PEST ASSESSMENT:Leek Moth, *Acrolepiopsis assectella* (Zeller), (Lepidoptera: Yponomeutidae)

USDA-APHIS-PPQ-CPHST-PERAL/ NCSU

Section A: Species Information

Scientific name: ***Acrolepiopsis assectella*** (Zeller)

Order: Lepidoptera

Family: Yponomeutidae
Subfamily: Acrolepiinae

Common Name: Leek moth,
onion leafminer, teinge du poireau

Synonyms: *Acrolepia assectella, Lita vigiliella, Roeslerstammia assectella, Roeslerstammia betulella*

Source: Garland 2002

Figure 1. Adult *Acrolepiopsis assectella* (All pictures by Eric Thibout, CBC)

Description: (All following descriptions summarized from Garland 2002)

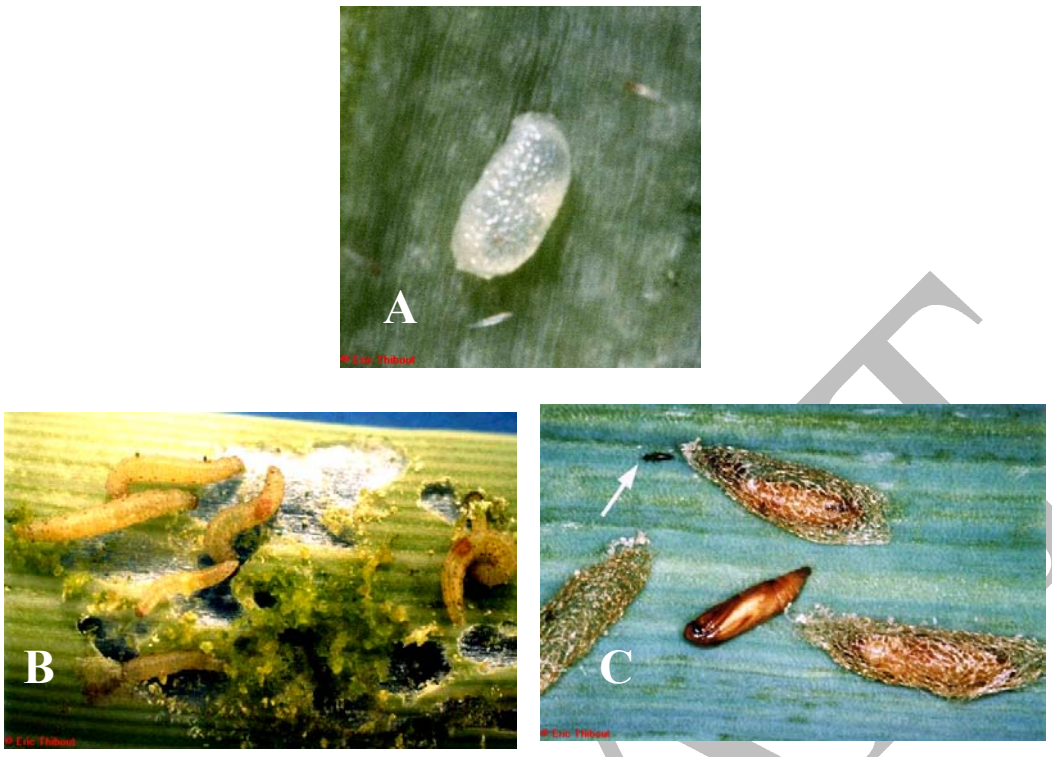

Figure 2. *Acrolepiopsis assectella* egg (A), larvae (B) and pupae (C).

Eggs: approximately 0.4 mm in diameter, oval in shape, iridescent white with raised sculpturing.

Larvae: 13-14 mm long, with a yellowish brown head that may have reddish brown maculation. The larval body is yellowish green with inconspicuous gray-brown patches around spiracles, and yellow plates speckled with brown on the first and last segments. The crochets on the abdominal prolegs are arranged in a circle, with each circle enclosing 3-5 crochets in a short longitudinal row.

Pupae: The pupae are 5.5-6.5 mm long, reddish brown, with abdominal spiracles on raised tubercles. The cremaster is bluntly rounded, bearing a dorsal lobe with eight hooked setae and a ventral lobe with four hooked setae. The pupae occur in an open network cocoon.
Adult: Adult moths have a wingspan of 15 mm, with slender pale brown forewings that are variably suffused with blackish brown and a large amount of white on the outer quarter and toward the apices. In addition, the forewing has a white triangle in the middle of the wing along the posterior margin. The hindwing is pale gray, darker towards the apical end and fringed on the posterior margin.

