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RESIDUAL AND AIR - BORNE EFFECTS OF PIRIMIPHOS - METHYL ON DIFFERENT SURFACES IN SOUTH OF IRAN

H. Ladonni [1], PhD ; M . Motabar [1], MD , PhD ; M. Iranpour [1], MSPH

Key Words : *Pirimiphos- methyl, Residual effect, Air-borne effect, Iran.*

ABSTRACT

An investigation was made to study the residual activity and air- borne effect of pirimiphos- methyl, at 2g a.i./m^2 in hut scale trials on different surfaces in kazeroun, and Bandar-Abbas, south of Iran. In kazeroun area, bio-assay contact mortality test with pirimiphos- methyl on mud, wood, cement and plaster surfaces, 54 days after hut spraying, decreased from 100% to 46.7%, 61.25%, 36.6% and 40%, respectively. In Bandar-Abbas area, after 72 days of hut spraying, the mortalities on cement and plasters surfaces decreased from 100% to 63. 4% and 45. 4%, respectively.

The fumigation effect of pirimiphos-methyl on mud and plaster walls with wooden ceiling were studied in Kazeroun. The activity of pirimiphos- methyl on mud and plaster surfaces dropped from 100% to 52% and 46.53% after 54 days of hut spraying respectively. The results suggested that pirimiphos-methyl has effective contact and vapour effect at least for about 50 days on different surfaces in south of Iran.

1- Medical Entomology Department, School of Public Health, Tehran University of Medical Sciences. P.O. Box 6446-14155, Tehran, Iran.

Introduction

There is a continuing need for testing new chemical insecticides for vector control because of development of physiological resistance to some of currently used insecticides.

In southern Iran *Anopheles stephensi* Liston is known to be resistant to DDT, dieldrin and malathion (6). After appearance of malathion resistance in *An. stephensi,* propoxur as a residual insecticide was substituted in south of Iran in 1978. However no resistance has been detected in *An. stephensi* to this latter insecticide, so far.

Village-scale trials followed by large-scale trials of pirimiphos-methyl as an adulticide in malaria control programmes have been conducted in a number of countries (1,2,3,7,8).

A village- scale trial of pirimiphos- methyl in central Java, Indonesia, indicated that 2 g/m^2 of pirimiphos-methyl was effective on vector population for about 12 weeks. Fumigation studies showed that this compound has an air-borne effect for nine weeks in sprayed houses (8). Field evaluation of pirimiphosmethyl for malaria control was carried out in Triap (during 1981-84) and Phulbani districts (during 1984-85), in India. Entomological assays indicated that 2 g/m^2 of pirimiphos-methyl had a great effect in reduction of vector population densities, at least for 2 months (2,3).

This report is dealing with the residual activity of pirimiphos-methyl (actellic) as a new insecticide on different surfaces in south of Iran in a hut-scale trial.

Materials and Methods

Pirimiphos-methyl (40% wettable powder) available under the trade name "actellic" was supplied by ICI Public Health, UK.

The bioassay mortality tests were simultaneously carried out in two different parts of Iran during summer 1991 as follows:

(1) Jadas village in kazeroun, south east of Iran (on different surfaces such plaster,

cement, wood and mud).

(2) Rudan village in Minab, costal area of Persian-Gulf (on Plaster and cement surfaces).

Bioassay tests were carried out with adults of *An. stephensi,* using the WHO standard method (9). The adults for bioassay tests were supplied from our insectaries in Kazeroun and Bandar-Abbas Training and Research Centres (KTRC & BTRC),

In order to investigate the contact effect of pirimiphosmethyl on different surfaces, the total number of 10 adult females of *An. stephensi* were released into each plastic chamber by means of an aspirator and held for 30 minutes (10 replicates). At the end of exposure time, the adults were transferred into clean paper cup and mortalities were recorded, following 24 hr of holding time.

