TECHNICAL NOTE

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Time Since Death Definition by Experimental Reproduction of *Lucilia Sericata* Cycles in Growth Cabinet

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ABSTRACT: Ten life cycles of *Lucilia sericata* (Megnin), reared in the field with continuous registration of temperature, humidity, and luminosity, have been compared to parallel life cycles reared in a growth cabinet. Thanks to this apparatus, constructed according to the directions of the authors, it is possible to change at will some fundamental microclimatic parameters such as lighting, temperature, and humidity to reproduce, with a single programming, the environmental conditions recorded in the field. Our results showed that, statistically, there is no difference between life cycles reared in the field and those reared in the laboratory in artificial field-like conditions.

KEYWORDS: pathology and biology, postmortem interval, *Lucilia sericata*, microclimatic conditions, experimental rearings, growth cabinets

One of the main problems in forensic entomology is aging the larvae collected on a corpse to estimate the minimum time since death.

Actually this determination could be done in two ways:

(1) using the Reiter "isomegalendiagram" [*1*] that relates, for constant temperatures, the size of the larvae with the time of development or

(2) matching the size of the larvae found on the corpse with the development rate of the same blowfly larvae experimentally reared at the season average temperature in which the body was found.

With both ways constant temperature is used, but under "field conditions" temperatures are rarely constant and it has been shown that fluctuating temperature affects the larvae development differently than constant temperatures.[3]

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[3]G. G. Ratcliffe, "Studies on the Development of the Larvae of Blowflies," M.Sc. thesis, University of Durham, unpublished.

The importance of using, for the experimental rearings, the temperatures at which the larvae developed on the corpse, has been often commented on [2,3], but no actual experimental support for this statement has been provided to date.

Materials and Methods

Ten complete cycles of *Lucilia sericata* (green bottlefly) were reared in field conditions with continuous recording of the microclimatic conditions by a Termoigrografo Salmoiraghi, Model 1750, Italy. With the values of temperature, humidity, and luminosity obtained, we recreated, in a growth cabinet the same microclimatic conditions for ten different experimental rearings of *L. sericata* obtained from eggs laid in laboratory rearings of known adult flies.

The growth cabinet was designed by the authors and constructed by Ditta Dentamaro, Valenzano, Bari, Italy [4]. It has the following characteristics: dimensions of 71 by 78 by 202 cm; capacity of 600 L; internal temperature ranging between +5 and +40°C accurate to 1°C; humidity ranging between 40 and 90% with an accuracy of 3%; and luminosity by means of two sets of fluorescent lamps (40 W and high luminosity). With the growth cabinet it is possible to program on an hourly schedule, at the beginning of each rearing, the temperature, moisture, and luminosity to which the experimental rearing will be exposed. Using the growth cabinet we then obtained ten internal rearings exposed experimentally to identical microclimatic conditions as the same number of rearings of the same blowfly recorded under field conditions (external rearings).

Diapause was not observed for any of the external or internal rearings.

For all the rearings, samples of animal brain were used to feed the larvae.

Results and Discussion

Descriptive statistical analysis has been separately performed for the hatching time of eggs, larvae feeding, and pupation for both external (field) and internal (growth cabinet) rearings.

Results are shown in Table 1 in which the statistical results of the external and internal complete rearings are also compared. The Students t test was applied and no statistical difference was observed between the two groups. A correlation analysis was then performed between the two groups. The coefficient of correlation (R) and coefficient of determination (R^2) of linear, logarithmical, and exponential regressions are shown in Table 2. The significance was constantly 0.1%.

Our results show that it is possible to obtain experimental rearings of *L. sericata* in forced microclimatic conditions. There is no significant difference between the field rearings and those grown experimentally in a growth cabinet under prerecorded, reproduced microcli-

TABLE 1—*Descriptive statistical analysis of the complete cycles of the ten external rearings grown under field conditions and the ten internal rearings grown in the growth cabinet in prerecorded microclimatic conditions. The values are expressed in hours.*

	External Rearings					Internal Rearings				
L. sericata	Min.	Max.	Mean	S.D.	C.Var.	Min.	Max.	Mean	S.D.	C.Var.
Eggs hatching	16	23	19.8	2	10.5	15	24	19.8	2.4	12.4
Larvae feeding	96	168	124	29.5	23.6	96	168	132	25.9	19.6
Pupation	144	288	175.2	50.6	28.9	144	240	165.6	41.4	25
Total immature	284	501	351	73.3	20.9	278	452	345	62.4	18

TABLE 2—*Regression analysis between the complete internal and external rearings of* L. sericata.

L. sericata	C.Det.	C.Corr.	Sign
Linear regression	0.916	0.957	0.001
Logar. regression	0.918	0.959	0.001
Expon. regression	0.915	0.956	0.001

matic conditions. This means that knowing the microclimatic conditions in which the larvae developed on a corpse makes it possible to recreate exactly an analogous rearing.

A more accurate aging of the larvae found on a corpse will then be possible, with a more reliable definition of the time since death.

References

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