

## LEVELS OF RESISTANCE TO SIX SYNTHETIC INSECTICIDES IN THE BORNEO HOUSEFLY\*1

BY

Akifumi HAYASHI,\*2,3 Satoshi SHINONAGA,\*3 Jeffrey Hui\*4  
and Rokuro KANO\*3

### ABSTRACT

The resistant levels of the 4 strains of the housefly collected in Borneo to six insecticides, namely DDT, Chrysron, DDVP, Baytex, Sumithion and Diazinon, were examined. It was found that most housefly population in Borneo showed a higher susceptibility than that of the Takatsuki strain of Japan, especially to DDT.

### INTRODUCTION

The Japanese authors had been studying the resistant levels of the housefly, *Musca domestica* L., to the insecticides in Southeast Asia and South Pacific area with the purpose of obtaining basic data for housefly control. They had already reported on the resistant levels of the housefly in Indonesia,<sup>1)</sup> New Guinea,<sup>2)</sup> Philippines,<sup>4)</sup> Malaysia<sup>5)</sup> and Singapore<sup>6)</sup> since 1974. Their survey in Borneo was made with the same purpose in 1976 and the results of the study are presented in this paper.

### MATERIALS AND METHODS

**Housefly strains:** The housefly strains used in this study were collected from four places in Sabah and Sarawak in Borneo. The adult flies were collected by sweeping nets and were kept in plastic cups, 5 cm in

diameter and 10 cm in height. The housefly eggs were collected by using breeding media. The eggs laid on the media were transferred to the new breeding cups and then bred to the pupae. The pupae were sent to our laboratory in Tokyo by air cargo. In the laboratory, the flies were bred and raised and then subjected to study. The flies were collected at a dumping ground and a market place. The Takatsuki strain was used as the standard strain for comparing its resistant levels with the Borneo strains. The same method for comparing was used simultaneously.

**Insecticides:** Insecticides used in this study were as follows: Sumithion (98.6%), Baytex (99.2%), Diazinon (99.6%), DDVP (97.6%), DDT (technical) and Chrysron (99.0%).

**Methods:** Each insecticide was diluted with acetone to the required concentration.

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\*2 林 晃史: Laboratory of Medical Zoology (Chief: Dr. Akifumi HAYASHI), Institute of Public Health, Chiba, Japan

\*3 篠永 哲・加納六郎・林晃 史: Department of Medical Zoology (Chief: Prof. Rokuro KANO), Faculty of Medicine, Tokyo Medical & Dental University (Tokyo Ika Shika Daigaku)

\*4 ジェフリー・ヒュー: Malaria Control Programme, Department of Medical Services, Kota Kinabalu, Sabah, Malaysia

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Table 1. LD<sub>50</sub> Values of 6 insecticides in the Adult Female Houseflies in Borneo

Insecticides Strains	LD <sub>50</sub> value ( $\mu\text{g}/\text{fly}$ )					
	DDT	Chryson	DDVP	Baytex	Sumithion	Diazinon
Kota Kinabalu (market)	1.775	0.0161	0.062	0.066	0.112	0.019
Ranau (dump)	0.445	0.0275	0.057	0.024	0.155	0.017
Kuching (market)	1.120	0.022	0.245	0.041	0.096	0.038
Kuching (dump)	0.815	0.0092	0.172	0.038	0.275	0.239
Takatuski	42.362	0.017	0.124	0.114	0.102	0.298

The levels of resistance were determined by the topical method of application. The female flies (body weight 21 to 23 mg) were anaesthetized by carbon dioxide, and 0.5  $\mu\text{g}$  of the diluted insecticides was applied to the scutum of the fly. The treated flies were then transferred to the clean containers provided with cotton balls soaked with sugar water for mortality counts over a period of 24 hours under a constant temperature of 25°C. Twenty females were used for each concentration and the same tests were conducted 3 times. As a control, acetone was used in the same way.

