PEST ASSESSMENT: False Codling Moth, *Cryptophlebia leucotreta* (Meyrick), (Lepidoptera: Tortricidae)

USDA-APHIS-PPQ-CPHST-PERAL/ NCSU

Section A: Species Information

Scientific name: ***Cryptophlebia leucotreta***

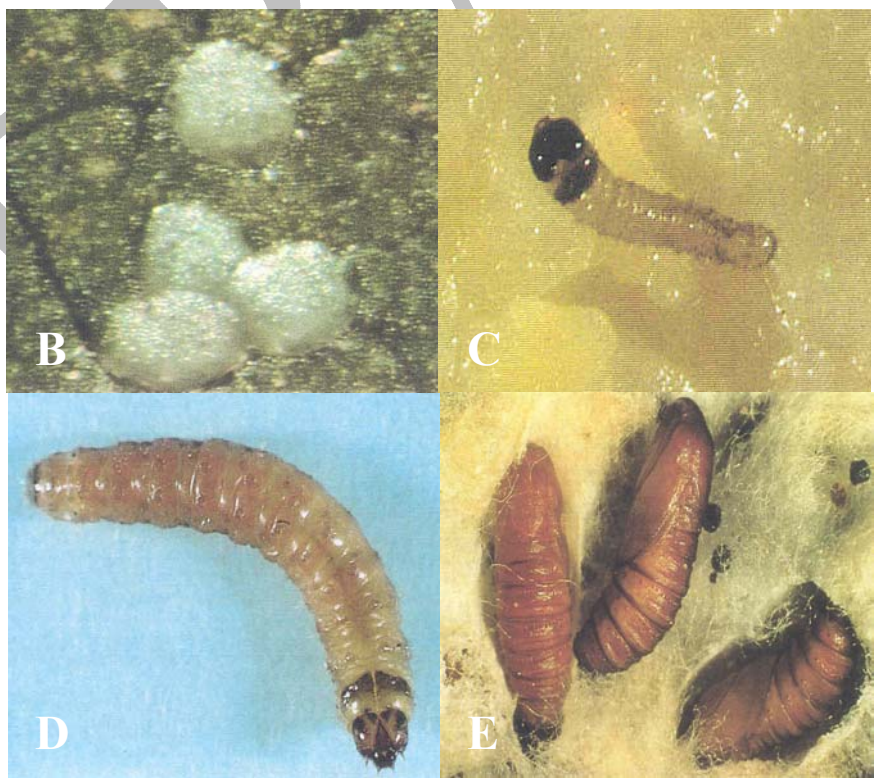
Order: Lepidoptera

Family: Tortricidae

Common Name: false codling moth

Source: Van Der Geest et al. 1991

Figure 1. False codling moth, C. *leucotreta,* adult, egg, first instar larvae, fifth instar larva and pupae (A-E). (Photos from Couilloud, 1988)



Description:

Eggs: flat oval shaped discs with a granulated surface and measurements varying from 0.77 mm in length by 0.60 mm in width up to 1 mm in diameter, the eggs are white to cream colored when initially laid, then changing to reddish color before the black head capsule of the larvae becomes visible under the chorion prior to eclosion (Daiber 1979).

Larvae: first instar (neonate) larvae approximately 1-1.2 mm in length with dark pinacula giving spotted appearance, fifth instar larvae are orangey-pink, becoming more pale on sides and yellow in ventral region, 12-18 mm long, with a brown head capsule and first thoracic segment. The last abdominal segment bears an anal comb with 2-7 spines. The mean head capsule width (mm) for the first through fifth instar larvae has been recorded as: 0.22, 0.37, 0.61, 0.94 and 1.37, respectively (Daiber 1979, Van Der Geest et al. 1991, Stofberg, 1948).

Pupae: prepupa and pupa form inside a lightly woven silk and soil cocoon formed by the fifth instar larvae on ground. Length is 8-10 mm sexual determination through morphological differences on pupal case is possible (Daiber 1979)

Adult: Adult body length 6-8 mm, wingspan of female and male moth is 17-20 and 15-18 (mm), respectively. Antennae are setiform with distinct segments. Forewing coloration of the moth is similar between the sexes with gray, black, brown and orange-brown markings (CABI, 2002, Couilloud, 1988).

