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

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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,1) New Guinea,2) Philippines,3) Malaysia4) and Singapore5) 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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Table 1. LD$_{50}$ Values of 6 insecticides in the Adult Female Houseflies in Borneo

<table>
<thead>
<tr>
<th>Insecticides</th>
<th>LD$_{50}$ value (µg/fly)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DDT</td>
</tr>
<tr>
<td>Kota Kinabalu (market)</td>
<td>1.775</td>
</tr>
<tr>
<td>Ranau (dump)</td>
<td>0.445</td>
</tr>
<tr>
<td>Kuching (market)</td>
<td>1.120</td>
</tr>
<tr>
<td>Kuching (dump)</td>
<td>0.815</td>
</tr>
<tr>
<td>Takatsuki</td>
<td>42.362</td>
</tr>
</tbody>
</table>

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 µg 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$_{50}$ values were remarkably lower than that of the Takatsuki strain (42.362 µg/fly). Compared with the strains of the other countries, Indonesia (0.406–7.251 µg), Philippines (0.251–3.46 µg), Malaysia (0.565–1.585 µg) and Singapore (0.63–0.85 µg), the values of the Borneo strains (0.445–1.775 µg) 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$_{50}$ values were 0.0092–0.0275 µg per fly. These values were not remarkably different from those of the Takatsuki (0.017 µg) and Singapore strains (0.011–0.014 µg). There are no reports on the resistant levels to Chryson in the other countries.

**DDVP:** The LD$_{50}$ value was the highest at Kuching (market) (0.245 µg) and lowest at Ranau (0.057 µg). The value at Kuching was higher than that of the Takatsuki strain (0.124 µg), 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 µg). The values in each country were as follows: Philippines (0.0301–0.354 µg), Malaysia (0.032–0.186 µg) and Singapore (0.046–0.103 µg).

**Baytex:** The LD$_{50}$ of Baytex were from 0.024 (Ranau) to 0.066 µg (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 µg), Manila (0.082–0.199 µg) or Singapore (0.112 µg).

**Sumithion:** The values of LD$_{50}$ were be-
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tween 0.096 (market, Kuching) and 0.275 μg (dump, Kuching), and the value at the dump was about 5 times that at the market. The LD_{50} value at the market was higher than that of the Takatsuki strain but still susceptible to Sumithion.

Recently, the LD_{50} value of Sumithion is increasing in the housefly colonies in many countries, especially in Japan. According to Yasutomi (1975),^3^ the LD_{50} value of Sumithion at the garbage dump of Tokyo bay (3rd Yumenoshima) was 54.9 μg per fly. The housefly colony in Tokyo bay in 1965 was 0.13 μg 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 μg) but the other strains in Asia were not markedly different from the Borneo strain.

**Diazinon:** The LD_{50} value of Diazinon were from 0.017 (Ranau dump) to 0.239 μg per fly (Kuching dump). All the Boreno 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 increase of resistance. Planned spraying and selection of insecticides should be introduced for housefly control in Borneo in the future.

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**References**


