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SEASONAL VARIATIONS IN THE SUSCEPTIBILITY OF ANOPHELES GAMBIAE  
TO DIELDRIN

by

M. H. Holstein, D.Sc., J. R. Cullen & E. Rivola  
World Health Organization

A certain number of routine examinations were carried out between May 1958 and the end of March 1959 in Ghana, West Africa, in the region between Accra and the Volta River in the East, for the purpose of verifying the susceptibility of Anopheles gambiae to dieldrin. The local anopheline population had not been subjected to any insecticide "pressure", since no treatment had been applied in or near the villages in any public health or agricultural campaign.

The tests were made with the WHO kit in the Accra laboratory. Temperature and humidity were registered during the tests and are shown in the following table:

TABLE 1

Date	Minimum temperature	Maximum temperature	Relative humidity
May 1958	24.5°C	29.0°C	78 - 86 %
November 1958	26.0°C	30.1°C	72 - 86 %
December 1958	26.2°C	29.5°C	70 - 84 %
February 1959	26.5°C	31.0°C	70 - 90 %
March 1959	27.0°C	30.4°C	76 - 90 %

After a period of unusual drought, so that severe rationing of water was necessary, the A. gambiae population density per dwelling dropped from 14 in May 1958 to 2 in December 1958 and 0.14 in February 1959. After some violent storms, the index rose at the end of March 1959 to 3.5.

The results of the tests are set out in the following table:

TABLE 2. EXPOSURE OF A. GAMBIAE FOR ONE HOUR TO DIFFERENT CONCENTRATIONS OF DIELDRIN IN RISELLA OIL

(Percentage of deaths after 24 hours)

(The figure in brackets refers to the number of females used)

Concentration	0	0.05	0.1	0.4	0.8	1.2	4.0
May 1958	0 (30)	13.7 (58)	86.5 (52)	100 (54)	100 (60)	100 (51)	100 (54)
November 1958	2.5 (40)	29.1 (24)	71.4 (42)	100 (41)	100 (48)	100 (48)	100 (42)
December 1958	0 (81)	30.4 (82)	61.5 (78)	98.8 (78)	100 (81)	100 (80)	100 (81)
February 1959	0 (32)	22.3 (67)	40.9 (66)	75.8 (62)	96.9 (65)	100 (58)	100 (40)
March 1959	0 (25)	9.0 (22)	60.7 (28)	97.0 (34)	100 (32)	100 (26)	100 (25)

Calculated graphically, the  $LC_{50}$  was as follows:

May 1958	0.075
November 1958	0.075
December 1958	0.090
February 1959	0.18
March 1959	0.090

It will be noted, therefore, that there was a definite increase in the  $LC_{50}$  when the drought was at its height. In view of the fact that the meteorological conditions in the laboratory did not undergo any important variations, it is justifiable to exclude the possibility of any effect of the temperature or humidity on either the impregnated papers or tested anophelines. It is to be assumed that when the species is subjected to unfavourable living conditions (in this case extreme drought), it reacts with an increased vigour which enables it to survive such conditions. A selection was made, by elimination of the less resistant insects, which might be

compared with the selective process among A. sacharovi at the beginning of winter in Europe, for example. It would seem that as in A. sacharovi hibernation brings about a considerable increase in the  $LC_{50}$  with respect to DDT (de Zulueta et al. 1957) so, in A. gambiae, resistance to drought is accompanied by increased tolerance with respect to dieldrin.

In conclusion, it should be noted that susceptibility tests of an anopheline species with respect to one or several insecticides should be interpreted with caution and that, wherever possible, biological and climatological data should be taken into account. The figures given show that a single susceptibility test carried out at a given time of year in a given area is not an adequate basis for the drawing of significant conclusions; in fact, it is liable to lead to erroneous conclusions.

#### REFERENCES

- Zulueta, J. de, Jolivet, P., Thymakis, K. & Caprari, P. (1957)  
Bull. Wld Hlth Org. 16, 475