DDT-RESISTANT ADULTS OF *ANOPHELES SUBPICTUS* IN THE LAHORE DISTRICT OF WEST PAKISTAN

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Susceptibility tests were performed by the authors with wild caught adults of *Anopheles subpictus* Grassi in two DDT-sprayed villages near Lahore, West Pakistan. The data collected, although somewhat meager, show a definite resistance to DDT by this species in this locality. Pronounced DDT-resistance in this species was found in 1956 at Jawalaheri and Nanglischidar, Uttar Pradesh, India, by Sharma and Krishnamurthy (1, 5) and recently by Pant (2) in Nepal. The species, as detailed below, has been reported to be relatively susceptible in Java by various authors (3).

Anopheles subpictus, for reasons still unknown, is not a vector of malaria in West Pakistan. However, it is a vector in some areas of Indonesia. In West Pakistan this species is extremely abundant after the monsoon rains, i. e., usually during the months of July and August. Larvae are found in great numbers in temporary and permanent pools. The adults freely enter buildings and are collected with great ease at any time during the day.

The susceptibility tests discussed herein were performed with the kit once provided

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by the International Cooperation Administration (4). The DDT-saturated papers used were those provided and obtainable from WHO-Geneva. An interesting fact is that the DDT-papers were 17 months old at the time of the tests. The papers were impregnated on 22–29 March 1957 and the tests performed in August 1958. Test performed by the Communicable Disease Center's Technical Development Laboratories at Savannah, Georgia, USA, showed that the DDT-papers were fully potent at the time of usage. Using *Anopheles quadrimaculatus* Say as the test insect, at an exposure of one hour the average mortality from three replicates with 1, 2, and 4 percent DDT-papers were 3 and 5 percent, 64 and 64 percent, and 96 and 99 percent. The first figure of these percentages refer to the papers used in Pakistan and the second to papers impregnated in January 1958.

The tests performed in West Pakistan were made with DDT concentrations of 0.25, 0.5, 1.0, 2.0, and 4.0 percent. The exposure times used were 1, 2, and 4 hours. At one hour exposure the highest kill with 4 percent papers was 20.0 percent. For comparison it can be mentioned that in tests performed in Java with the same species and with specimens from four localities, with 4 percent papers and one hour exposure, mortalities of 95, 82, 89, and 100 percent were obtained (2). At two hours exposure the highest kill with 4 percent papers was 56.2 percent. At 4 hours exposure (in a second village) the highest kill was 70.0 percent. A summary of the results is tabulated below.

SUMMARY. 1. Preliminary tests done

TABLE 1.—DDT-resistance studies with adults of *Anopheles subpictus* in West Pakistan, August 1958

SUMMARY of RESULTS

A. Village Chung, 14 miles west from Lahore, on the Montgomery road; village sprayed twice, last in 1956.

Tests 1, 2, 3; August 7 and 8, 1958. One hour exposure.

Concentration of DDT	No. of replicates	Total No. of adults	Total No. dead at 24 hrs.	Percent dead	Temperatures*
Control	6	139	0	0.0	
0.25	6	157	1	0.6	92 Max.
0.50	6	150	0	0.0	84 Min.
1.0	6	154	2	1.3	83 Wet
2.0	3	71	3	4.2	87 Dry
4.0	3	73	8	10.9	

Tests 4, 5; August 9, 1958. Two hours exposure.

Control	2	49	0	0.0	
0.25	2	42	0	0.0	89 Max.
0.50	4	57	2	3.5	81 Min.
1.0	4	87	5	5.7	82 Wet
2.0	4	92	15	16.3	91 Dry
4.0	4	81	40	49.3	

B. Cattle-shed on eastern end of military cantonment, east from Lahore; area sprayed an unknown number of times.

Test 6; August 26, 1958. Four hours exposure.

Control	1	21	1	4.7	94 Max.
0.5	3	65	7	10.7	80 Min.
1.0	3	65	16	24.6	79 Wet
4.0	3	52	28	53.8	83 Dry

* Highest and lowest of 3 and 2 sets of readings for 1- and 2-hour exposure tests respectively.

with a standard susceptibility kit showed that *Anopheles subpictus* Grassi exhibits a definite resistance to DDT in the Lahore District of West Pakistan.

2. The DDT-impregnated papers used in these tests although 17 months old were found to be fully potent.

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