

Ent - Med

A Case of Dominant Dieldrin Resistance in *Anopheles gambiae* Giles

In the course of field investigations by one of us (J.H.) in the village of Gaoulou near Sassandra, Ivory Coast, a population of *Anopheles gambiae* Giles was found which showed similar low mortalities when exposed to 0.4 and 4.0 per cent dieldrin in 'Risella' oil for 1 h, and high but incomplete mortality when exposed to 4.0 per cent DDT in 'Risella' oil for 1 and 2 h. Detailed results of these exposures as well as results of exposures to the organophosphorus insecticides, malathion and 'Baytex', are given in Table 1.

In May 1962 eggs from this population were dispatched to the Ross Institute in London, where a colony was successfully established. The results of testing the susceptibility of adults reared from these eggs and of adults of the first laboratory generation on DDT and dieldrin are given in Table 2. Similar low and almost identical mortalities are shown on 0.4 and 4.0 per cent dieldrin for 1 h, and these are very similar to the mortalities found in the field. On 4.0 per cent DDT for 1 h, however, no survivors were found in London. It is concluded that the increased

TABLE 1. INSECTICIDE SUSCEPTIBILITY OF THE GAOULOU-SASSANDRA POPULATION OF *Anopheles gambiae*. (TESTS MADE IN AFRICA)

Insecticide (%)	No. of females tested	Exposure period (h)	No. of dead females	Mortality (%)
DDT	Wild caught gravid and freshly fed females			
0	120	1 and 4	5	4
0.5	131	1	13	10
1	156	1	58	37
2	184	1	128	70
4	162	1	147	91
4	108	2	104	96
4	116	4	116	100
Dieldrin	Wild caught gravid and freshly fed females			
0	21	1	1	4
0.4	112	1	13	12
4	116	1	10	9
Malathion	Laboratory bred females, freshly fed			
0	100	1	3	3
0.4	81	1	2	2
0.8	101	1	18	18
1.6	99	1	86	87
3.2	79	1	79	100
Baytex	Laboratory bred females, freshly fed			
0	Same controls used as for malathion			
0.2	38	1	1	3
0.4	99	1	21	21
0.8	118	1	97	82
1.6	80	1	80	100

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Table 2. INSECTICIDE SUSCEPTIBILITY OF THE GAOULOU-SASSANDRA POPULATION OF *Anopheles gambiae*. (TESTS MADE IN LONDON ON LABORATORY-REARED, UNFED FEMALES AND MALES, 1-4 DAYS OLD)

Insecticide (%)	No. of mosquitoes tested	Exposure period (h)	No. of dead mosquitoes	Mortality (%)
0	35	1	1	3
0	39	5	0	0
DDT				
4.0	289	1	239	100
Dieldrin				
0.4	97	1	13	13
4.0	104	1	11	11
4.0	137	5	54	39

tolerance to this insecticide in the field is the result of a slight 'vigour tolerance' and not to the presence of individuals specifically resistant to DDT.

Females of the Sassandra colony have been crossed with males of an insecticide-susceptible strain of *A. gambiae* from Diggi, Western Sokoto, Northern Nigeria, and with a homozygous dieldrin-resistant strain from Kano, Northern Nigeria. These belong to the two partially incompatible fresh-water forms of *A. gambiae* described by Davidson and Jackson¹—Diggi to the group A and Kano to the group B. F_1 males of the Kano \times Sassandra cross were sterile while those from the Diggi \times Sassandra cross were normal. The Sassandra strain thus belongs to group A.

The results of testing the F_1 and F_2 generations of the Diggi \times Sassandra cross on 0.4 and 4.0 per cent dieldrin for 1 h are given in Table 3. The F_1 adults show no mortality on either dosage, while the F_2 adults show a similar mortality on both dosages, and this mortality is very close to 25 per cent. It is concluded, therefore, that the Sassandra females used on this cross were homozygous for dieldrin resistance, and that resistance in this strain is dependent on a single dominant genetic factor.

In respect of its dominance this type of resistance differs from those previously recorded for three other strains of *A. gambiae* from West Africa and for other anopheline species². Here dieldrin resistance was found to be monofactorial and semi-dominant, 0.4 and 4.0 per cent dieldrin for 1 h being the dosages

Table 3. MORTALITIES ON DIELDRIN OF F_1 AND F_2 GENERATIONS OF CROSS, DIGGI σ \times GAOULOU-SASSANDRA ρ . (TESTS MADE IN LONDON ON LABORATORY-REARED, UNFED FEMALES AND MALES, 1-4 DAYS OLD)

Dieldrin (%)	No. of mosquitoes tested	Exposure period (h)	No. of dead mosquitoes	Mortality (%)
		F_1 generation		
0.4	7	1	0	0
4.0	51	1	0	0
		F_2 generation		
0	39	1	0	0
0.4	530	1	118	22
4.0	545	1	145	27

discriminating between susceptible, heterozygotes and resistant individuals.

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¹ Davidson, G., and Jackson, C. E., *Bull. World Health Org.*, 27, 303 (1962).

² Davidson, G., and Jackson, C. E., *Nature*, 190, 364 (1961).