

EFFECT OF LIGHT ON THE PUPARIATION OF
LIRIOMYZA TRIFOLII (DIPTERA:AGROMYZIDAE)

G. L. LEIBEE

University of Florida, IFAS
Central Florida Research and Education Center
P. O. Box 909, Sanford, FL 32771

In preliminary tests, emergent third-instar larvae (larvae after exiting from the leafmine) of *Liriomyza trifolii* (Burgess) subjected to a period of darkness were observed to pupate before those maintained under continuous lighting. Oatman (1959) reported this behavior for a similar species, *L. pictella* (Thomson). The experiment described here documents this behavior for *L. trifolii*.

The mature *L. trifolii* third-instar larva exits the leafmine in the morning and drops to the ground to pupate (Leibee, 1984). This behavior facilitated the collection of mature third-instar larvae for use in this experiment. Infested carrot foliage was placed onto 0.64-cm (hole size) wire cloth over paraffin-coated cafeteria trays from 5 A.M. (the beginning of the photoperiod) to 9 A.M. to collect the larvae as they dropped from the foliage. The collection procedure was conducted in a fully lighted room maintained at 25°C. The cafeteria tray containing the larvae was removed from underneath the foliage at the end of the collection period. Twenty third-instar larvae were transferred with a camel's-hair brush to each of six plastic pill cups with caps. At 10 A.M., three of these cups were individually wrapped with two layers of aluminum foil to subject the larvae to complete darkness and placed along with the uncovered cups into a fully lighted growth chamber maintained at 25°C. Only the larval stage was present in the cups when placed into the growth chamber. The three uncovered cups were inspected at 15-min intervals for the presence of puparia. After one h (11 A.M.), the three covered cups were unwrapped and included in the inspections for pupariation. The cumulative number of larvae that had pupariated was recorded after each 15-min interval.

The results are presented in Table 1 as percent cumulative pupariation. The continuously lighted larvae pupariated at a relatively steady rate throughout the experiment once pupariation began. When the covered cups were unwrapped at the end of the 1-h dark period, it was found that significantly ($P < 0.01$) more of the larvae had pupariated (63.3% vs 20%) in these cups than in the cups that were left uncovered. After the dark period was over, only 1.7% more of the dark-treated larvae pupariated during the next 30 min as compared to 16.7% for the continuously lighted larvae. After this period of reduced pupariation in the dark-treated larvae, pupariation resumed and continued at a steady rate to completion. After 120 min there was no significant difference ($P > 0.1$) in percent cumulative pupariation between treatments. Pupariation was complete in both treatments after 225 min, indicating that pupariation could be delayed for only a limited amount of time regardless of lighting conditions. All the larvae subjected to darkness did not pupariate, indicating a difference in responsiveness to the absence of light. Since the larvae could have been from one to five hrs old at the beginning of the dark period, this difference in responsiveness might have been due to age with the younger larvae not having acquired the ability to pupariate during the dark period. The reduced amount of pupariation in the dark-treated larvae during the 30 minutes following the dark period was probably due to the large number of larvae pupariating earlier and leaving mostly larvae that were unable to pupariate.

In conclusion, this study shows that pupariation of the emergent larva of *L. trifolii* can be delayed for a limited time by continuous lighting. This behavior, in addition to

TABLE 1. EFFECT OF SUBJECTING NEWLY EMERGED THIRD-INSTAR LARVAE OF *LIRIOMYZA TRIFOLII* TO ONE HOUR OF DARKNESS ON THE PERCENT CUMULATIVE PUPARIATION IN THE LABORATORY.

Cumulative Time (min)	% Cumulative Pupariation ¹	
	Light ²	Dark/light ³
0	0.0	0.0
15	0.0	C O V
30	3.3	E R
45	6.7	E D
60	20.0	63.3***
75	28.3	65.0***
90	36.7	65.0**
105	43.3	70.0**
120	65.0	81.7*
135	73.3	85.0 NS

¹Treatment means compared for each time by ANOVA; *** = significant at 0.01; ** = significant at 0.05; and * = significant at 0.10; NS = not significant.

²Larvae maintained under continuous light.

³Larvae maintained in complete darkness for 1 h and then returned to continuous light.

the emergent larva being negatively phototactic (Leibee 1984), might contribute to the survival of *L. trifolii* by causing the larva to delay pupariation until it has made its way to sites of low light intensity where temperature and humidity conditions are more likely to be suitable for pupation. Knowledge of this behavior can be useful in designing experiments where the larval and pupal stages are involved and in developing rearing procedures for this species.

I thank Drs. John F. Darby and Arshad Ali for their comments on this manuscript. Fla. Agric. Exp. Stn. Journal Series No. 5850.

REFERENCES CITED

- LEIBEE, G. L. 1984. Influence of temperature on development of *Liriomyza trifolii* (Burgess) (Diptera: Agromyzidae) on celery. Environ. Ent. 13: 497-501.
- OATMAN, E. R. 1959. The melon leaf miner *Liriomyza pictella* (Thompson) (Diptera: Agromyzidae). II. Ecological studies. Ann. Ent. Soc. America 52: 83-89.