

## DETECTION OF DDT RESISTANCE IN ADULT *ANOPHELES MELAS* AND LARVAL *ANOPHELES LISTERI* POPULATIONS FROM LOBITO, ANGOLA (PORTUGUESE WEST AFRICA)

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**INTRODUCTION.** Hydrocarbon chlorinated insecticides have been used, for several years, by Public Health authorities in Lobito, a coastal town of Angola. Either DDT, dieldrin or gamma-BHC were indifferently used, at about 6 months intervals, in space spraying operations by means of fog dispersing machines such as TIFA. As it was suspected that they had developed resistance to DDT, anophelines recorded in the region (Ribeiro *et al.*, 1964) were tested to this chemical, in order to assess whether or not actual DDT resistance was present.

In this paper, we present the first data concerning this study, results being analysed according to the point of view previously proposed by the writers (Ribeiro & Mexia, 1967).

**MATERIAL AND METHODS.** From the taxonomic viewpoint, both tested *melas* and *listeri* from Lobito were found to be homogeneous local populations (Ribeiro *et al.*, 1964).

Tests were carried out according to the standard WHO bioassay technique, using

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DDT-impregnated papers and DDT solutions supplied by the Organization.

All tested *A. melas* adults were blood-fed house-caught females and *A. listeri* larvae used in the tests were in the early fourth or in the third advanced instars.

**RESULTS.** Data on the response of the adult *melas* populations are shown in table 1 and fig. 1.

The presence of a "plateau" at the 30 percent mortality level is clearly indicated by a lack of increase in mortality when DDT concentration is increased from 0.5 to 1.0 percent.

This heterogeneous character of the response to the chemical was confirmed by a heterogeneity test (Finney, 1952) which was significant at the 5 percent confidence level.

In table 2 and fig. 2 are shown the data concerning the response of the larval *listeri* population.

Here again, the lack of increase in mortality when DDT concentration is increased from 0.004 to 0.01 p.p.m. indicates the presence of two phenotypically distinct components separated at the 80 percent mortality level.

The heterogeneous character of this re-

TABLE 1.—DDT test data for the adult population of *A. melas* from Lobito.

TEMPERATURE DURING EXPOSURE PERIOD	27–28° C.					
HUMIDITY DURING EXPOSURE PERIOD	70%					
TEMPERATURE DURING 24 hr. HOLDING PERIOD	25–30° C.					
DDT CONCENTRATION (%)	0.25	0.50	1	2	4	CONTROL
<b>RESULTS</b>						
DEAD	2	7	7	18	25	0
TOTAL	25	24	25	25	25	25
MORTALITY (%)	8	29, 1	28	72	100	0

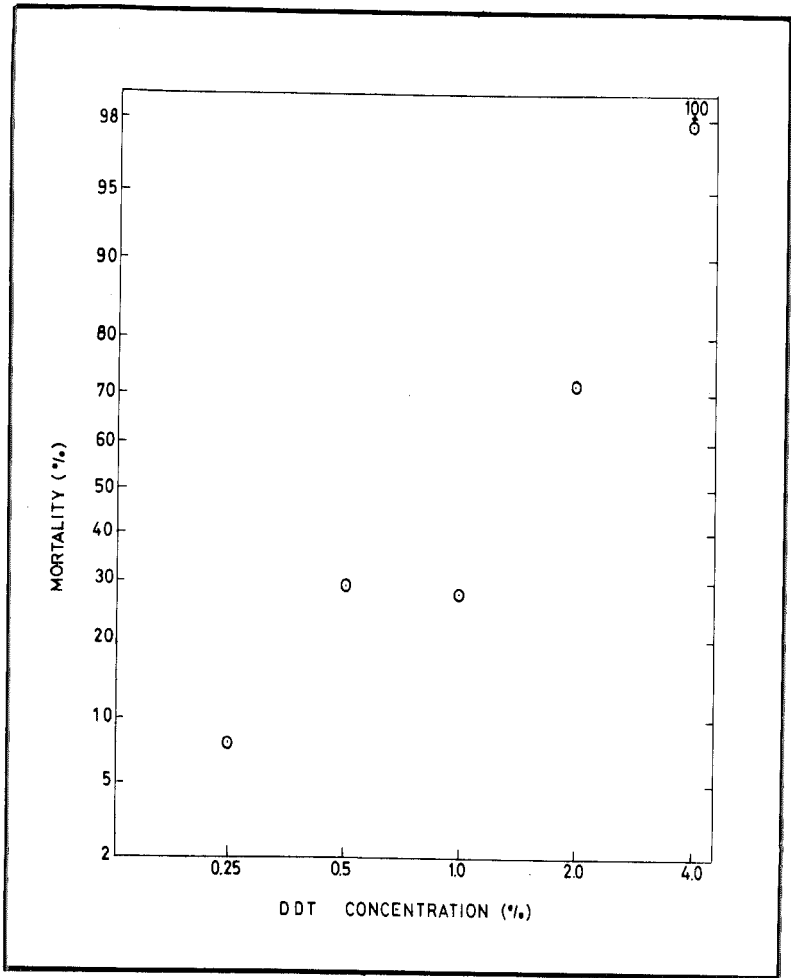


FIG. 1.—DDT id-p graph for the adult population of *A. melas* from Lobito.