The vapour toxicity of actellic in treated rooms was assessed only in Kazeroun, using a metal cylinder cage covered with metal mosquito netting with dimensions of 16 and 10 cm for height and diameter respectively (9).

Twenty five adult females of *An. stephensi* were released into each cage and the cages were hanged on the 4 different corners of ceiling, at distances of about 50 cm apart from the wall and ceiling for treated and untreated rooms. The vapour effect of pirimiphos-methyl on *An. stephensi* was studied, using mortality rates after 5 hr of exposure and 24 hr of holding time.

Results and discussion:

Mud surfaces:

The result of bio-assay tests with *An. stephensi* on mud surfaces in Kazeroun are shown in Fig 1 and table 1. The mortalities decreased from 100% to 63.3% and 46.7% after 47 and 54 days of pirimiphos-methyl spraying respectively.

Cement surfaces:

The residual effect of pirimiphos-methy on cement surfaces in Kazeroun and Bandar-Abbas are shown in Figs 1 , 2 and tables 1 , 2 respectively. In Kazeroun the mortalities dropped from 100% to 60% and 36.6% after 47 and 54 days of spraying, while in Bandar-Abbas, pirimiphos-methyl had longer residual effect, i.e. the activity decreased from 100 to 63. 4% and 31% after 72 and 83 days of hut spraying respectively.

Plaster surfaces:

The residual effect of actellic on plaster surfaces in Kazeroun and Bandar-Abbas are shown in Figs 1, 2 and tables 1, 2 respectively. In Kazeroun the morality fell from 100% to 56.6% and 40% , after 47 and 54 days of hut spraying respectively, while in Bandar-Abbas, actellic had longer activity, i.e. the mortality decreased from 100% to 57.3% and 45. 9% after 57 and 72 days of hut spraying respectively.

Wooden surfaces:

The residual effect of pirimiphos- methyl on wooden surfaces in Kazeroun are shown in Fig 1 and table 1. In Kazeroun, mortalities dropped from 100% to 61. 25% and 57. 5% after 54 and 61 days of hut spraying respectively.

Vapour effect:

The air borne effect of pirimiphos-methyl on different huts covered with mud

and plaster were studied in Kazeron. The results are shown in table 1 and Fig 3. In sprayed huts, the airborne toxic mortalities decreased from 100% to 76.17% and 52.5% for mud surfaces and 70. 58% and 46. 53% for plaster surfaces after 47 and 54 days of hut spraying respectively.

The air borne effect of pirimiphos-methyl on different hute covered with mud and plaster were studied in Kazeroun. The results are shown in table 1 and Fig 3. In sprayed huts, the airborne toxic mortalities decreased from 100% to 76. 17% and 52.5% for mud surfaces and 70.58% and 46. 53% for plaster surfaces after 47 and 54 days of hut spraying respectively.

The results indicated that pirimiphos-methly at $2g/m^2$ has contact and air-borne effect for about 50 days on different surfaces against *An. stephensi.*

Das and his co-workers (1) evaluated the residual effect of pirimiphos-methyl at a dosage of 1 g/m^2 against *An. stephensi* on different surfaces. Mortalities fell from 100% to 60.3%, 73 and 68. 9% after 2, 3 and 4 weeks of house spraying for plaster, cement and mud surfaces respectively. The Cross-resistance spectrum of pirimiphos-methyl has also been studied in adults and larvae of several organophorous resistant straim by Hemingway and her co-workers (4). Susceptipility tests indicated that there was no cross-resistance in *An. arabiensis* and *Culex quinquefasciatus* but only a slight cross-resistance was observed in *An. albimanus.* The studies on the cross-resistance spectrum of pirimiphos- methyl in a malathion resistant strain of *An.stephensi* from Bandar-Abbas, south of Iran has also indicated that there is no cross-resistance between malathion and pirimiphos-methyl in *An. stephensi*(5).

