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# Development of the Green Cloverworm, *Plathypena scabra* (F.), on Alfalfa and Soybean (Lepidoptera: Noctuidae)[1]

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SCOTT, J.J., AND L.P. PEDIGO (Department of Entomology, Iowa State University, Ames, Iowa 50011). Development of the green cloverworm, *Plathypena scabra* (F.), on alfalfa and soybean (Lepidoptera: Noctuidae). Proc. Iowa Acad. Sci. 84(4): 144-145, 1977.

The development of the green cloverworm, *Plathypena scabra* (F.), was studied under controlled laboratory conditions. First-stage larvae were placed on each host plant, and maintained in an environmental chamber. Larvae were checked daily, and the stadia recorded. Upon adult emergence, the sex was recorded. Results showed that larvae reared on soybean completed egg to adult development in a significantly shorter time than larvae reared on alfalfa. There was no significant difference between the developmental rates of the males on either alfalfa or soybean. However, there was a significant difference in female development between these two hosts.

INDEX DESCRIPTORS: *Plathypena scabra*, green cloverworm, feeding, alfalfa, soybean.

The green cloverworm, *Plathypena scabra* (F.) is an occasional pest of Iowa soybean. Primarily defoliators, the larvae usually feed on the leaf tissue of soybean. In the laboratory, they have been observed feeding on soybean pods, flowers, cotyledons, and stems, but only under conditions of starvation (Pedigo *et al.*, 1973). The first 2 instars feed on the lower epidermis of the leaf, while later stages eat completely through the leaf.

The insect reportedly develops on 34 plant species (Pedigo *et al.*, 1973). In Iowa, the most common hosts are soybean, alfalfa, and clover. Most research has focused on feeding behavior on soybean and alfalfa because of the economic importance of these crops.

The egg to adult stadium has been recorded for alfalfa (Hill 1925, Smith and Franklin, 1961), clover (Coquillett 1881), and soybean (Stone and Pedigo, 1972). However, only Stone and Pedigo (1972) reared the larvae under laboratory conditions, where temperature and humidity could be closely regulated.

This study was initiated to determine possible differential effects of the primary Iowa hosts, alfalfa and soybean, on green cloverworm development. This information is necessary to understand the ecology of the species.

## METHODS AND MATERIALS

Green cloverworm eggs were obtained from field-collected females. The females were placed in 1-pt oviposition cages with a 2'' x 4'' roughened blotter paper strip (Pedigo, 1971) used as an ovipositional surface. The strips were placed in a growth chamber with the following environmental conditions: 16 hr photophase, 30°C temperature, and 75% RH. The humidity was maintained, by using NaCl, according to the method indicated by Winston and Bates (1960).

After eclosion, 1st-stage larvae were placed in separate 1-pt ice cream cartons. Each carton contained either a soybean trifoliate or an alfalfa sprig in a florist's pick (Aqua-pic®). The tops of the cartons were removed and covered with nylon mesh for ventilation. A completely randomized design was used, 4 trials of 2 treatments (host plants constituted treatments), with 20 replications in each treatment.

The larvae were examined at 24-hr intervals and the stages recorded. Larval-instars were determined by measuring head-capsule widths. Pupal weights were recorded and adult sex determined upon emergence.

## RESULTS AND DISCUSSION

The experiment consisted of 4 separate trials; however, the 4th trial was discarded because of unusually high larval mortality in the alfalfa treatment. The reason for the high mortality was unknown.

The mean stadia for green cloverworm stages is given in Table 1. A difference of 1.2 days was found in the total egg to adult stadium between larvae fed alfalfa and those fed soybean foliage. Development on soybean was significantly faster than on alfalfa ($F = 9.68$, $P < 0.05$). The larval stadium was 15.2 days on soybean and 15.8 days on alfalfa. There was no significant difference between the length of the larval stages ($F = 3.92$, $P > 0.05$).

A difference of 0.4 days was found in the pupal stadium between alfalfa and soybean. The pupal stadium on soybean was significantly shorter than that of alfalfa ($F = 11.97$, $P < 0.05$).

The larval stage on soybean was 3.8 days shorter than that of Stone and Pedigo (1972). The larval stage on alfalfa was 7.0 days shorter than that of Hill (1925) and 1.2 days shorter than that of Smith and Franklin (1961). The egg to adult stadium for soybean could not be compared with Stone and Pedigo (1972), because they did not record the egg stadium. The egg to adult stadium on alfalfa was 9.8 days shorter than that of Hill (1925) and 4.3 days shorter than that of Smith and Franklin (1961). The difference in the results obtained in this study and those from previous studies was probably caused by differences in larval rearing conditions. The larvae in this study were reared under controlled laboratory conditions. Hill (1925) reared the larvae under ''natural'' conditions in an outdoor insectary. Stone and Pedigo (1972) reared the larvae in the laboratory, but under varying temperature conditions. Smith and Franklin (1961) did not report rearing conditions.