Life History: (Summarized from Garland 2002)

Eggs are laid singly on host, primarily on the lower leaf surface near the base.

Larvae initially are solitary leaf miners, which feed beneath the epidermis, becoming gregarious if mines coalesce. Larvae prefer to feed on younger leaves of leek, boring through to the center of the plant, but can consume leaves more than two months old. Fifth instar larvae have been reported to display a circadian feeding rhythm, with the majority of feeding occurring at night

Pupation site location has had varied reports, with pupation occurring on the host plant itself, nearby soil, companion plants and on plant debris

The adult has a facultative imaginal diapause, when females do not reproduce. Diapause termination has been found to be accelerated under laboratory conditions by long daylength and high temperature exposure (Abo-Ghalia and Thibout, 1983). A delay in oviposition initiation with relationship to minimum temperature requirements has been observed in Italy (9.5 C) and mean daytime temperature Poland (15 C). Adult flight and mating has been described as nocturnal and longevity varies from 7-68 d for non-hibernating adults and up to eight months for hibernating (diapausing) adults. In laboratory studies if leek was absent at the termination of diapause, vittelogenesis and mating were delayed.

The major economic host plants affected by *A. assectella* are leek, onion, shallot, garlic and chive.

Prediction Model:

A generic insect degree day model was used to predict the potential of leek moth infestation in the United States with temperature accumulations above the low developmental threshold as the main weather factor controlling the pest insects' biology. The template is based on the time of development for a generation of *A. assectella* with degree days accumulated above the lower developmental threshold of 6 C for all stages and individual stage degree day requirements as determined from values in Asman (2001). No definitive upper threshold temperature was estimated in the literature, but high temperatures have been reported as unfavorable for *A. assectella*, therefore 34 C was used as the upper temperature threshold value in the model. It was necessary to estimate the length of the pre-oviposition period for the adult female, as none was previously reported. This period has been observed to be approximately 48 h post emergence, and was estimated to be 28 DD in the model template and placed in the adult category of the template. In the template the oviposition section does not represent the length of oviposition time by the adult, but rather the number of degree days required for an egg to develop and hatch following deposition. At present in the template there is no adjustment for diapause inducing conditions which would reduce the potential number of generations per season for *A. assectella*. The conditions that have been reported as inducing diapause are photoperiods less than 15-16 hours, while long photoperiods and high temperatures accelerated diapause termination.

Results. The risk probability maps generated for *A. assectella* (Figure 3) are for a specified time period, June 1-7, which was selected arbitrarily, but adequately represents a period when many of the crops of interest are actively growing. The model parameters for each selected generation (overwintering, first, second or third) were examined by individual year in a 30 year historical national weather database. The data is interpreted as the number of times the model parameters (accumulated degree days (DD) between temperature thresholds) occur within the selected timeframe (i.e. if the designated DD accumulations for a specific location occur 10 years out of 30 than there is a 30% probability of occurrence or 3 out of 10 years). The crop maps were generated from county data for acres grown (1997 Census of Agriculture). The number of generations of *A. assectella* in the southern areas of the US would be greater, as indicated by the smaller distance between generation probability bands in Figure 2 B-D. Onion may be the most susceptible crop as it is grown over the greatest portion of the US.