Life History:

False codling moth, *C. leucotreta,* is an internal fruit feeding tortricid that does not undergo diapause and may be found throughout the year in warm climates on suitable host crops. *C. leucotreta* is a generalist with respect to host plant selection and has been recorded as feeding on over 50 different plant species. The generalist feeding strategy enables survival in marginal conditions as is necessary due to lack of diapause.

The adult moths emerge from cocoons located on the soil surface, mate and lay approximately 100-400 eggs at 15 and 25 C, respectively, with very few eggs (0.4 per female) laid at 10 C (Daiber, 1980). Female moths undergo a pre-oviposition period of egg maturation which averages 27 DD above 12 C. Peak oviposition occurs within three days after emergence and more than 50% of the eggs are laid in the first third of the reproductive period, which varies in length in an inverse relationship to temperature. Oviposition occurs at the highest rate in the early evening near sunset.

Eggs are laid singly on fruit or bolls of the crop and neonate larvae emerge, wander the area and make an entry wound. Larvae typically complete five instars of development within a fruit or boll then exit and drop to the soil to begin construction of a cocoon.

False codling moth is predominantly a warm climate pest and development is limited by cold temperatures. Exposure to temperatures below 10 C reduces survival or development of several life stages and eggs have been reported to be killed at temperatures below 1 C.

The most economically important plants in the United States that would be affected by the introduction of *C. leucotreta* are cotton, citrus, peaches, and maize.

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Prediction Model:

A generic insect degree day model was used to predict the potential of false codling 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 *C. leucotreta* with degree days accumulated above the lower developmental threshold of 12 C for all stages and individual stage degree day (DD) requirements as determined from values in Daiber (1979a, b, c, 1980). The high temperature threshold for false codling moth was set at 40 C. Although not incorporated at the present time in the insect degree day template model, it may be desirable to put a factor with regard to low or high temperatures that result in mortality (in the case of false codling moth 1 C). With no diapause period expressed by the false codling moth it is difficult to predict what stage may be the starting stage of the year, the pupal stage was selected as it is the longest developmental stage of *C. leucotreta* and would be most affected by cooler autumn and winter temperatures. 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.

Results.

The risk probability maps generated for *C. leucotreta* (Figure 2) 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). Cryptophlebia leucotreta is a warm climate insect which requires higher temperatures to develop and does not undergo diapause. Predictive models and crop phenology data may aid in scouting, but it is difficult to predict emergence of C. leucotreta due to lack of diapause and large host range.

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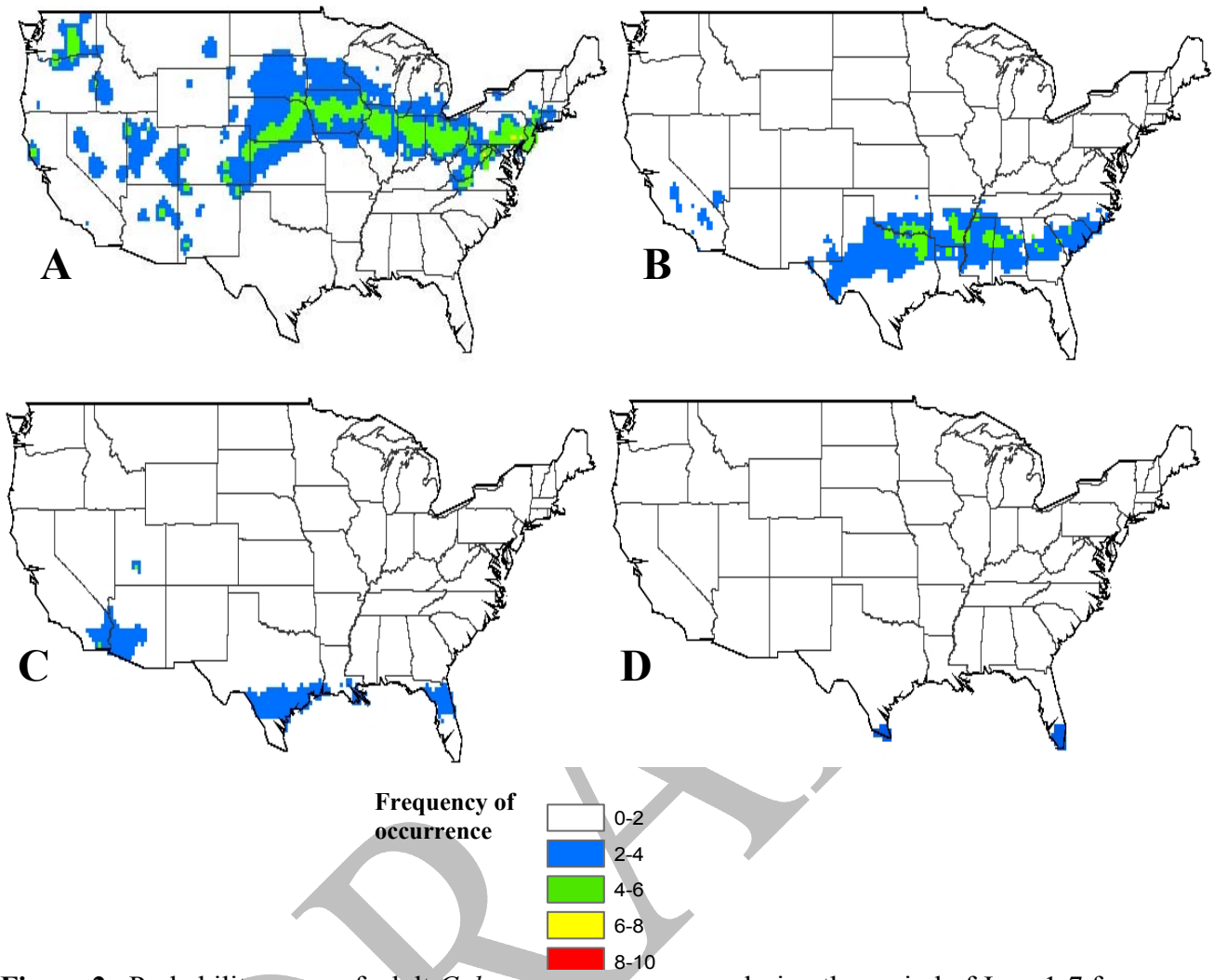

