

## Effects of Low Temperatures on the Eggs of the Angoumois Grain Moth,<sup>1</sup> the Indian-Meal Moth,<sup>2</sup> and the Confused Flour Beetle<sup>3,4</sup>

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The tests reported in this paper were conducted to determine the effects of low temperatures on the eggs of the Angoumois

<sup>1</sup> *Sitotroga cerealella* (Oliv.)

<sup>2</sup> *Plodia interpunctella* (Hbn.)

<sup>3</sup> *Tribolium confusum* Duv.

<sup>4</sup> This report is a part of a thesis presented to the Graduate School of Kansas State University in partial fulfillment of the requirement for the Master of Science Degree. Accepted for publication June 13, 1960.

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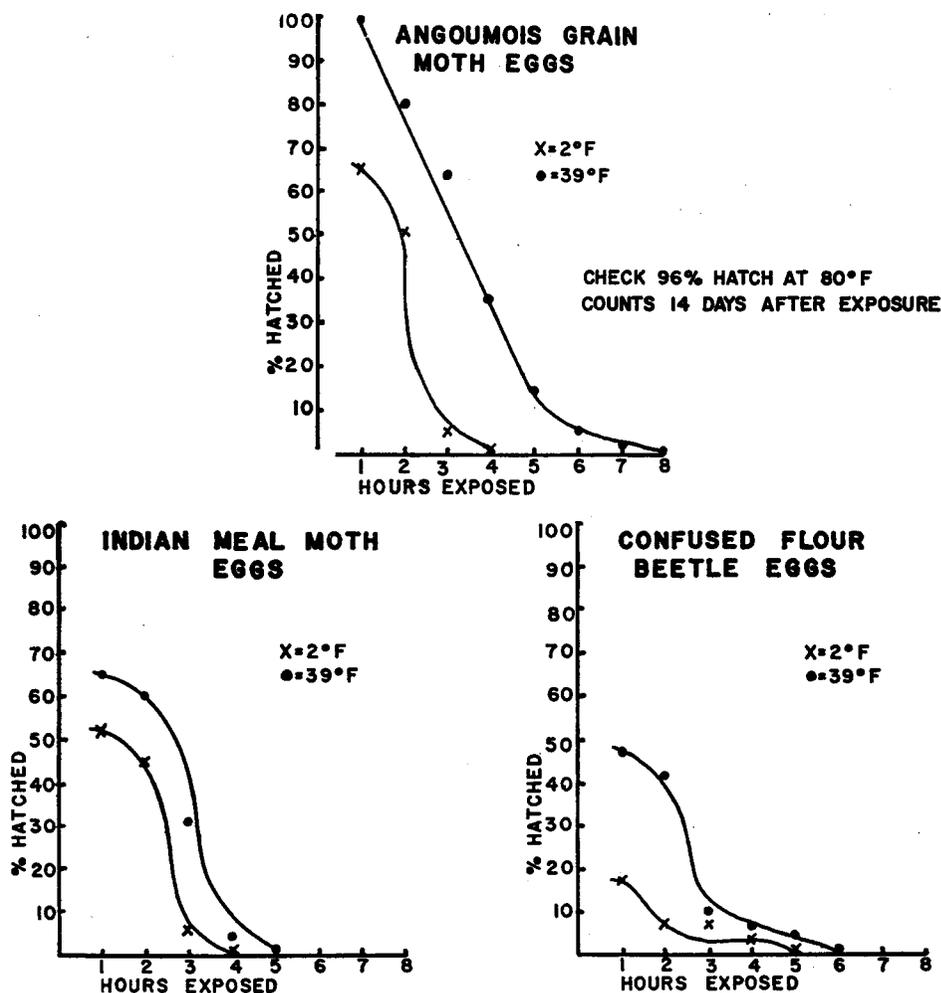


Fig. 1.—Percentages of Angoumois grain moth, Indian-meal moth, and confused flour beetle eggs hatching after exposure for different lengths of time to temperatures of 2° F. and 39° F.

grain moth, the Indian-meal moth, and the confused flour beetle. A 12-cubic foot deep freeze and a 6-cubic foot refrigerator were used in this experiment to provide temperatures of 2° F. and 39° F.

Angoumois grain moth eggs were subjected to both temperatures for periods of from 1 to 8 hours, and incubated for 14 days. The number of hatched eggs was then recorded and the percentages computed.

No eggs were observed to hatch after an exposure of 4 hours at 2° F., whereas a 1-hour exposure at that temperature resulted in a 65% hatch; at 39°, an 8-hour exposure inhibited all hatching, whereas a 1-hour exposure at this temperature yielded a 100% hatch (fig. 1). Ninety-six per cent of the control eggs hatched. From these data, it was determined that the  $LE_{50}$  (lethal exposure to effect a 50% hatch) is 2 hours at 2° F. and 3.3 hours at 39° (fig. 1).

Comparable studies were made on Indian-meal moth eggs. The eggs were exposed from 1 to 5 hours at 2° F. and 39° F. After a 4-hour exposure at 2°, no hatching was observed; a 1-hour exposure at that temperature resulted in a 52% hatch; at 39°, a 5-hour exposure totally inhibited hatching but a 1-hour exposure yielded a 65% hatch (fig. 1). Thus, the  $LE_{50}$  at 2° is 1.6 hours and at 39° is 2.5 hours. Ninety-six per cent of the untreated eggs hatched.

Confused flour beetle eggs were studied in a similar manner. These eggs were exposed 1 to 6 hours at 2° F. and 39° F. At 2° an exposure of 5 hours inhibited hatching of all eggs but a 1-hour exposure resulted in a 17% hatch; at 39° a 6-hour exposure totally inhibited all hatching whereas a 1-hour exposure yielded a 47% hatch (fig. 1). Thus, the  $LE_{50}$  at 2° is much less than 1 hour and at 39° it is 0.9 of an hour. Ninety-six per cent of the control eggs hatched.

Reprinted from the  
JOURNAL OF ECONOMIC ENTOMOLOGY  
Vol. 53, No. 5, October, 1960  
pp. 973-974