

until the advent of DDT, when psylla was included in the list of test insects for that compound. Experiments in Kaleden in 1945 indicated fairly clearly that in stove oil solution DDT, per unit weight of toxicant, is less effective against pear psylla than nicotine sulphate applied with summer oil and soap.

In order to utilize the Ontario recommendation of dormant oil, investigations on the effects of various petroleum fractions on orchard trees were begun in 1942. Since the time when dormant oil first became generally used in British Columbia, it had been felt that light oil of 100-110 S.S.U. viscosity at 100° F. was less likely to cause tree injury than a heavier oil of, for example, 200-220 S.S.U. viscosity as used in Ontario against pear psylla. There appears to have been little experimental evidence to support such a view. On the contrary, four years' experiments have indicated that under British Columbia conditions the heavy "psylla" oil is less likely to cause injury to pear or apple trees than its lighter counterpart.

WHAT OF THE FUTURE?—There is every indication the pear psylla is in British Columbia to stay. It is very unlikely

that high temperature with low humidity will prove sufficient to eradicate it, since in many irrigated orchards there are pot-holes or close plantings with poor air drainage and consequently fairly high humidity. Furthermore, it is improbable that growers will take special steps to control it unless so forced by its activities. That would not be efficient orcharding; nor would it be human nature. Rather, from the standpoint of difficulty of control, the pear psylla in all likelihood will be classed with the aphids and treated accordingly. Should the insect flourish in this Province, adequate commercial control may be attained by addition of derris concentrate, for example, to one or two codling moth sprays. This would require a total outlay of five to ten dollars per acre of pear trees but no extra labour. If control of scale insects becomes necessary, simultaneous control of psylla can be effected by applying a heavy dormant oil scale spray somewhat earlier than usual. In that case there would be neither extra outlay nor extra labour. The pear psylla is certainly an unwelcome immigrant, but British Columbia fruit growers will doubtless learn to live with it at no great financial loss or inconvenience.

## FEEDING PERIODS PREREQUISITE TO THE MATING OF *DERMACENTOR ANDERSONI* (Acarina)<sup>1</sup>

J. D. GREGSON

Livestock Insect Laboratory, Kamloops, B.C.

In a previous paper (Gregson<sup>2</sup>) the author mentioned that the feeding rates of female *D. andersoni* Stiles were substantially increased by the presence of male ticks. The experiments described in the present article were planned to demonstrate whether or not copulation is necessary to promote this stimulated feeding, and, since this species of tick only mates while feed-

ing, to determine if any initial engorging period is necessary before this act will take place.

### EXPERIMENT A

On April 4, 1945, five capsules, each containing about half a dozen male and female *D. andersoni* were attached to a sheep in the manner described by the author<sup>3</sup>. The males were moved successively from these capsules as indicated in the following table. Another capsule containing females only, served as the control.

<sup>1</sup> Contribution No. 2409, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

<sup>2</sup> Gregson, J. D., 1944. The influence of fertility on the feeding rate of the female of the wood tick, *Dermacentor andersoni* Stiles. Ent. Soc. Ont., 74th Ann. Rept. (1943). 74:46-47; figs. 1-4.

<sup>3</sup> Gregson, J. D., 1942. Notes on the laboratory rearing of some Canadian ticks (Acarina). Ent. Soc. Brit. Columbia, Proc. 39:32-35.

**TABLE I**  
**Experiment A.—Dates of removal of male ticks from each capsule. Host infested with both sexes of ticks on April 24, 1945.**

Cap. No.	Apr. 25	Apr. 26	Apr. 27	Apr. 28	Apr. 29
1	x				
2		x			
3			x		
4				x	
5					x
6	Control. Females only.				

On May 1, at the end of seven days' feeding, the surviving females were removed, weighed and photographed. They were then set aside in oviposition tubes until October 1, when the fertility of the eggs produced was checked.

**DISCUSSION.** The only females which fed rapidly were those with which males had been left until the sixth day. These were also the only ones to lay fertile eggs. This appears to demonstrate that one or both sexes must feed for at least six days before copulation and subsequent acceleration in feeding can take place.

### EXPERIMENT B

This experiment was performed simultaneously with the preceding one. Six capsules as before, but containing only females, were attached to a sheep. Males were added to five of the capsules of females at such intervals that the males of each successive group would be deprived of an additional day's feeding by the time the females were removed. In this way it was hoped that it could be shown whether male ticks require a feeding period prior to copulation.

On the eighth day only the females accompanied by males that had had the opportunity to engorge for a six day period were fully engorged.

Fertile eggs were subsequently laid by all these females, but by only two of the five females accompanied by males that had fed for five days. All the remaining females fed slowly and laid eggs which later proved to be sterile.

