

RESISTANT LEVEL OF HOUSEFLIES TO SIX KINDS OF SYNTHETIC INSECTICIDES IN MALAYSIA*¹

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ABSTRACT

The resistant level of the houseflies to six kinds of insecticides, DDT, Resmethrin, DDVP, Baytex, Sumithion and Diazinon, was examined on the seven strains collected in Malaysia. It was found that their susceptibility is rather higher than that of the Takatsuki strain which is a standard strain in Japan. However, their susceptibility to Sumithion was the same or slightly lower than that of the Takatsuki strain. The resistant level to five of six kinds of insecticides was the highest in the strain of Cameron Highland. The values were close to Singh's data in 1973, and this means that the resistance of the houseflies to the insecticides is increasing in Malaysia.

INTRODUCTION

There are only a few reports on the resistance of houseflies to the insecticides in the South Pacific area and Southeast Asia. Hooi et al. (1970) reported on the housefly problem in Cameron Highland in Malaysia and Singh (1973) reported on the susceptibility of the houseflies in Malaysia. Kano et al. (1974) and Hayashi et al. (1974) reported on the resistant level of the houseflies collected in Indonesia and New Guinea. In 1977, Kano et al. reported on the resistant level of the houseflies to several kinds of insecticides in the Philippines.

According to Hooi and Singh, the resis-

tance of the houseflies in Cameron Highland has increased and is a big problem in Malaysia. On the contrary, the houseflies in Indonesia, New Guinea and the Philippines showed a higher susceptibility to most of the insecticides than the Japanese strains. The authors obtained seven housefly strains in Malaysia in October 1975 and examined the resistant level to six kinds of insecticides in order to obtain the basic data for housefly control in Malaysia.

MATERIALS AND METHODS

Houseflies: The houseflies used in this study were collected from seven areas in Malaysia. These were kept in plastic cups;

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Table 1. Localities and dates of housefly strains collected in Malaysia

No. of strain	Place	Date
1.	Cameron Highland Farm	24 October, 1975.
2.	Incinerator	//
3.	Singlet	//
4.	Tapah	27 October, 1975.
5.	Kuala Lumpur Market	25 October, 1975.
6.	Port Klang	//
7.	Ampang Village	//

Table 2. LD₅₀ values of the adult female houseflies in Malaysia to six kinds of insecticides ($\mu\text{g}/\text{fly}$)

Strain	Insecticide	DDT	DDVP	Baytex	Sumithion	Diazinon	Resmethrin
No. 1	Cameron Highland	1.585	0.136	0.141	0.151	0.083	0.0157
No. 2	//	1.290	0.108	0.112	0.251	0.103	0.0921
No. 3	//	0.910	0.033	0.068	0.166	0.029	0.0280
No. 4	Tapah	0.565	0.039	0.053	0.178	0.022	0.0120
No. 5	Kuala Lumpur	1.000	0.043	0.046	6.132	0.021	0.0130
No. 6	Port Klang	0.675	0.032	0.029	0.101	0.005	0.0084
No. 7	Ampang Village	1.510	0.145	0.035	0.105	0.076	0.0088
	Takatsuki	43.36	0.124	0.114	0.102	0.298	0.017

5 cm in diameter and 10 cm in height, with breeding media. The eggs laid on the media were transferred to 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 then subjected for study.

The sites and dates of collection of the houseflies are shown in Table 1. The Takatsuki strain was used as a standard strain for comparing the resistant level with the Malaysian strains by the same method simultaneously.

Insecticides: The insecticides used in this study were as follows: DDT (technical), Resmethrin (purity 91.90%, 5-benzyl-3-furylmethyl-(\pm)-cis, trans-chrysanthemate), DDVP (purity 97.6%, 0,0-dimethyl 0-(2,2-dichlorovinyl) phosphate), Baytex (purity 99.2%, 0,0-dimethyl 0-((4-methyl mercapto 3-methyl) phenyl) phosphorothioate), Sumi-

thion (purity 98.6%, 0,0-dimethyl 0-(3-methyl-4-nitrophenyl) phosphorothioate) and Diazinon (purity 99.6%, (0,0-diethyl 0-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate)).

Method: Each insecticide was diluted with acetone to the required concentration. The level of resistance was determined by the topical application method. The female flies (body weight 21–23 mg) were anesthetized with carbon dioxide, and 0.5 μl of the diluted insecticide was applied to the scutum of the fly. The treated flies were then transferred to clean vessels with cotton balls soaked in sugar water. Mortality counts for 24 hours under a constant temperature of 25°C were made. Twenty females were used for each concentration and the same tests were conducted three times. As a control, acetone was used in the same way.

RESULTS AND DISCUSSION

The results of the tests on the Malaysian houseflies with six kinds of insecticides are shown in Table 2.