The residual activity of pirimiphos-methyl (25% W.P) at $2g/m^2$ was evaluated against *An. stephensi* in Pakistan (7). The mortalities reached to 75%, 100% 87. 5% after 63 days and 5%, 50% and 12.5% after 83 days of house spraying for mud, wood and cement respectively. Field evaluation of pirimiphos-methyl at 2 g/m^2 for control of malaria in Tripal district in India has shown that this insecticide caused 100% mortality on *An. philippinensis,* six weeks after house spraying (3).

Contact and air- borne bioassay tests on different surfaces, in south of Iran

indicated that, pirimiphos-methyl could cause more than 60% mortality on ***An. stephensi,*** up to 47 days after spraying on treated surfasces.

Because of Lack of any cross-resistance between malathion and pirimiphos-methyl in ***An. stephensi*** from Bandar-Abbas, The results suggest that pirimiphos-methyl with moderate residual activity and long lasting airborne effects at 2g/m2, could be a good candidate of malaria control in south of Iran, if short term control is desired.

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Table 1. Results of bioassay tests for contact and fumigation efficacy of pirimiphosmethyl ($2g/m^2$) on different surfaces in Kazeroun, south of Jran (1992)

Days after spraying	Contact (%mortality) *Surfaces*			Airborne (%mortality) *Sufaces*		
	Mud	Wood	Cement	Plaster	Mud	Plaster
5	100 (63)	100 (80)	100 (60)	100 (60)	100 (100)	100 (100)
12	100 (60)	100 (91)	100 (61)	100 (60)	100 (99)	100 (97)
19	100 (61)	100 (82)	100 (61)	100 (60)	100 (99)	100 (97)
26	93.4 (61)	100 (82)	90 (60)	93.4 (59)	100 (98)	100 (100)
33	83.6 (61)	100 (82)	81.9 (61)	86.6 (60)	100 100	100 (98)
40	72.1 (61)	100 (82)	68.8 (61)	68.2 (60)	80.6 (98)	75.2 (101)
47	63.3 (60)	76.8 (82)	60 (60)	56.6 (60)	76.17 (97)	70.58 (102)
54	46.7 (60)	61.25 (80)	36.6 (60)	40 (60)	52.5 (99)	46.53 (101)
61	18.03 (61)	57.5 (80)	5 (60)	10 (60)	22.22 (99)	16.5 (103)

The figures in the parentheses represesnt the number of mosquitoes tested.

Table 2. Results of bioassay tests for contact efficacy of pirimiphos-methyl (2g/m2) on plaster and cement surfaces in Bandar- Abbas, south of Iran (1992)

Days after spraying	Contact (%mortality) Surfaces	
	Cement	Plaster
10	100 (99)	100 (98)
20	100 (102)	100 (100)
32	100 (99)	100 (101)
42	95.8 (95)	76.2 (101)
57	86.7 (98)	57.3 (96)
72	63.2 (98)	45.9 (98)
83	31 (100)	31 (100)

