THE EFFECT OF COOL TEMPERATURES ON SOME STAGES OF THE CIGARETTE BEETLE

S. E. CRUMB and F. S. CHAMBERLIN
U. S. Department of Agriculture
Bureau of Entomology

The use of cool chambers for the storage of surplus stocks of cigars has made it important to determine the effect of these moderately cool temperatures on the cigarette beetle (*Lasioderma serricorne* Fab.). The temperatures employed range from 50° to 65° Fahrenheit. Pook[1], Jones[2] and Runner[3] have shown that with exposure to temperatures below 32° F. for a sufficient period all stages of the beetle can be killed, but the only recorded experiments with temperatures such as are in use for cigars in the storage chamber are those of Jones[2], who carried out a short series of tests on each of the stages of the cigarette beetle at temperatures ranging from 46° to 57° F.

In these experiments by Jones it was found that some of the eggs hatched after an exposure of 20 days, but that none of the small and half-grown larvae lived more than 30 days. The large larvae, pupae, and adults, however, were found to be very much more resistant. Large larvae lived for as much as 157 days, the pupae transformed to adults, and the adults lived for 111 days.

Jones did not establish an exposure which would destroy the viability of all eggs, and, since stages of the beetle other than the egg and the small larvae are very rarely found in fresh cigars, the writers carried out a series of experiments at Tampa, Fla., and Clarksville, Tenn., during 1927 and 1928 in an effort to establish the proper periods of exposure for eggs and small larvae at several temperatures. A few experiments also have been carried out with large larvae and pupae.

These experiments were conducted under conditions of commercial storage and the temperatures and humidities used were those actually occurring in commercial practice. Humidity ranges in the storage rooms were such that it is unlikely that any of the mortality indicated is the result of excessive dryness. Under the conditions existing at the beginning of the experiments, it was not possible to obtain accurate counts of the insects involved without disturbing their positions and crushing the

[1] Pook, Gustav. 1910. Die Anwendung von Kalte zur Verwichtung des Tabakwurms. Chemiker-Zeitung, Jahrg. 34, No. 126, p. 1127.

[2] Jones, C. R. 1913. The Cigarette Beetle (*Lasioderma serricorne* Fabr.) in the Philippine Islands, Philline Jr. Sci., Ser. D, vol. 8, No. 1, pp. 1-39, illus.

[3] Runner, G. A. 1919. The Tobacco Beetle: An Important Pest in Tobacco Products. U. S. Dept. Agr. Bul. 737, p. 77, illus.

eggs or young larvae. The cigars must be entirely free of all living stages of the beetle, as the whole box may be returned to the manufacturer upon detection of a single sign of infestation. Thus detailed counts of the extent of the infestation after treatment are not particularly important, as the presence of any living stages, however few, in the treated cigars, invalidates the treatment.

In these experiments an exact duplicate of the treated material was reserved as a check, unless otherwise noted, and both lots of material were kept under the same conditions both before and after exposure. Where cigars were used, these were fresh and were packed in a box with sufficient paper to prevent them from rolling about. The boxes were sealed with adhesive tape or with strips of paper. Usually 100 specimens were exposed in each experiment.

The various "stations" referred to in the table were of the character indicated below.

Station No. 1 was the humidor of a cigar factory. The daily temperature fluctuated mainly between 50° and 60° F., with brief periods of higher and lower temperatures, and there were a few isolated days during which the temperature was maintained between 60° and 70° F. The relative humidity usually ranged between 45 and 50 per cent.

Station No. 2 was a cave. The material was placed well back where the temperature was constant at 56° F. The relative humidity was high.

Station No. 3 was the humidor of a cigar factory. The temperature was maintained at about 65° F., varying two or three degrees above or below this temperature. The relative humidity was taken only a few times and ran about 95 per cent.

The details of the various "conditions" referred to in table 1 are as follows:

"Vials." Eggs of the cigarette beetle were placed on a slightly moistened strip of tobacco which was then inserted in a vial having a cover of cheesecloth over the mouth. This vial was inserted in a second vial containing moist tobacco and the screw cap of the outer vial was screwed down tightly.

"Capsules." A hole was made in the bottom of a gelatin capsule and a compact wad of pliable tobacco was forced into the capsule, closing the hole, after which larvae, or eggs on a strip of tobacco, were introduced. The capsules were then given to a cigar maker, who rolled one or two capsules into each cigar. This arrangement allowed the larvae to escape into the cigar after the tobacco in the capsule had been consumed.

