

# THE EFFICACY OF THE DRUMMOND ADULT TEST ON *BOOPHILUS MICROPLUS* FEMALES (ACARINA: IXODIDAE) SUBJECTED TO VARIOUS PERIODS OF COLD STORAGE PRIOR TO ORGANOPHOSPHATE TESTING

A. M. SPICKETT<sup>(1)</sup> and A. J. NARI HENRIOUD<sup>(2)</sup>

## ABSTRACT

SPICKETT, A.M. & NARI HENRIOUD, A. J., 1983. The efficacy of the Drummond adult test on *Boophilus microplus* females (Acarina: Ixodidae) subjected to various periods of cold storage prior to organophosphate testing. *Onderstepoort Journal of Veterinary Research*, 50, 197-198 (1983)

Engorged females of *Boophilus microplus*, stored at 4 °C for up to 5 days, and females, kept at room temperature for 1 day and then at 4 °C for 1 day, showed no significant differences in their response to an organophosphate as determined by the Drummond adult test.

## INTRODUCTION

The response to acaricides by ticks, as determined by the Drummond adult test method (Drummond, Ernst, Trevino, Gladney & Graham, 1973), involves the use of numerous engorged females. Various factors (e.g. inadequate daily laboratory yield, insufficient numbers from field collections and other immediate duties) often preclude the immediate testing of fresh specimens.

Studies on *Anocentor nitens* (R. O. Drummond, personal communication, 1981) showed that refrigerated storage of engorged females for up to 2 days did not influence their response to acaricides. Gothe (1967) investigated the cold resistance of the eggs and larvae of *Boophilus decoloratus*, *Boophilus microplus* and *Margaropus winthemi* and showed that the percentage hatch of *B. microplus* decreased markedly with extended storage at 0 °C. No attempt has been made, however, to relate these data to acaricide response. Investigations were therefore conducted to determine the length of refrigerated storage possible without adverse affect on acaricide response as determined by the Drummond adult test.

## MATERIALS AND METHODS

### Storage of female ticks

In the 1st experiment 15 groups, each containing 30 individually massed engorged females of *B. microplus* in separate vials, were placed in a refrigerator at 4 °C directly after their detachment from the host. One group was removed after each successive day and placed in an incubator at 27 °C and 80% relative humidity to allow oviposition, incubation and hatch to take place. The total egg mass per group and the pre-oviposition periods, number of females not ovipositing and percentage hatch were monitored for each group of females.

In a 2nd experiment 7 groups, each containing 30 individually massed females in separate vials, were refrigerated at 4 °C after 1 day of incubation at room temperature. Further treatment and observations were as in the 1st experiment.

### Acaricide testing

Analysis by the Drummond test (Drummond *et al.*, 1973) involves computation of estimated reproduction (ER) by the formula:

$$ER = \frac{\text{egg mass}}{\text{female mass}} \times \% \text{ hatch} \times 20\ 000$$

Tests were, therefore, undertaken on those groups in which the 2 parameters, egg mass per unit female and

percentage hatch were not adversely affected by cold storage treatment. Percentage control was computed by the formula

$$\frac{ER(\text{control}) - ER(\text{treated})}{ER(\text{control})} \times 100$$

Three Drummond adult tests, using dioxathion at 8 concentration levels were subsequently performed on each of 5 groups of females, namely, (a) a control group within 12 hours of detachment; (b) after 4 days at 4 °C; (c) after 5 days at 4 °C; (d) after 1 day at room temperature plus 1 day at 4 °C, and (e) after 1 day at room temperature plus 2 days at 4 °C. Mean values of the 3 test repetitions were computed for each group and the 5 groups compared at each concentration level, using the least significant squares method of Bonferroni.

Log probit analysis (Finney, 1971) was performed for each of the 5 groups and the mortality lines thus obtained were compared, using a probit programme developed by H. van Ark, Department of Agriculture (personal communication, 1982). Comparison of mortality lines included testing for homogeneous residual variances, comparison of slopes (parallelism) and comparison of the respective elevations.

## RESULTS AND DISCUSSION

### Storage of female ticks

The production potential of females kept at 4 °C for progressively longer periods is given in Table 1.

After 6 days at 4 °C a sudden rise in the number of non-ovipositing females occurred. This number increase progressively up to the 15-day group of females, none of which were able to lay eggs. This resulted in a marked decrease in the parameter egg mass produced per unit female from Day 6 onwards. Percentage hatch dropped to 80% in the 7 day group and thereafter decreased progressively to 30% in the 11- to 14-day group.