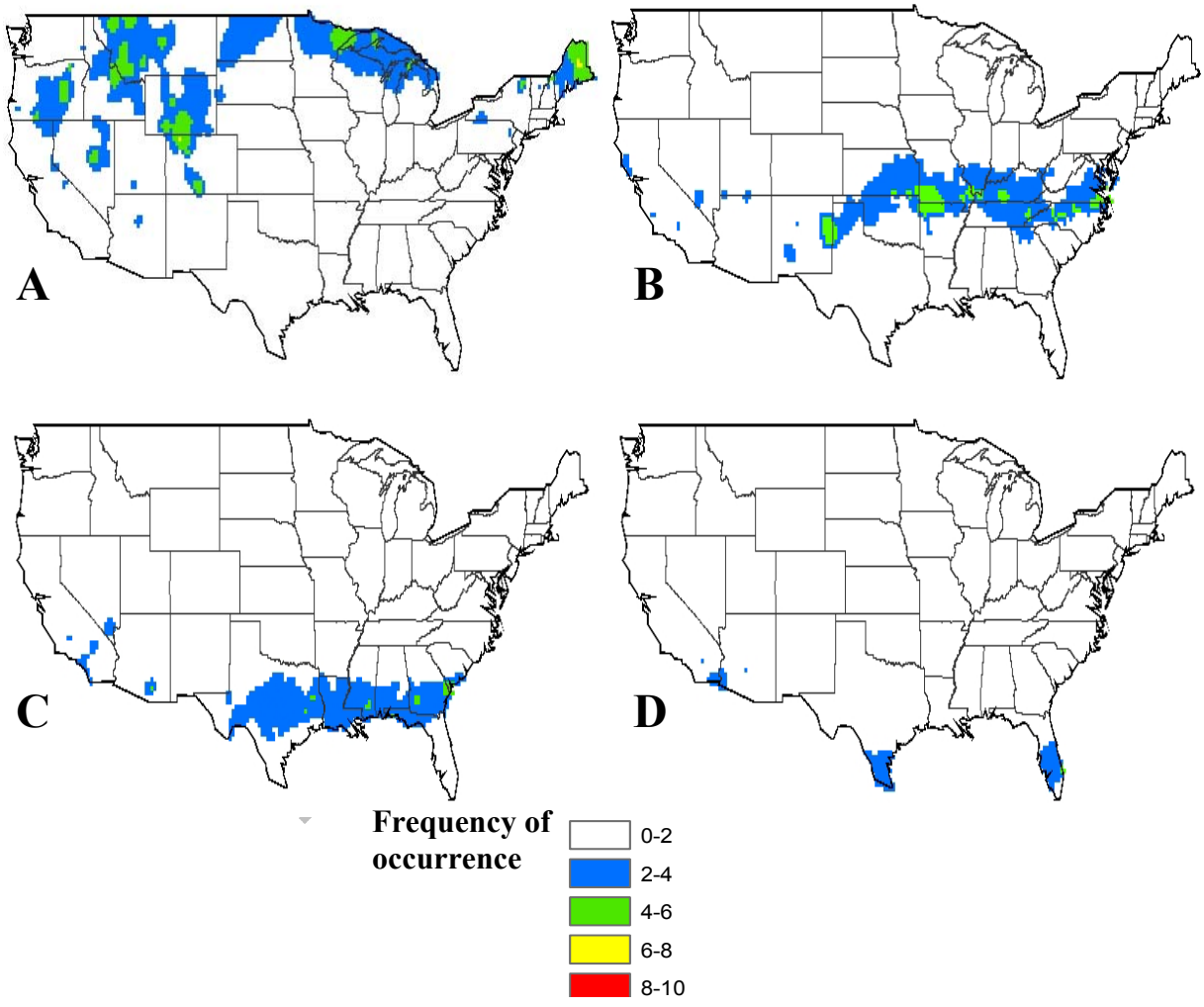

Figure 3. Probability maps of adult *A. assectella* emergence during the period of June 1-7 for overwintering, first, second and third generations (A-D), respectively, represented by frequency of occurrence out of 10 years. Maps based on 30-years of climactic data.

