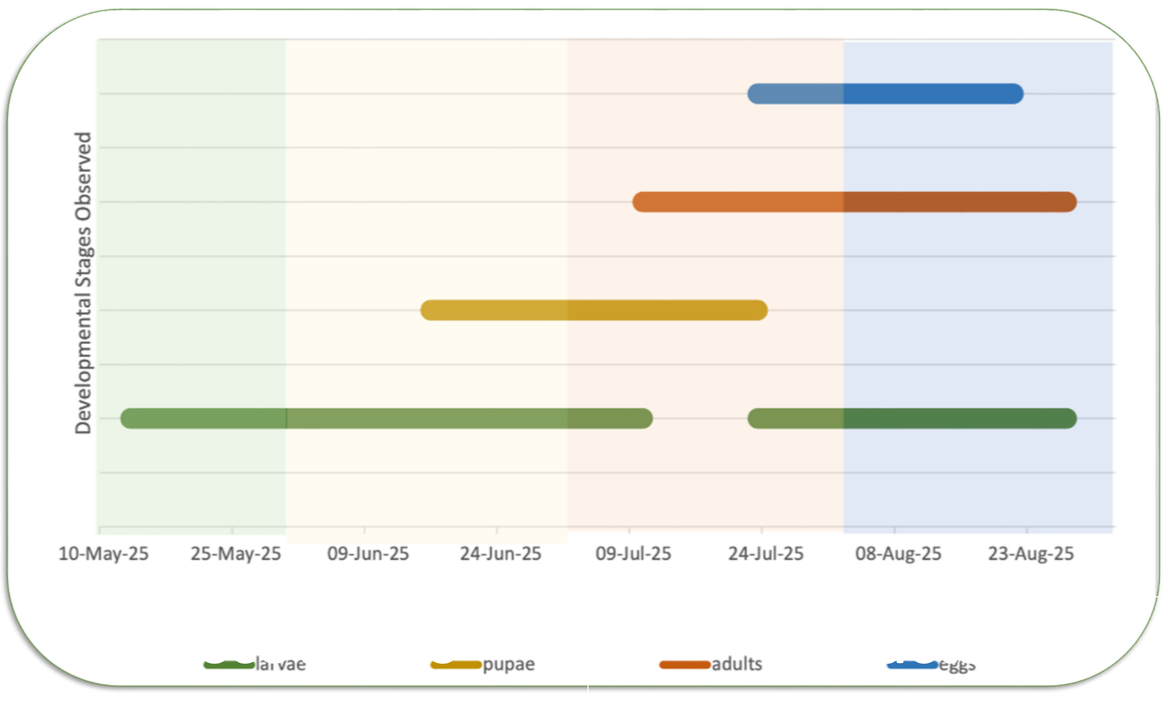

Figure 3. Graph of *H. thestealis* life stages observed from May to August 2025 in the ginseng research garden near Courtland, ON.

Discoveries	Impacts
Early-stage larval habit of abandoning leaf rolls	Gives growers longer to apply insecticides and suggests they will be more effective
Finding a single generation and learning about their life stages	Informs growers about the pest's life cycle to help time management options
Discovering their eggs	Gives growers another opportunity to scout and apply controls later in the season

Future Steps

Further research is needed to verify the information on this pest's life cycle. Future steps could include rearing efforts to validate the estimated number of larval instars, tracking efforts to confirm the absence of a second generation in coming seasons, and determining how they overwinter in ginseng gardens.

References:

(1) Handfield, L. Handfield, D. (2021) A revision of the Canadian species of the Genus *Herpetogramma* Lederer, 1863 (Lepidoptera: Crambidae: Spilomelinae: Herpetogrammatini), with descriptions of three new species. *Bonn Zool Bull* 70 (1): 173-199

(2) Morse, D. (2017) Where should I lay my eggs? Oviposition choices of a shelter-building moth and the shifting danger of being parasitized. *Entomol Exp Appl*. 165 (1): 1-8