#### RESULTS AND DISCUSSION

The results of the tests on the Borneo strains of housefly are shown in Table 1. The results with each insecticide are as follows:

**DDT:** The LD<sub>50</sub> values were remarkably lower than that of the Takatsuki strain (42.362  $\mu\text{g}/\text{fly}$ ). Compared with the strains of the other countries, Indonesia (0.406–7.251  $\mu\text{g}$ ), Philippines (0.251–3.46  $\mu\text{g}$ ), Malaysia (0.565–1.585  $\mu\text{g}$ ) and Singapore (0.63–0.85  $\mu\text{g}$ ), the values of the Borneo strains (0.445–1.775  $\mu\text{g}$ ) were comparatively lower than those of the Indonesian and Philippine strains, but not remarkably different from the West Malaysia and Singapore strains.

**Chryson:** The LD<sub>50</sub> values were 0.0092–

0.0275  $\mu\text{g}$  per fly. These values were not remarkably different from those of the Takatsuki (0.017  $\mu\text{g}$ ) and Singapore strains (0.011–0.014  $\mu\text{g}$ ). There are no reports on the resistant levels to Chryson in the other countries.

**DDVP:** The LD<sub>50</sub> value was the highest at Kuching (market) (0.245  $\mu\text{g}$ ) and lowest at Ranau (0.057  $\mu\text{g}$ ). The value at Kuching was higher than that of the Takatsuki strain (0.124  $\mu\text{g}$ ), but the range between the highest and lowest in each country was not remarkably different from the Borneo strains, except in the case of the Indonesian strains (0.007–0.094  $\mu\text{g}$ ). The values in each country were as follows: Philippines (0.0301–0.354  $\mu\text{g}$ ), Malaysia (0.032–0.136  $\mu\text{g}$ ) and Singapore (0.046–0.103  $\mu\text{g}$ ).

**Baytex:** The LD<sub>50</sub> of Baytex were from 0.024 (Ranau) to 0.066  $\mu\text{g}$  (Kota Kinabalu). This values were not markedly different from those of the market and dump of Kuching, Sarawak, and showed a little higher susceptibility than that of the Takatsuki strain in Japan. However, comparing with the results of the survey in the other Asian countries, the Borneo strains were a little more susceptible than those of the urban strains, Jakarta (0.094–0.143  $\mu\text{g}$ ), Manila (0.032–0.199  $\mu\text{g}$ ) or Singapore (0.112  $\mu\text{g}$ ).

**Sumithion:** The values of LD<sub>50</sub> were be-

tween 0.096 (market, Kuching) and 0.275  $\mu\text{g}$  (dump, Kuching), and the value at the dump was about 3 times that at the market. The  $\text{LD}_{50}$  value at the market was higher than that of the Takatsuki strain but still susceptible to Sumithion.

Recently, the  $\text{LD}_{50}$  value of Sumithion is increasing in the housefly colonies in many countries, especially in Japan. According to Yasutomi (1975),<sup>3)</sup> the  $\text{LD}_{50}$  value of Sumithion at the garbage dump of Tokyo bay (3rd Yumenoshima) was 54.9  $\mu\text{g}$  per fly. The housefly colony in Tokyo bay in 1965 was 0.13  $\mu\text{g}$  and the value increased about 400 times during the last 10 years (Yasutomi, 1975).

Among the Asian countries, the strain in Kuala Lumpur showed the highest value (6.132  $\mu\text{g}$ ) but the other strains in Asia were not markedly different from the Borneo strain.

**Diazinon:** The  $\text{LD}_{50}$  value of Diazinon were from 0.017 (Ranau dump) to 0.239  $\mu\text{g}$  per fly (Kuching dump). All the Borneo strains were showed higher susceptibility than that of the Takatsuki strain in Japan.

From the overall point of view, the susceptibility levels to the insecticides in the housefly strains in Borneo were comparatively higher for the tested insecticides than the Japanese strains. They do not increase the resistant levels because no insecticides were sprayed for the purpose of housefly control in this area. However, if they use much insecticides for fly control without planning, the Borneo houseflies will increase their resistance in the future as in the case of the Japanese houseflies. Therefore, a counterplan must be considered to check the in-

crease of resistance. Planned spraying and selection of insecticides should be introduced for housefly control in Borneo in the future.

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