Figure 2. Probability maps of adult *C. leucotreta* emergence during the period of June 1-7 for overwintering, first, second and third generations (A-D), respectively, represented by frequency of occurrence out of 10 years. Maps based on 30-years of climactic data.

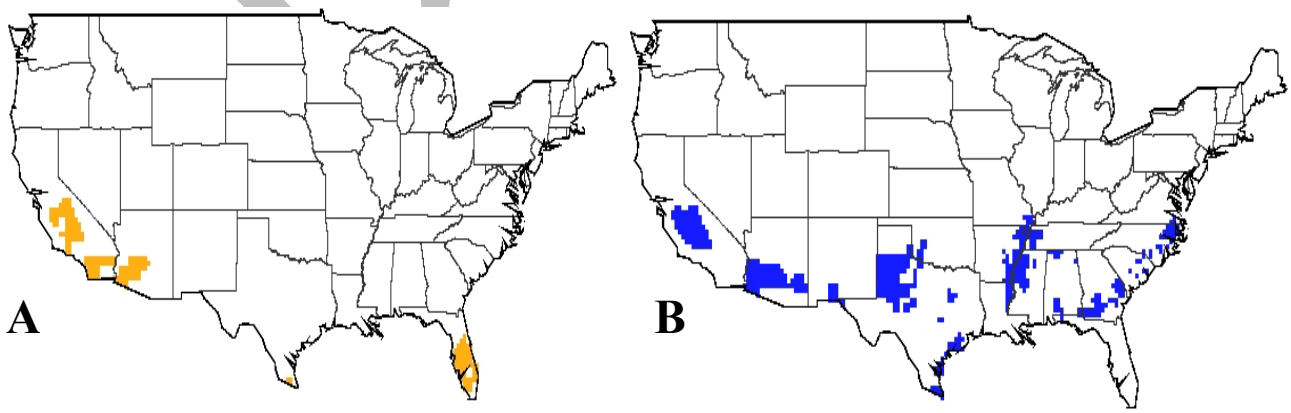

Figure 3. Counties in United States where > 10,000 acres of citrus (A) and > 20,000 acres of cotton are grown (B). (1997 Census of Agriculture)