TABLE 1.—EXPERIMENTS IN THE TREATMENT OF STAGES OF THE CIGARETTE BEETLE BY PROLONGED EXPOSURE TO COOL TEMPERATURES, TAMPA, FLA., 1927-28.

Stages Treated	Condition	Sta. No.	Temp. °F.	Exposure Days	Results	
					Treated	Check
Eggs	Capsules	1	50-60	8	Hatched after removal.	Eggs hatched.
do	do	1	50-60	15	Some hatched after removal.	do
do	Cigars	1	50-60	21	A few hatched after removal.	Cigars very wormy.
do	Vials	1	50-60	23	1 out of 60 hatched after removal.	No check.
do	Leaf	1	50-60	28	Hatched, possibly before entered. No larvae in cigars.	A few larvae.
do	do	1	50-60	30	Few hatched, one live larva.	do
do	Cigars	1	50-60	31	1 out of 100 hatched after removal.	Cigars very wormy.
do	Capsules	1	50-60	35	None hatched.	Eggs hatched.
do	Vials	1	50-60	40	do	do
do	Leaf	1	50-60	47	do	A few larvae.
do	Cigars	1	50-60	53	do	All cigars punctured.
do	Vials	2	56	16	Hatched after removal.	Eggs hatched.
do	do	2	56	24	6 out of 100 hatched.	do
do	do	2	56	33	None hatched.	do
do	do	2	56	41	do	do
do	do	2	56	47	do	do
do	Capsules	3	65	12	Hatched before removal.	No check.
do	do	3	65	18	do	do
do	do	3	65	28	do	do
do	Cigars	3	65	29	Hatched, two live larvae in cigars.	Nearly all cigars punctured.
do	Leaf	3	65	32	Hatched, larvae dead.	No check.
do	Capsules	3	65	42	Hatched, 2 larvae alive.	do
do	Leaf	3	65	47	Hatched, larvae dead.	A few larvae in cigars.
Newly Hatched Larvae	Slit cigars	1	50-60	21	None alive.	Only a few alive.
do	do	1	50-60	31	do	do
do	do	1	50-60	32	do	do
do	do	1	50-60	42	do	do
Large Larvae, Pupae	Capsules	1	50-60	22	Nearly all alive.	Alive.
do	do	1	50-60	45	Many alive, one punctured cigar.	Nearly all cigars punctured.
do	do	3	65	12	Nearly all alive.	No check.
do	do	3	65	42	About 16 per cent survived.	do
do	do	3	65	53	Cigars punctured, live adults and larvae.	do
do	do	3	65	59	Cigars punctured, live adults and larvae.	do

"Leaf." Beetles were allowed to oviposit on leaf tobacco and this was placed among cigars in a sealed box.

"Cigars." Fresh cigars were packed, open end up, in quart jars containing a large number of beetles. The cigars were removed and entered in experiments after they had become heavily infested with eggs.

"Slit Cigars." A slit was cut in fresh cigars and into this slit eggs of the tobacco beetle were inserted, 10 or more to each cigar, after which the cigars were kept under favorable conditions until the eggs were hatched.

The results of these experiments are indicated in table 1.

We draw the following conclusions from the results of these experiments:

At a temperature of from 50° to 60° F. eggs do not hatch and they are nonviable upon removal to normal temperature after an exposure of 35 days; a limited number of experiments with just-hatched larvae indicate that these larvae do not survive an exposure of 21 days; large larvae survive for at least 45 days and sometimes puncture cigars at this temperature.

At 56° F. eggs do not hatch, and they are nonviable upon removal to normal temperatures after an exposure of 33 days.

At a temperature of 65° F. development of all stages of the beetle continues at a reduced rate; eggs hatch, larvae pupate, adults emerge, and adults and the surviving larvae puncture the cigars. The newly-hatched larvae seem to be very susceptible to reduced temperature and very few small larvae survive after the eggs and resulting larvae have been exposed for a period of 32 days at this temperature.

Since stages other than the eggs and very small larvae occur very rarely in fresh cigars, it seems that storage of fresh cigars at a temperature of 55° F. for a period of 35 days should provide a satisfactory control of the tobacco beetle if sufficient care is taken to prevent reinfestation after the cigars are removed from storage.