**TABLE II**  
**Experiment A.—State of female ticks from capsules 1 to 6 on May 1. (See Table I.)**

Capsule No.	Average weight in grams of females in each group	Fertility of egg masses October 1, 1945
1.	0.209	All sterile
2.	.145	All sterile
3.	.238	All sterile
4.	.227	All sterile
5.	.667	All fertile
6.	.198	All sterile 1

1 Control. No males present.

**TABLE III**

**Experiment B.—Dates on which male ticks were added to each capsule. Host infested with females only on April 24, 1945.**

Cap. No.	Apr. 25	Apr. 26	Apr. 27	Apr. 28	Apr. 29
1.	x				
2		x			
3			x		
4				x	
5					x
6	Control. Females only.				

**DISCUSSION.** The experiment appears to demonstrate that the males must feed for at least five days before they will mate with feeding females.

**EXPERIMENT C**

The preliminary feeding period necessary for male sexual activity having been noted, it remained to be shown if a similar period was necessary before the female became in a receptive condition.

On May 7 a series of males was allowed

to feed on a sheep. By May 14 it was assumed that all had fed sufficiently to mate, and at this date they were added to equal numbers of unfed females which were distributed under four capsules on a sheep. The males were then removed at daily intervals from each successive group. The fifth capsule contained females only as a control.

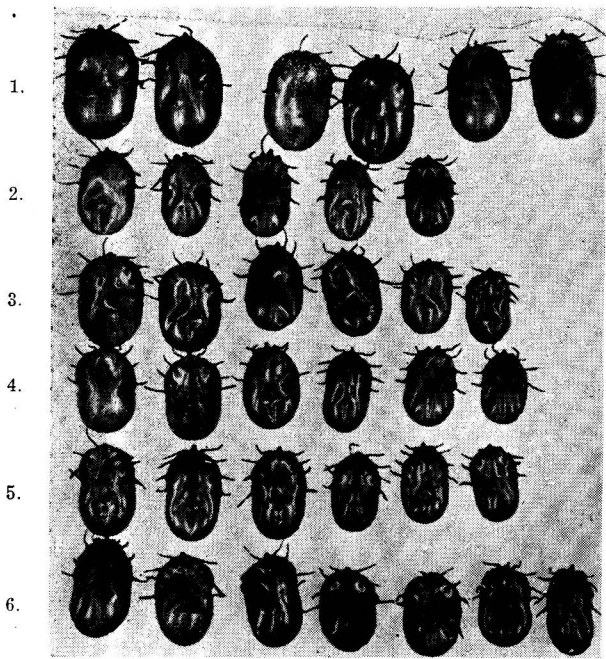
By May 19 some of the females were already engorged and dropping. Thus two days less were required than for the shortest feeding period during the preceding month. To illustrate the maximum contrast in feeding, the entire series was removed at this date, the fifth day after infestation.

**DISCUSSION.** — The experiment illustrated clearly that engorgement in five days is possible if females are mated with pre-fed males. In this experiment, all females

**TABLE IV**

**Experiment B.—State of female ticks from capsules 1 to 6 on May 1. (See Table III.)**

Capsule No.	Average weight in grams of females in each group	Fertility of egg masses, October 1, 1945
-------------	--	--



1.	0.559	All fertile
2.	.196	2 fertile 3 sterile
3.	.264	All sterile
4.	.237	All sterile
5.	.200	All sterile
6.	.255	All sterile <sup>1</sup>

<sup>1</sup> Control. No males present.

**TABLE V**  
**Experiment C.—Dates of addition and removal of male ticks from each capsule. Host infested with females on May 14, 1945.**

Cap. No.	May 14	May 15	May 16	May 17	May 19
1	x 1				1 detached
2		x 1			2 detached
3		x 1			4 detached
4				x 1	2 detached
5	Control.	Females only.			0 detached

1 All males pre-fed.

fed rapidly with the exception of those of the control, where there were no males, and group one, in which the males were removed within a day of being placed with the females. In this group only one of the five females fed rapidly. As with the other experiments, the eggs of all the rapidly feeding ticks were fertile.

On May 20, an additional experiment was carried out to support this supposition that a brief feeding period is necessary before the female tick will mate. Two pre-fed males of the above stock were placed

with two unfed females for three days, after which time the females only were placed on a sheep. At the end of five days they had become only half engorged, and so presumably had not mated prior to feeding. These results, and the fact that only one of the five ticks of group 1 of Experiment C engorged rapidly, suggests that one day is the minimum feeding period needed to produce sexual maturity in the female tick. The longer feeding period necessary in the case of the male appears to be taken care of in nature by the earlier activity and appearance of the male at the commencement of the tick season.

**SUMMARY.**—Experiments involving the feeding of *Dermacentor andersoni* ticks on sheep were designed to illustrate that a preliminary feeding period for both sexes is necessary before this species of tick will mate. It is shown that males require a minimum feeding period of five days, and females, one day.

**TABLE VI**  
**Experiment C.—State of female ticks from capsules 1 to 5 on May 19. (See Table V.)**

Capsule No.	Average weight in grams of females in each group	Fertility of egg masses, October 1, 1945
1.	0.179	1 fertile 4 sterile
2.	.446	All fertile
3.	.471	All fertile
4.	.427	All fertile
5.	.72	All sterile 1

1 Control. No males present.