The susceptibility to DDT was the highest in a strain of Tapah and the LD₅₀ value was 0.565 μg per fly. The lowest was in a strain of Cameron Highland (No. 1) and the value was 1.585 μg . The ratio of the highest value to the lowest one was 1 to 2.8, and there was a little difference among the values in each strain. No strain showed a higher LD₅₀ value than that of the Takatsuki strain, 43.36 μg . This means that the resistance to DDT in the Malaysian houseflies is not increasing like the Indonesian (Kano et al., 1974) and the Philippine houseflies (Kano et al., 1977).

With Resmethrin, the highest susceptibility was shown in the strain of Port Klang (0.0084 μg) and the lowest one was in that of Cameron Highland (No. 2) where the LD₅₀ value was 0.0921 μg . The LD₅₀ value of the Cameron Highland strain showed a higher value than that of the Takatsuki strain (0.017 μg). The highest value was 10.96 times that of the lowest one. It is assumed that the tolerance of the No. 2 strain of Cameron Highland to Resmethrin is increasing.

The susceptibility to DDVP was the highest in a strain of Port Klang (0.032 μg) and the lowest was in that of Ampang Village (0.145 μg). The highest susceptibility to DDVP among these strains was 4.5 times that of the lowest one. The LD₅₀ values of the strain of Ampang Village and of Cameron Highland (No. 1) were close to those of the Takatsuki strain, and strains of Indonesia (Jakarta) and the Philippines (Manila, Davao and Baguio) which was reported by Kano et al. in 1977. The results with DDVP also resemble the data of

the report of Singh (1973) who reported on the resistant level of houseflies of Port Klang, Ampang Village and Cameron Highland.

The LD₅₀ values with Baytex were from 0.029 μg (Port Klang) to 0.141 μg (Cameron Highland, No. 1). The value of Cameron Highland No. 1 strain was about 4.8 times that of Port Klang and higher than that of the Takatsuki strain. The results were close to those of the Indonesian and Philippine strains as with DDVP.

With Sumithion, the LD₅₀ values were between 0.101 μg (Port Klang) and 0.251 μg (Cameron Highland, No. 2). The values were close to that of the Takatsuki strain.

The LD₅₀ values with Diazinon were 0.005 to 0.103 μg . The highest and lowest values were in the strain of Port Klang and Cameron Highland No. 2, respectively, like with Sumithion. The LD₅₀ value of the strain of Cameron Highland No. 2 was about 21 times that of Port Klang. If the Port Klang strain is assumed as the standard strain with Diazinon, the Cameron Highland No. 2 strain is a resistant strain. However, all the strains in Malaysia showed a higher susceptibility than that of the Takatsuki strain, the LD₅₀ value of which was 0.298 μg . In the present time, the resistant level to Diazinon has not been increasing in the houseflies of Cameron Highland. It is interesting that the susceptibility to Diazinon is close to that of Resmethrin.

CONCLUSION

As discussed above, the LD₅₀ value of each strain in Malaysia was lower than that of the Takatsuki strain. Among the strains in Malaysia, the Port Klang strain was highly susceptible to almost all insecticides and the Cameron Highland strains showed a comparatively lower susceptibility than the other strains in Malaysia.

REFERENCES

- 1) Hooi, C., Keiding, J., Singh, I., and Sta, M.: Susceptibility studies on the Housefly, *Musca domestica* L. Southeast Asian J. Trop. Med. Pub. Hlth., 1: 304, 1970.
- 2) Hayashi, A., Hatsukade, M., Shinonaga, S., and Kano, R.: The resistant Level of the Houseflies to Several Synthetic Insecticides in Indonesia. Botyu-Kagaku, 39: 88-91, 1974.
- 3) Hayashi, A., Hatsukade, M., Shinonaga, S., and Kano, R.: The resistant Level of the Houseflies to Several Synthetic Insecticides in New Guinea. Botyu-Kagaku, 39: 115-117, 1974.
- 4) Singh, I.: Evaluation of Insecticides against Four strains of the House fly, *Musca domestica* L. from West Malaysia. Southeast Asian J. Trop. Med. Pub. Hlth., 4: 554-559, 1973.
- 5) Kano, R., Hayashi, A., Hatsukade, M., Shinonaga, S., Saroso, J. S., and Koiman, I.: The Resistant Levels of the Houseflies to Several Synthetic Insecticides in Indonesia. Japan. J. Trop. Med. Hyg., 2: 53-58, 1974.
- 6) Kano, R., Cabrera, B. D., Hayashi, A., and Shinonaga, S.: Resistant Levels of the Houseflies to six Kinds of Insecticides in the Philippines. Southeast Asian J. Trop. Med. Pub. Hlth., 8: 515-518, 1977.