The production potential of females kept first at room temperature for 1 day before storage at 4 °C for progressively longer periods is shown in Table 2.

The number of females not ovipositing increased after 5 days at 4 °C, causing a corresponding decrease in the parameter egg mass produced per unit female. Percentage hatch, however, effectively dropped to 85% in the 3-day group of females, and decreased further to 50% after 6-7 days at 4 °C.

### Acaricide testing

The mean percentage control of 3 repetitions of the Drummond test for the 5 treatment groups tested at 8 concentration levels is given in Table 3.

<sup>(1)</sup> Veterinary Research Institute, Onderstepoort, 0110

<sup>(2)</sup> Miguel Rubino Veterinary Research Institute, Brigadier Gral Juan A. Lavalleja Km 29, Pando, Uruguay

Received 17 May 1983—Editor

TABLE 1 Production potential of females stored at 4 °C for progressively longer periods of time directly after engorgement and drop

Days at 4 °C	No. ♀♀ per group	Mean ♀ mass (g)	Percentage ♀♀ not ovipositing	Mean egg mass (g) per ♀	Percentage hatch
0	30	0,342	3,3	0,170	95
1	30	0,354	3,3	0,189	95
2	30	0,319	3,3	0,154	90
3	30	0,308	0	0,156	90
4	30	0,325	3,3	0,172	90
5	30	0,319	3,3	0,151	90
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6	30	0,324	13,3	0,138	90
7	30	0,311	30,0	0,089	80
8	30	0,326	36,6	0,105	70
9	30	0,334	53,3	0,058	50
10	30	0,324	76,6	0,029	40
11	30	0,314	80,0	0,028	30
12	30	0,339	86,6	0,021	30
13	30	0,321	83,3	0,018	30
14	30	0,318	93,3	0,006	30
15	30	0,291	100,0	—	—

TABLE 2 Production potential of females kept for 1 day at room temperature before storage for progressively longer periods at 4 °C

Days at 4 °C	No. ♀♀ per group	Mean ♀♀ mass (g)	Percentage ♀♀ not ovipositing	Mean egg mass (g) per ♀	Percentage hatch
0	30	0,275	0	0,153	95
1	30	0,294	3,3	0,188	90
2	30	0,286	6,6	0,150	90
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3	30	0,310	3,3	0,141	85
4	30	0,309	6,6	0,154	85
5	30	0,315	13,3	0,122	60
6	30	0,302	20,0	0,025	50
7	30	0,316	60,0	0,055	50

TABLE 3 Mean percentage control of 3 repetitions of the Drummond test performed on each of 5 groups of engorged females at 8 concentrations with corresponding F-values

Concentration Parts per million	Groups tested					F-value
	Control group	Days at 4 °C		One day at room temp. + days at 4 °C		
		0	4	5	1	
400	5,40	5,63	4,27	4,67	3,11	0,4296
450	6,13	6,24	9,70	3,00	5,79	0,5196
540	7,20	5,33	8,37	5,37	4,43	0,2863
648	7,90	4,27	6,40	7,10	6,45	0,1186
772	7,23	7,93	10,67	4,20	6,72	0,3932
933	7,90	4,17	8,73	6,27	7,87	0,3254
1 119	6,60	10,53	6,03	7,30	8,86	0,2562
1 343	10,50	11,67	8,43	10,13	12,00	0,4109

F (P=0,05) = 3,58

No significant differences existed between the 5 treatment groups at any of the concentration levels tested [F < F (P=0,05) = 3,58; Table 3].

Comparison of the log probit lines for the 5 treatment groups showed residual variances to be homogeneous ( $\chi^2 = 2,64$ ; P = 0,05; DF = 4); the lines to the parallel ( $\chi^2 = 15,61$ ; P=0,05; DF = 4), and the respective elevations of the 5 lines to be similar (F = 1,2973; P=0,05; DF = 4,34).

The analyses thus show that the Drummond adult test can be performed on engorged females of *B. microplus* stored for up to 5 days at 4 °C, or for up to 2 days at 4 °C after they had been kept previously at room temperature for 1 day, without any significant difference in the final results (percentage mortality) obtained.

#### ACKNOWLEDGEMENTS

We wish to thank Mrs Susan Brett for expert technical assistance in the performance of the chemical tests.

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