NOTES ON SOME PHENOMENAL FEEDING OF TICKS

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The following are notes on a series of experiments that have been conducted along such lines tending to contribute towards a better knowledge of tick feeding, its varying rates and its relation to disease. They are mentioned at this date as subjects of general interest, and to save confusion have been grouped according to the various procedures that have been followed. Their relationship and bearing to each other is withheld until such time as conclusions may be drawn from the combined results of these and other observations.

Infesting Experiments

1) The relation of the rate of tick feeding to tick paralysis was mentioned in the writer's last report to this society (1). To the instances of varying rates of engorgement then given, may be added another striking example.

A series of ticks (**Dermacentor andersoni**) obtained from Rayleigh, B. C. on April 30, 1936 were placed on a sheep on August 9. At the end of 9 days, 18 live female ticks were recovered. Of these, 3 had engorged and dropped, 1 was three-quarters engorged, the remaining 14 were still flat, even though they had been attached throughout the entire period. It is assumed that in spring, **all** would have engorged under a maximum of 7 or 8 days. Last year's studies (1) suggested that the cause of this abnormal feeding lay primarily in the ticks. Histological studies of such ticks, after feeding tests, have as yet revealed no unusual structural differences, beyond advanced and retarded assimilative processes. Comparisons of the flat, slow- and fast-engorging ticks, is unfortunately impossible, since at that stage their feeding potentialities are not known.

2) On January 18, 1937, a series of **D. andersoni** female ticks that had been collected during the previous spring and had since been kept under a natural climate were subjected to the following conditions for a week:

(a) Kept at 70° F., humidity 100%, and irradiated with a mercury arc lamp for 10 minutes each day, (distance from lamp: 12 inches).

(b) Kept at 70° F., humidity 100%.

(c) Fluctuated at 12-hour intervals from 0° F. to 70° F., saturated humidity.

(d) Kept at 0° F., humidity 100%.

These ticks were then infested in four groups on a sheep kept at room temperature. At the end of 5 days the groups were removed and the excreta of each set collected from each cage.

The effect of the various treatments was illustrated exceptionally well by the clearly-defined differences of size and colour shades of the ticks of each group (see accompanying photograph), and by the graph of weights of ticks and excreta representing the proportions of blood extracted by each of the four groups of ticks. The corresponding average length of the ticks and the average weight of ticks and excreta of each of the above mentioned groups were 9.5, 8.5, 8.0 and 6.5 mm., and .14, .11, .10 and .01 grams. The irradiated ticks fed nearly twice as fast as those that had been kept at zero temperature.

Artificial Feeding Experiments

Owing to the impracticability of keeping a nutrient medium sterile, all experiments involving the artificial feeding of ticks are necessarily limited to a maximum of 30 hours duration at room temperature.

Since signs of engorgement do not become apparent, externally, until some 20 hours after attachment, internal changes are observed to determine whether assimilation of blood has commenced. A slight engorgement of less than 6 hours is accompanied by the diminishing of certain intracellular purple particles within the gut, together with the appearance of numerous fuchsin-staining cytoplasmic globules.

3) Five ticks were individually invited to feed by a process described by Vainshtein for forced feeding of mosquitoes (2). The tick was placed in a glass tube, tapered at the head end and plugged with cotton wool to prevent the animal from backing out. The capillary stem of a small funnel was inserted through the tapered end and placed over the hypostome of the tick, the palps being pushed back as during normal feeding. Haemolysed defibrinated sheep's blood was placed in the capillary funnel and the tick kept at room temperature for 30 hours.

Of the 5 ticks so treated, 1 was found, by sectioning, to have taken in blood and had commenced to engorge.

4) Four pairs of female **D. andersoni** ticks were taken from laboratory stock on January 17, 1937 and placed on mouse skins stretched over the ends of vials containing defibrinated haemolysed sheep's blood. After 30 hours, half of these ticks had attached. Microscopic examination showed that only one had commenced to engorge.

Totze (3), in his account on the artificial feeding of ticks **(Ixodes ricinus)**, states that he could induce the nymphs and adults to feed by such means only after removal of the tips of the first pair of legs, in which the olfactory organ is situated.