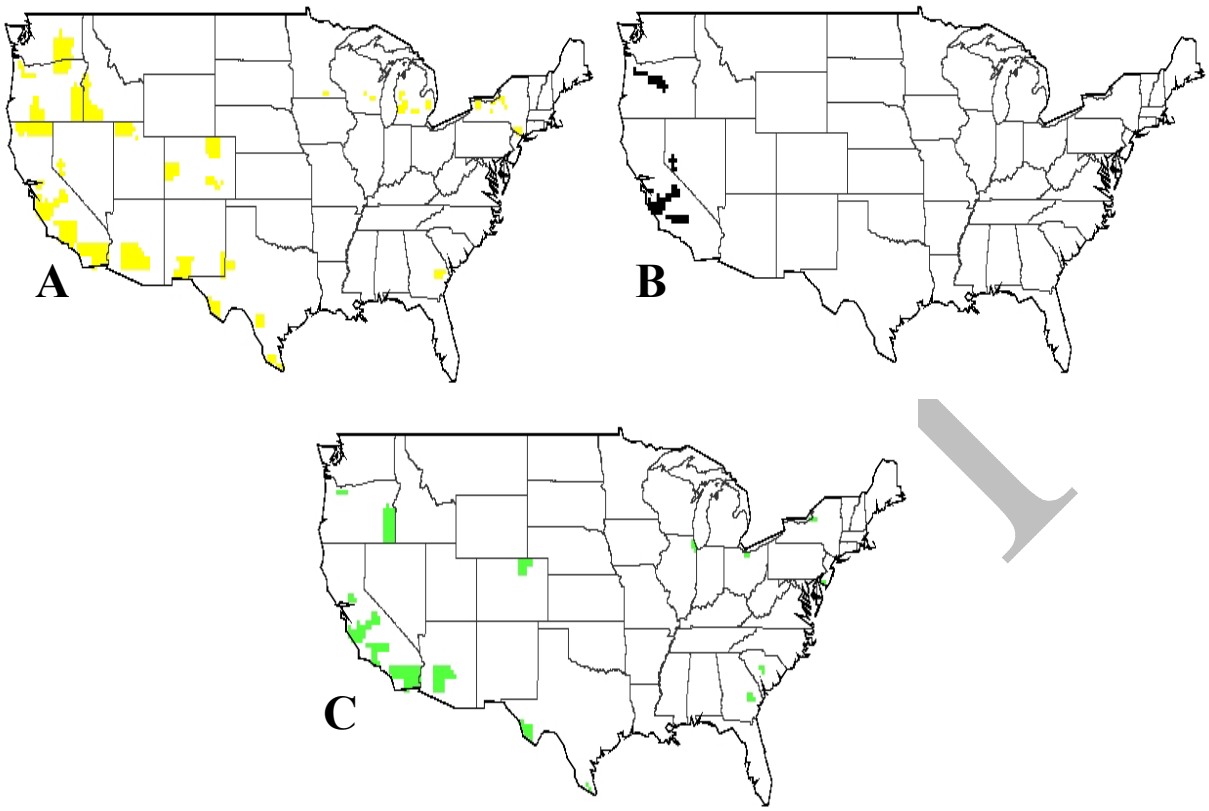

Figure 4. Counties in United States where greater than 100 acres of onion (A) garlic (B) or green onions (C) are grown (1997 Census of Agriculture).

Figure 5. Regions of crops depicted in Figure 4 and greater than 3 years out of 10 occurrence of overwintering generation *A. assectella* adult from June 1-7. Maps based on 30-years of climactic data.

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Section D:

References Cited:

Abo-Ghalia, A and E. Thibout. 1983. Termination of the reproductive diapause and resumption of reproductive activity in the leek moth *Acrolepiopsis assectella* (Lepidoptera). Agronomie 3(8), 717-722.

Åsman, K. 2001. Effect of temperature on development and activity periods of the leek moth *Acrolepiopsis assectella* (Zeller) (Lep., Acrolepiidae). J. Appl. Entomol. 125: 361-364.

Garland, J.A. 2002. Pest facts sheet – leek moth. Bulletin Entomological Society of Canada 34:3, 129-153.

Table 1. Biological parameters used for modeling phenology of *A. assectella*

	Stage	6 c DD in stage	34 First entry	second entry
Overwintering stage	Pupae	201	0	201
	Adult			
	POP	28	202	230
	Egg	120	231	351
	Larvae	324	352	676
	Pupae	201	677	878
	Adult			
1	POP	28	879	907
	Egg	120	908	1028
	Larvae	324	1029	1353
	Pupae	201	1354	1555
	Adult			
2	POP	28	1556	1584
	Egg	120	1585	1705
	Larvae	324	1706	2030
	Pupae	201	2031	2232
	Adult			
3	POP	28	2233	2261
	Egg	120	2262	2382
	Larvae	324	2383	2707
	Pupae	201	2708	2909
	Adult			
4	POP	28	2910	2938
	Egg	120	2939	3059
	Larvae	324	3060	3384
	Pupae	201	3385	3586
	Adult			
5	POP	28	3587	3615
	Egg	120	3616	3736
	Larvae	324	3737	4061
	Pupae	201	4062	4263
	Adult			
6	POP	28	4264	4292
	Egg	120	4293	4413
	Larvae	324	4414	4738
	Pupae	201	4739	4940
	Adult			
7	POP	28	4941	4969
	Egg	120	4970	5090
	Larvae	324	5091	5415
	Pupae	201	5416	5617
	Adult			
8	POP	28	5618	5646
	Egg	120	5647	5767
	Larvae	324	5768	6092