The differences in the egg to adult stadium also were considered according to sex. The egg to adult stadium for males was 28.2 days on soybean and 29.1 days on alfalfa. The female egg to adult stadium was 27.4 days on soybean and 28.8 days on alfalfa. An analysis of variance showed no significant difference in the egg to adult stadium between males reared on alfalfa and those reared on soybean ($F = 2.81$, $P > 0.05$); females showed a significant difference. Females reared on soybean had a significantly shorter egg to adult stadium than females reared on alfalfa ($F = 6.74$, $P < 0.05$).

The mean pupal weight was 93.6 mg for those reared on alfalfa and 88.1 mg for those reared on soybean. An analysis of variance showed no significant difference between pupal weights on alfalfa and soybean ($F = 2.76$, $P > 0.05$). However, there was a difference in pupal weight according to sex. The mean pupal weight for males was 106.8 mg on alfalfa and 101.8 mg on soybean. The mean female pupal weight was 80.6 mg on alfalfa and 77.7 mg on soybean. Male pupae were signific-

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Table 1. *Green cloverworm development in days for each growth stage on different hosts.*

| Host | Egg stage | Larval Instars 1 | 2 | 3 | 4 | 5 | 6/6+7[a] | Larval stage | Pupal stage | Egg to adult |
|---|---|---|---|---|---|---|---|---|---|---|
| Soybean | 5 | 2.2 | 2.1 | 2.0 | 2.0 | 2.1 | 5.0 | 15.4 | 7.6 | 27.8 |
| Alfalfa | 5 | 2.4 | 2.2 | 2.0 | 2.1 | 2.2 | 5.0 | 15.9 | 8.0 | 29.0 |

[a]Includes some larvae that had 7 stadia.

antly heavier than female pupae for both alfalfa ($F = 15.62$, $P < 0.05$) and soybean ($F = 70.57$, $P < 0.05$). The difference in pupal weight between the sexes was expected because the adult male green cloverworm is noticeably larger than the female.

The lack of difference in pupal weight between insects fed alfalfa foliage and those fed soybean foliage would indicate that the nutritive content of alfalfa and soybean were similar for the green cloverworm. However, because there was a shorter developmental period for the insect on soybean, this host may contribute more to the insect's survival and reproductive potential.

The reason for faster development on soybean cannot be determined from this experiment. A possible explanation of this phenomenon is that the nutritive contents of the host may be similar (and therefore pupal weights the same), but the quantity of the nutrients may be different. The importance of nutrient quantity has been shown for the development of other moths, e.g. the black cutworm (Zaazou et al. 1973) and the pink bollworm (Vanderzat 1958). However, further research is necessary to determine whether it is the quantity of the nutrients in the host or some other factor that caused the difference in green cloverworm development.

## LITERATURE CITED

COQUILLETT, D. W. 1881. On the early stages of *Hypena scabra*. Can. Entomol. 13:137-8

HILL, C. C. 1925. Biological studies on the green cloverworm. U.S. Dep. Agric. Bull. 1336, 17 p.

PEDIGO, L. P. 1971. Ovipositional response of *Plathypena scabra* (Lepidoptera: Noctuidae) to selected surfaces. Ann. Entomol. Soc. Amer. 64:647-51.

PEDIGO, L. P., J. D. STONE, and G. L. LENTZ. 1973. Biological synopsis of the green cloverworm in central Iowa. J. Econ. Entomol. 66: 665-73.

SMITH, R. C., and W. W. FRANKLIN. 1961. Research notes on certain species of alfalfa insects at Manhattan (1904-1956) and at Fort Hays, Kansas (1948-1953). Kans. Agric. Exp. Stn. Prog. Rep. 54: 60-8.

STONE, J. D., and L. P. PEDIGO. 1972. Development and economic-injury level of the green cloverworm on soybean in Iowa. J. Econ. Entomol. 65: 197-201.

VANDERZANT, E. S. 1958. Amino acid requirements of pink bollworm. J. Econ. Entomol. 51:309-11.

WINSTON, P. W., and D. H. BATES. 1960. Saturated solutions for the control of humidity in biology research. Ecology 41:232-7.

ZAAZOU, M. H., H. S. M. FAHMY, A. A. M. KAMEL, and A. H. EL-HEMAESY. 1973. Effects of food on the development of the greasy cutworm, *Agrotis ipsilon* (Hubn.). Bull. Soc. Entomol. Egypte 57:279-86.