In Vivo Experiments

5) A dozen female **D. andersoni** ticks were encised around the posterior margin of the integument and placed in mediums of de-

fibrinated haemolysed sheep or guinea pig blood. Examined after intervals of 6 to 18 hours, several of these ticks showed indications of engorgement. Assimilation was, however, noted only in instances where the gut had been ruptured, permitting the access of blood. In instances where the gut had not been cut, or in other experiments where attempts to inject blood into the gut proved unsuccessful, it was found that the surrounding fluid had failed to bring about assimilative changes.

In Vitro Experiments

6) Several attempts have been made to culture fragments of living tick gut in a medium of sterile defibrinated haemolysed blood. In no cases, where the gut has been removed from the tick, has the writer been able to obtain the characteristic assimilative changes.

Acknowledgement

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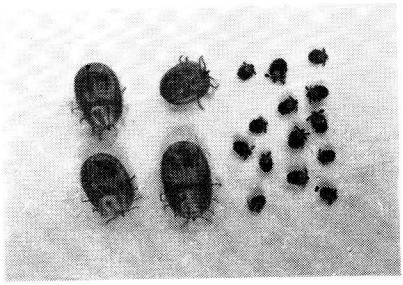
References

(1). Gregson, J. D.; Studies on the Rate of Tick Feeding in Relation to Disease; Proc. B. C. Ent. Soc., 1936.

(2). Vainshtein, N. B.; On the Technique of Forced Feeding of Mosquitoes; Rev. Applied Ent., Series B, Vol. 24, Part 11, November 1936.

(3). Totze, R.; Contribution to the Physiology of the Senses of Ticks; Rev. Applied Ent., Series B, Vol. 21, Part 8, August 1933.

(February 5th, 1937)



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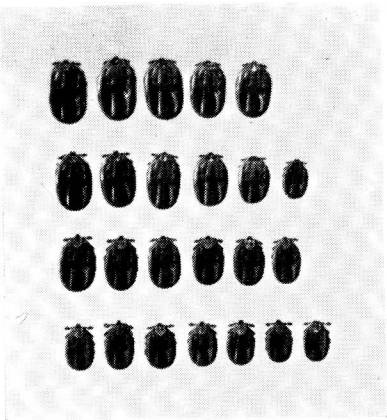

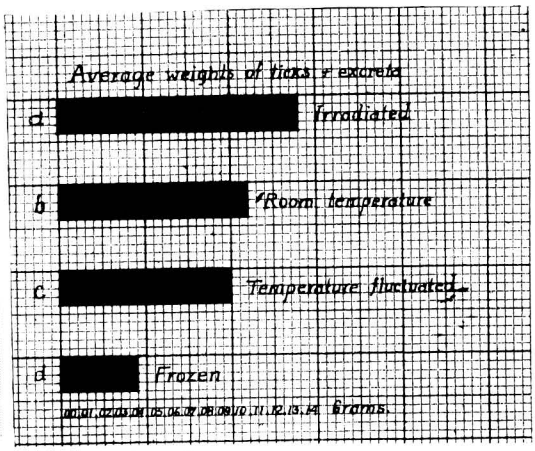

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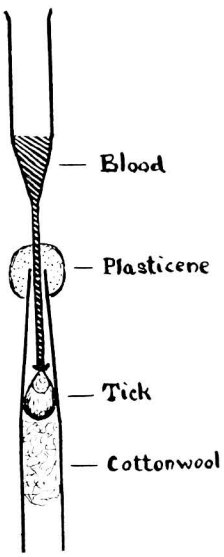

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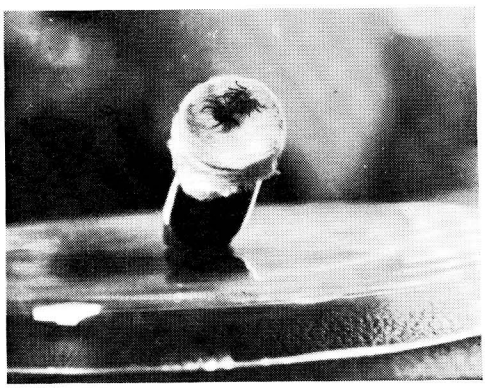