TABLE 2.—DDT test data for the larval population of *A. listeri* from Lobito.

TEMPERATURE DURING TEST	24-30° C.					
DDT CONCENTRATION (P.P.M.)	0.002	0.004	0.01	0.02	0.1	CONTROL
RESULTS						
MORIBUND AND DEAD	21	39	37	49	45	7
TOTAL	50	46	48	49	45	50
Mortality (%) CORR.	32.6	82.3	73.3	100	100	14

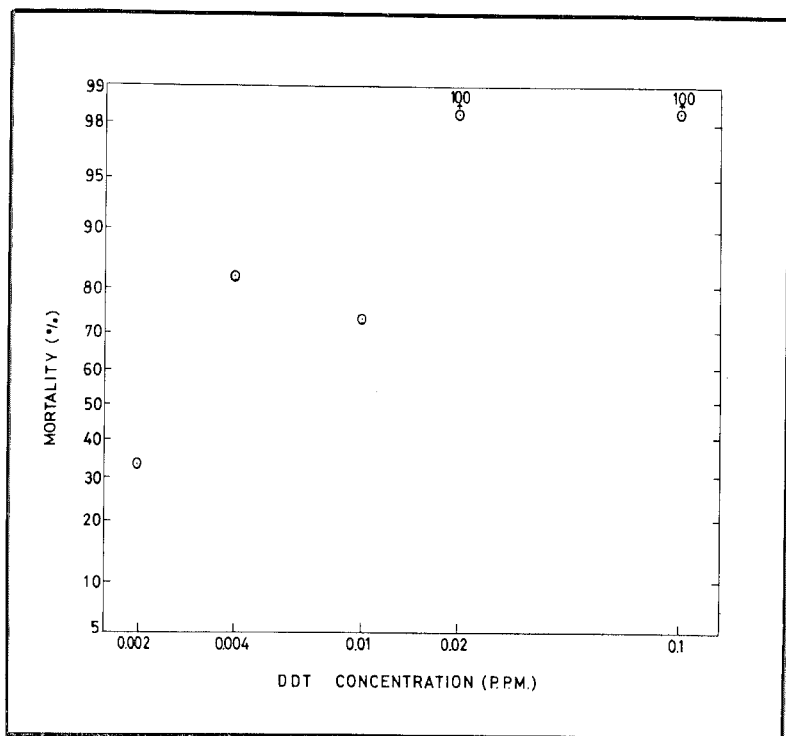


FIG. 2.—DDT id-p graph for the larval population of *A. listeri* from Lobito.

sponse to the insecticide was also demonstrated by the finding of a heterogeneity test (Finney, 1952) that was significant at the 1 per thousand confidence level.

CONCLUSIONS. As the above referred data revealed the presence of two phenotypes in both tested field populations subjected to DDT selection pressure, the following conclusions may be drawn:

- 1—both adult *A. melas* and larval *A. listeri* populations from Lobito have developed resistance to DDT;
- 2—approximately, 70 percent of *melas* adults and 20 percent of *listeri* larvae are DDT resistant individuals.

SYNOPSIS. By the analysis of the data from WHO standard bioassay procedures carried out on the adult *A. melas* and larval *A. listeri* populations from Lobito (Angola), it is shown that both local populations have developed resistance to

DDT, 70 percent of *melas* adults and 20 percent of *listeri* larvae, approximately, being DDT resistant individuals.

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#### References

- FINNEY, D. J. 1952. Probit analysis. Cambridge, The University Press, 318 p.
- RIBEIRO, H., CASACA, V. M. R. and COCHFEL, J. A. L. P. 1964. A malaria survey in the Lobito-Catumbela region, Angola (Portuguese West Africa). An. Inst. Med. Trop. (Lisboa), 21(¾): 337-351.
- RIBEIRO, H. and MENIA, J. T. 1967. Insect resistance to chemicals as a population phenomenon. An. Esc. nac. Saúde Públ. e med. trop. (Lisboa), 1(¼):185-190.