CUTWORM AND ARMYWORM POPULATION DYNAMICS AND INVESTIGATION OF PARASITISM IN KENTUCKY BLUEGRASS PRODUCTION

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Introduction

Damage from cutworms and armyworms (Lepidoptera: Noctuidae larvae) can occur quickly, and the potential for stand loss is of particular concern. This project builds on previous work by OSU Extension faculty to assess the impact of cutworms and armyworms in Kentucky bluegrass (KBG) seed production systems. Butler and Hammond (2001) used light traps to sample adult moths. They identified a suite of about ten species that could be problematic for regional KBG production. The primary objective of our work is to gain a better understanding of flight timings and relative abundance of noctuid moths relevant to KBG production systems. Second, we aim to assess the impact of parasitoids, predators, and naturally occurring entomopathogens, because these beneficial agents can help mitigate damage from cutworm and armyworm larvae in fields.

Our study focused on three species:

- Winter cutworm (*Noctua pronuba*), a relatively new concern in Oregon grass production (Landolt et al., 2015)
- Glassy cutworm (*Apamea devastator*), a known grass pest in this region (Kamm, 1990)
- Snowy-veined Apamea (*A. niveivenosa*, previously *Protagrotis niveivenosa*), which was noted in prior KBG studies by OSU (Butler and Hammond, 2001)

Materials and Methods

Adult moth activity

Seasonal abundance of adult moths was tracked using green UniTrap buckets baited with pheromone lures. Lures were developed by a local supplier (AlphaScents, West Linn, OR). The winter cutworm lure is commercially offered by the supplier. The glassy cutworm lure, however, had to be custom formulated, based on pheromone ratios for snowy-veined Apamea that had been identified but never field tested (Keith, 1965). An intoxicant strip was placed within each bucket to effectively and quickly kill captured moths within the trap. Traps were placed near commercial KBG production fields in eastern Oregon and near ryegrass and fine fescue fields in western Oregon as comparisons. Traps were placed in late May and checked every 2 weeks through September. Catch collections of all adult moths (species of interest and nontargets) were bagged, labeled, and shipped to OSU for identification

Lab evaluation of larvae

Noctuid larvae were collected from grass seed production fields in western Oregon from November 5 to December 7. Larvae were reared individually on artificial diet, which is a combination of powdered protein (wheat germ, soybean), nutrients and vitamins, agar, and other ingredients. Percent mortality was evaluated, with a specific interest in detecting parasitoid emergence or symptoms of parasitoid development.

A rating scale was established to assess overall "viability" of each cutworm, with 0 = death within 2 weeks; 1–2 = an intermediate continuum of distinct tissue damage, lethargy, darkening of the cuticle, and eventual death; 3 = continued feeding with no notable reduction in activity; and 4 = the cutworm was able to successfully molt.

Results and Discussion

Adult moth activity

A total of 1,048 noctuid moths were collected during the 2020 season. Unfortunately, 45% of all captured moths were cabbage looper (*Trichoplusia ni*), and another 10% were true armyworm (*Mythimna unipuncta*).

Snowy-veined Apamea moths were detected in eastern Oregon only, mainly from one site (278 of 375 total). The first trap catch occurred on June 11 (Figure 1a). A total of 81 glassy cutworms were trapped from both eastern and western Oregon, with a first capture date of June 30 (Figure 1b), which matches timing previously reported (Kamm, 1990). Surprisingly, only four winter cutworms were trapped throughout the entire season (data not shown). The low trap catch of *N. pronuba* may be reflective of low densities during the sampling period, sampling methodology, or both.

Custom lures developed for trapping *Apamea* species were successful. We were able to detect both glassy cutworm moths and snowy-veined moths using the lures. This result is important because a commercially available lure does not yet exist. Knowing that the

lure formulation works is a crucial aspect for future investigation of the *Apamea* moth "complex" that has been reported previously from bluegrass production systems (Keith, 1965).

Lab evaluation of larvae

The first challenge of the lab assay was to ensure that glassy cutworm and winter cutworm could be reared in the laboratory; to our knowledge this has never been attempted for either species. Artificial diet was accepted by all larvae, and we now have methodology in place to continue these research efforts. Observed emergence of parasitoids (Diptera: Tachinidae) occurred in two glassy cutworms and one winter cutworm (Table 1). Our sample sizes were small (n = 20 glassy cutworms and 7 winter cutworms), but this work is ongoing. Both species can be found in western Oregon in the winter (Green, 2018), yet there has been some dispute about whether they are actively feeding or just persist as diapausing larvae. In our trial, 35% of glassy cutworms were able to complete a molt. Most of the winter cutworms, on the other hand, perished soon after being brought into the lab environment. Further investigation is needed to elucidate the causes of mortality and how parasitism plays a role.

References

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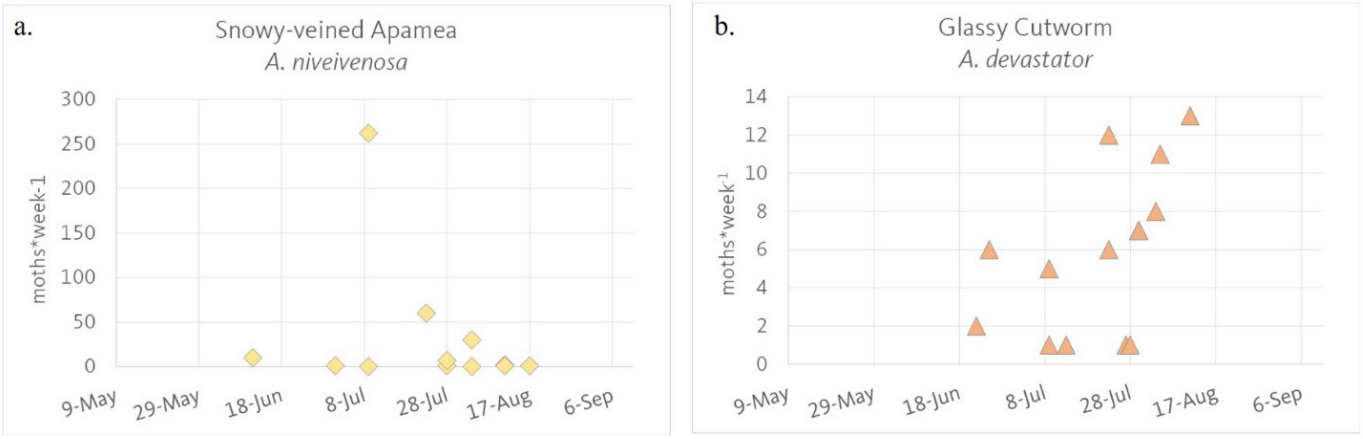

Figure 1. Activity trends of snowy-veined Apamea (a) and glassy cutworm (b), as measured by bucket traps baited with a custom-formulated lure.

Table 1. Assessment ratings of field-collected larvae from western Oregon, November–December 2020.

No. of individuals tested	Species	Behavioral and physiological ratings[1,2]					Actual emergence of parasitoids
		0	1	2	3	4	
		---------- (%) ----------					(count, %)
20	Glassy cutworm (*Apamea devastator*)	20	5	20	20	35	2, 10
7	Winter cutworm (*Noctua pronuba*)	57	0	0	29	14	1, 14

[1]0 = died within 14 days; 1 = localized tissue damage, eventual death; 2 = cuticle darkening, lethargy, eventual death; 3 = continued feeding with no change in activity; 4 = successful molt
[2]Mortality does not necessarily indicate parasitism; see text.