

THE EFFECT OF HUMIDITY ON THE REPRODUCTION
OF *AMBLYOMMA VARIEGATUM*
(FABRICIUS, 1794) (ACARINA : IXODIDAE)

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HUMIDITY
EGGS
AMBLYOMMA
VARIEGATUM

ABSTRACT : The effect of humidity on the reproduction of *Amblyomma variegatum* (Fabricius, 1794) (Acarina : Ixodidae) was studied using different humidity ranges at constant temperature of 25° C.

It was observed that varied humidity changes do not have apparent influence on the preoviposition, oviposition and the eclosion of the eggs of *A. variegatum* at 25° C.

HUMIDITÉ
PONTE
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RÉSUMÉ : L'effet de l'humidité sur la reproduction d'*Amblyomma variegatum* (Fabricius, 1794) (Acarina : Ixodidae) a été étudié en employant des taux d'humidité différents pour une température constante de 25°.

On a observé que les divers changements d'humidité n'ont pas d'influence apparente sur la préoviposition, sur l'oviposition, et sur l'éclosion des œufs chez *A. variegatum* à 25°.

INTRODUCTION

Climatic factors are known to have a great influence on tick development. WILSON (1944, 1946, 1950), MATTHYSSE (1954), MACLEOD (1970), BRANAGAN (1973a, b), NEWSON (1978), DIPEOLU and OGUNJI (1977), and MOHAMMED (1976), all working on various ixodid ticks, observed that the adults are more active during the rainy season while the immatures are active during the dry season. They associated engorgement and oviposition of female ticks with wet seasons when the relative humidity is over 75 %. ARTHUR (1962), however, considered that humidity and rainfall are generally unimportant in the development of ticks. RUDOLPH and KNÜLLE (1974) put the critical equilibrium humidity for *A. variegatum* at between 80-85 %.

STRICKLAND (1961) remarked that in Nigeria, the seasonal geographic pattern shown by ixodid ticks

was influenced by various climatic factors of which humidity was the most important. Literature is very scanty in Nigeria on how humidity affects reproduction in *A. variegatum*. The aim of this study is to find out how humidity affects preoviposition, duration of oviposition, the eggs and eclosion patterns in *A. variegatum*.

MATERIALS AND METHODS

Adult *Amblyomma variegatum* females at various stages of engorgement were detached from cattle at the Veterinary Control Post, Bodija, Ibadan. The engorged ticks were weighed in the laboratory and only those that weighed above 1gm were used for this experiment. Each engorged tick was placed in a universal bottle which was then plugged with cotton wool. The ticks were divided into five groups. Each group (containing 20 ticks) was placed in dessica-

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tors with different humidity regimes as follows : 0 % RH ; 10 % RH ; 40 % RH ; 70 % RH and 100 % RH, respectively. The room temperature was constant at 25° C.

Daily observations were made to determine the onset of oviposition, duration of oviposition and time of eclosion of eggs. For this experiment, the collection of engorged females from the Veterinary Control Post was done weekly for a period of three months. In each universal bottle was a record of the date of collection.

A control experiment was also set up at room temperature as described above but the relative humidity was kept at 85 %.

RESULTS

As already mentioned, the ticks were separated into five groups and each group was subjected to a different humidity regime.

Preoviposition period.

From the data presented in Table 1, it was observed that the preoviposition period was the same in the different humidity regimes. The preoviposition period ranged from 9-14 days (mean 11.5 ± 3.66). This compares with the preoviposition period for the control kept at 25° C and relative humidity 85 %. Therefore humidity does not seem to have effect on preoviposition in *A. variegatum*.

Oviposition period.

The course of oviposition was monitored by weighing the eggs removed from each sample at 5-day intervals. Table 1 shows that the females in all the 4 different humidity regimes laid for a period of 25 to 35 days (mean 30 ± 7.35) as in the control. The peak of oviposition was also either on the 10th or the 15th day of oviposition. Therefore humidity does not seem to have effect on the course of oviposition.

Preclosure period.

Table 1 shows that in the 4 different humidity regimes, the preclosure period varied between 58 and 70 days.

At 0 % RH, the preclosure period varied from 58-69 days (mean 60 days \pm sd 5.66). At 10 % RH and 40 % RH, the preclosure period varied from 58-70 days (mean, 63 days).