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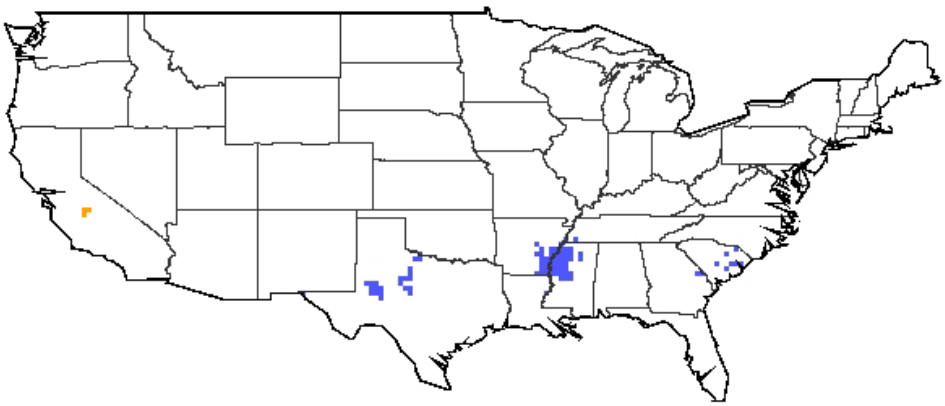

Figure 4. Regions where greater than (>) 10000 acres of citrus (orange color) or > 20000 acres of cotton (blue color) and > 3 years out of 10 occurrence of first generation *C. leucotreta* adult from June 1-7. Maps based on 30-years climactic data.

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Section D:

References Cited:

Couilloud, R. 1988. *Cryptophlebia (Argyoploce) leucotreta* (Meyrick). Lepidoptera, Tortricidae, Olethreutinae. Coton et Fibres Tropicales 43: 319-351.

Daiber, C. C. 1979. A study of the biology of the false codling moth [*Cryptophlebia leucotreta* (Meyr.)]: the egg. Phytophylactica 11, 129-132.

Daiber, C. C. 1979. A study of the biology of the false codling moth [*Cryptophlebia leucotreta* (Meyr.)]: the larva. Phytophylactica 11, 141-144.

Daiber, C. C. 1979. A study of the biology of the false codling moth [*Cryptophlebia leucotreta* (Meyr.)]: the cocoon. Phytophylactica 11, 151-157.

Daiber, C. C. 1980. A study of the biology of the false codling moth *Cryptophlebia leucotreta* (Meyr.): the adult and generations during the year. Phytophylactica 12: 187-193.

Stofberg, F.J. 1948. Larvae structure as a basis for certain indentification of false codling moth (*Argyroploce leucotreta,* Meyr.) larvae. Journal of the entomol. Soc. Of South Africa. XI, 68-75.

Van Der Geest, L.P.S., C. H. Wearing and J. S. Dugdale. 1991. Tortricids in miscellaneous crops. In World Crop Pests 5. Tortricid Pests: Their biology, natural enemies and control. L.P.S. van der Geest and H. H. Evenhuis [eds]. Elsevier. Pp 563-577.

Crop Protection Compendium .2002- Global Module, 4th Edition. © CAB International, Wallingford, UK.

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Table 1. Biological Parameters used for modeling the phenology of false codling moth (*C. leucotreta*)

False codling moth	Lower Threshold Stage	12 DD in stage	Upper Threshold First entry	40 second entry
Overwintering stage	Pup	180	0	180
	adult	28	181	209
1	oviposition	69	210	279
	Larvae	156	280	436
	Pup	180	437	617
	adult	28	618	646
2	oviposition	69	647	716
	Larvae	156	717	873
	Pup	180	874	1054
	adult	28	1055	1083
3	oviposition	69	1084	1153
	Larvae	156	1154	1310
	Pup	180	1311	1491
	adult	28	1492	1520
4	oviposition	69	1521	1590
	Larvae	156	1591	1747
	Pup	180	1748	1928
	adult	28	1929	1957
5	oviposition	69	1958	2027
	Larvae	156	2028	2184
	Pup	180	2185	2365
	adult	28	2366	2394
6	oviposition	69	2395	2464
	Larvae	156	2465	2621
	Pup	180	2622	2802
	adult	28	2803	2831
7	oviposition	69	2832	2901
	Larvae	156	2902	3058
	Pup	180	3059	3239
	adult	28	3240	3268
8	oviposition	69	3269	3338
	Larvae	156	3339	3495
	Pup	180	3496	3676
	adult	28	3677	3705
9	oviposition	69	3706	3775
		NO DIAPAUSE		

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