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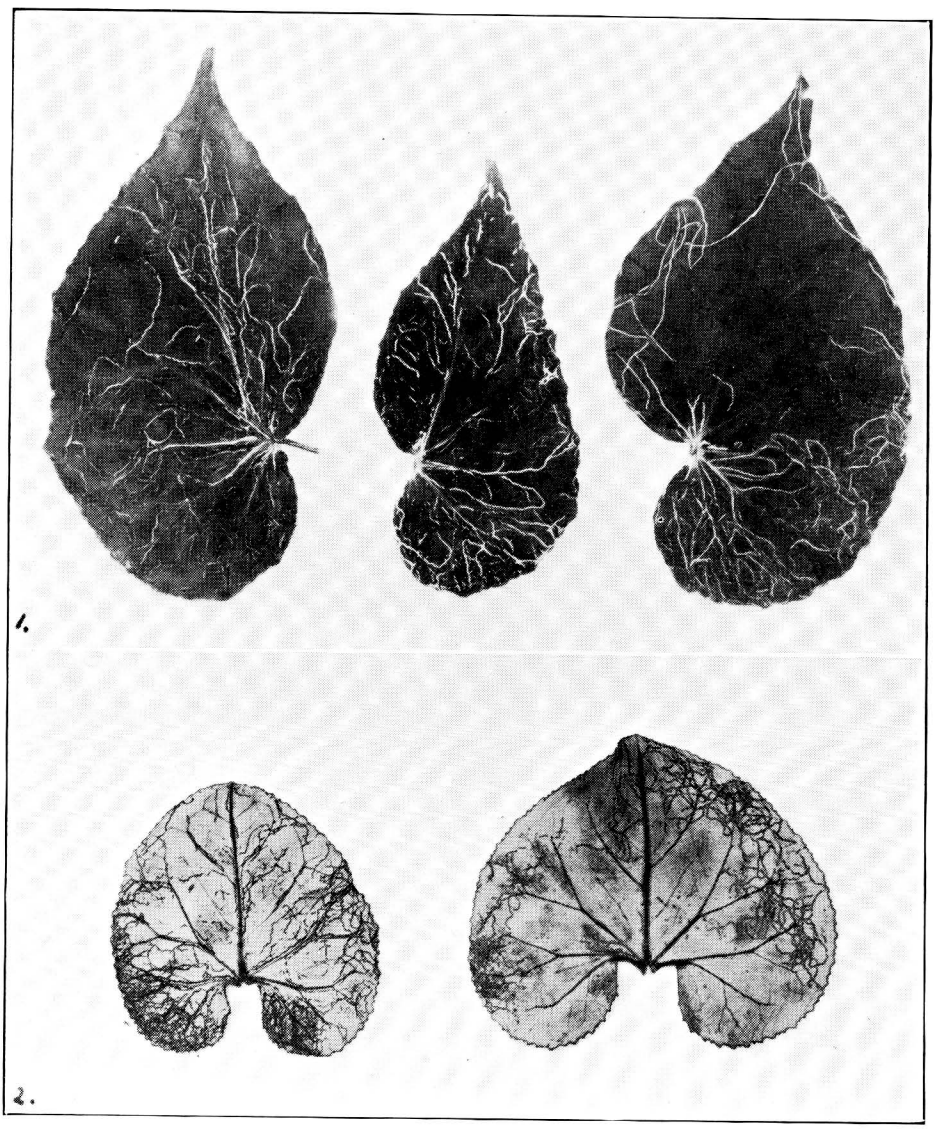

Damage to the Foliage of Greenhouse Plants caused by the Long Winged Thrips *(Scirtothrips longipennis* Bagn.*)* (Fig. 1) on the upper surface of begonia leaves and (Fig. 2) on the lower surface of cyclamen leaves, showing the characteristic dark, rust-brown, irregular, serpentine lines.