The Biology of *Heliothis armigera* (Hüb.) as Influenced by food and Temperature(*)

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The effect of several constant temperatures and hosts on the duration of developmental periods, growth, mortality, and reproduction of the corn earworm was studied. The experiments were conducted through eight generations. The stock used was reared on lettuce at 30° C.

The incubation period lasts up to 16,61 days at 13° C, and two days at 30, 32, and 35° C. By an increase in temperature from 18 to 20° C, this period decreases from 11.5 to 6 days. The incubation period is not the same for the eggs laid on each day of oviposition period.

Most of the larvae of the earlier generations had five instars, whereas in the later generations there were mostly six instars. Neither the temperature nor food used in this investigation was found to have an effect on this situation. The genetic make-up of the larvae may have a bearing on the problem.

The duration of the larval instars depends on the temperature and hosts as well as on the generation from which the larvae were obtained. The total feeding period of the larvae with six instars is longer than that of the larvae with five instars. It was also found to be longer in the later generations than in the earlier ones. The decline in the length of the feeding period is much more striking between 18 and 20° C than between any other two successive temperatures studied. This period was 47.25 days at 18° C and 25.40 days at 20° C in the first generation. However, it is steadily decreased as the temperature is increased up to 35° C. At this temperature it lasts from 9 to 17 days with an average of 11.00 to 14.67 days depending upon generation. The feeding period of the corn earworm was shortest when reared on corn. The next most favorable host was string bean, followed by lettuce and tomato. On the latter the

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for development is approximately 26.6° C.
feeding period averaged 17.40 days at 30° C as compared with 11.71 days on corn.

The duration of prepupal and pupal periods are independent of the larval food or generation and appear to be solely dependent upon temperature. The pupal period averages 25.0 days at 20° C and only 8.27 days at 35° C.

The total time necessary to complete development on corn from hatch to emergence of the adult was 30.80 days at 25.6° C and 23.29 days at 30° C. It is similar for beans, but extended by 4 to 6.5 day on tomato.

The larvae reached their greatest length on corn and their shortest length on tomato. In regards to temperature, maximum size was attained when they were reared at 25.6° C. The length of the larvae decreased as the temperature deviated up or down this point. In general the effect of temperatures on the length of the larvae did not become readily apparent until the fourth instar except at 18° C. where it was noticeable beginning with the second instar. The most marked change accurred during the last stage of the larvae having five instars while it was rather gradual with those having six instars.

The relation that existed between larval length, temperature, and host was also reflected in the pupae. Heaviest and longest pupae were obtained when the larvae were reared on corn at 26.6° C. Corn was followed by beans, lettuce and tomato. Between pupation and emergence there is a loss in pupal weight, and this loss was found to be greatest at 25° C and when the larvae were reared on corn.

Larvae that completed their development at 15° C from hatch or from the second instar on produced hibernating pupae Hibernation of pupae was not induced when larvae were supjected to a temperature of 15° C for one or two weeks during the later instars.

In the laboratory reared material used in this investigation the mortality increased with the number of generation and as temperature decreased. The mortality was less on corn than any of the other hosts.

The preoviposition period of the moths reared on tomato was longer than on any other hosts while there was found to be no differential effects of larval hosts on the length of oviposition period. A moth reared on corn deposited eggs for 19 days. The difference between the longevities of both sexes was not significant. The number of eggs laid varied from individual to individual. However, more eggs were laid by the moths reared on corn, followed by those reared on lettuce. Tomato proved to be least favorable for egg deposition. The largest moths were obtainad at 26.6° C and on corn. Although the males have longer body than the females the difference is not always significant.

Based upon this information it can be concluded that corn is the preferred host of the corn earworm and that the optimum temperature