TABLE 1 : Effect of different humidity regimes on the preoviposition, oviposition and preclosure patterns in *A. variegatum* at constant Laboratory temperature of 25° C (n = 20 adults per experiment)

Relative Humidity (%)	Mean Preoviposition Period (Days)	Mean Oviposition Period (Days)	Mean Preclosure Period (Days)
Control :			
85 %	11.5 ± 3.66	30 ± 7.35	60 ± 5.66
0 %	11.5 ± 3.66	30 ± 7.35	60 ± 5.66
10 %	11.5 ± 3.66	30 ± 7.35	63 ± 4.62
40 %	11.5 ± 3.71	30 ± 7.35	63 ± 4.61
70 %	11.5 ± 3.66	30 ± 7.35	63 ± 4.62
100 %	11.5 ± 3.66	30 ± 7.35	63 ± 4.62

At 70 % and 100 % RH, the preclosure period varied from 58-67 days (mean, 62 days). This result shows that different humidities do not seem to influence the eclosion of eggs of *A. variegatum*.

DISCUSSION

The results of these observations and experiment demonstrate that humidity has no effect on the preoviposition and oviposition except the eclosion pattern of *Amblyomma variegatum*. While temperature either accelerates or retards development of ticks (BRANAGAN 1973a, b ; DIPEOLU and OGUNJI 1977b) differing levels of humidity did not seem to influence the rate of development in *A. variegatum* at a constant temperature of 25° C. That humidity appeared to exert no intrinsic influence on the rate of development agrees with the general summary on tick development made by ARTHUR (1962) that relative humidity has no influence on the duration of the developmental periods in ticks. Hence while assertions by some researchers (WILSON, 1944, 1946, 1950, in Malawi ; BRANAGAN, 1973 in Kenya ;

DIPEOLU 1975; and MOHAMMED, 1976) working on *Rhipicephalus appendiculatus* and *Amblyomma variegatum* observed that the engorgement and oviposition of female *R. appendiculatus* in Malawi and Kenya and female *A. variegatum* in Nigeria are confined to the wet season when relative humidity is over 75 % can be accepted as a description of actual events, it should not be taken that these development processes are controlled by this specific factor. BRANAGAN (1973) opined that it could be possible that the levels of humidity necessary for the survival of eggs and unfed larvae occur only during the wet season and that most of the unfed immatures will be eliminated by the low humidities which prevail in the dry season.

LEES (1946) and ARTHUR (1951) had observed that the eggs of *Amblyomma hebraeum* are extremely sensitive to desiccation. BRANAGAN (1973) also observed that the eggs of *Rhipicephalus appendiculatus* are very sensitive to aridity and that exposure to humidity below 40 % RH for 14 days was wholly lethal at any temperature. In this experiment, however, differing humidity regimes did not seem to have any effect on the eggs of *A. variegatum* at constant temperature. Eggs kept at 0 % RH hatched into active larvae at about the same time that the eggs in the control experiment hatched into larvae. Relative humidity of 40 % and below neither retarded the development of the eggs nor prolonged the time the eggs developed into larvae. This is rather surprising in a place like Ibadan where the relative humidity is usually above 50 % all year round (meteorological data for Ibadan 1983-1986). It should be noted that during the peak of the rainy season, the relative humidity is usually above 80 %. This leads to the conclusion that while relative humidity may affect the seasonal incidence of the unengorged adult population of *A. variegatum*, once engorged, relative humidity will not have effect on preoviposition, oviposition and eclosion pattern of the eggs of this species. The implication of this is that once the engorged females are detached from cattle, they do not need the sophistication of being reared in controlled humidity chambers as they will oviposit, and the eggs will eclose if kept anywhere in the laboratory at constant room temperature. This observation

reconfirms the fact that high relative humidity alone cannot be responsible for the seasonal occurrence of eggs and larvae of *A. variegatum* during the rainy season. NORVAL (1977) and SHORT and NORVAL (1981) observed that by regulating their seasonal occurrence, ticks can ensure that the most desiccation-sensitive stages of their life cycle occur at times of the year that are most suitable for their survival.

In *A. hebraeum*, adult activity is regulated by combined influences of temperature, humidity and day length (NORVAL 1977) but in *A. variegatum* while adult activity is regulated by the combined influence of temperature, precipitation, and relative humidity, once engorged, the replete females do not seem to be affected by variance in humidity at 1 % level of significance.

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