The figures in the parentheses represent the number of mosquitoes tested

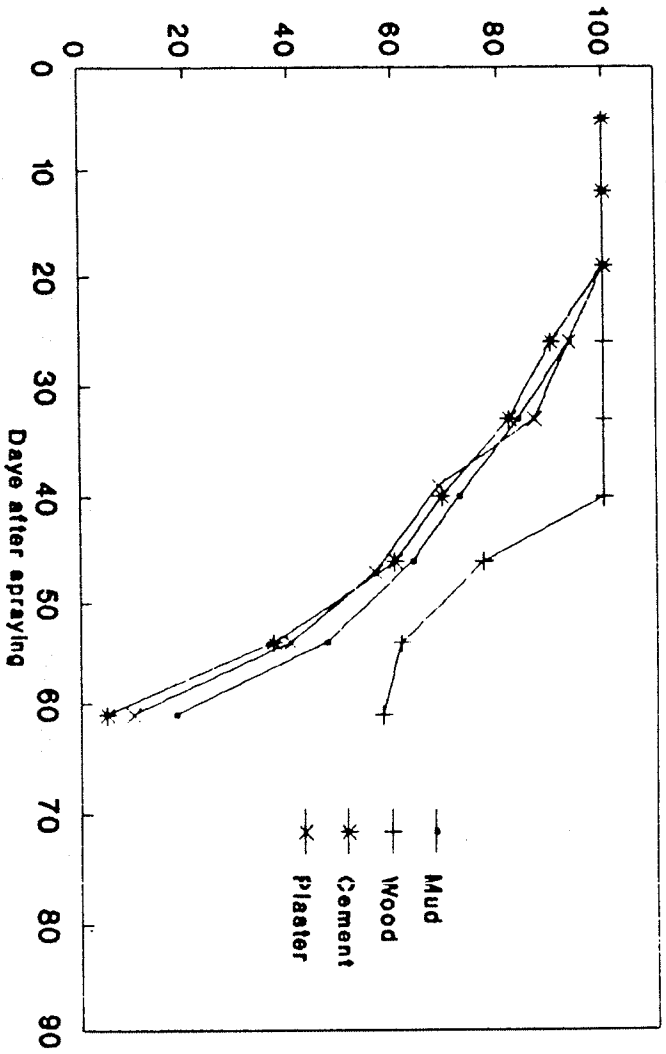
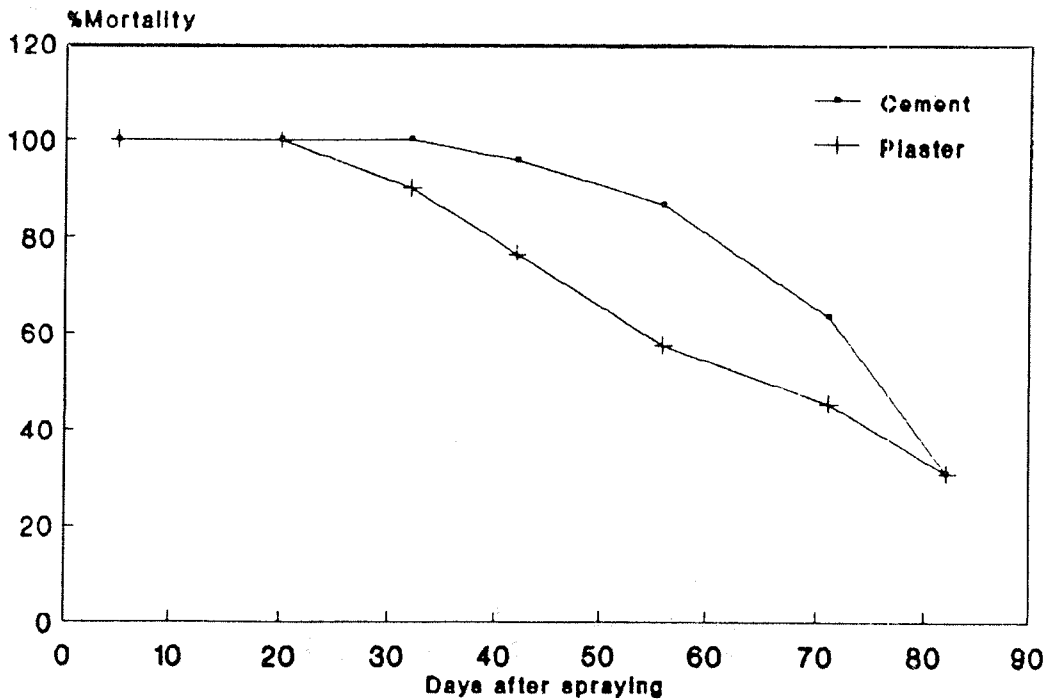


Fig 1. Result of bioassy tests for contact effect of pirimiphos-methyl on different surfaces in Kazeroun

Fig 2. Result of bioassy tests with pirimiphos-methyl on different surfaces in Bandar-abbas, south of Iran



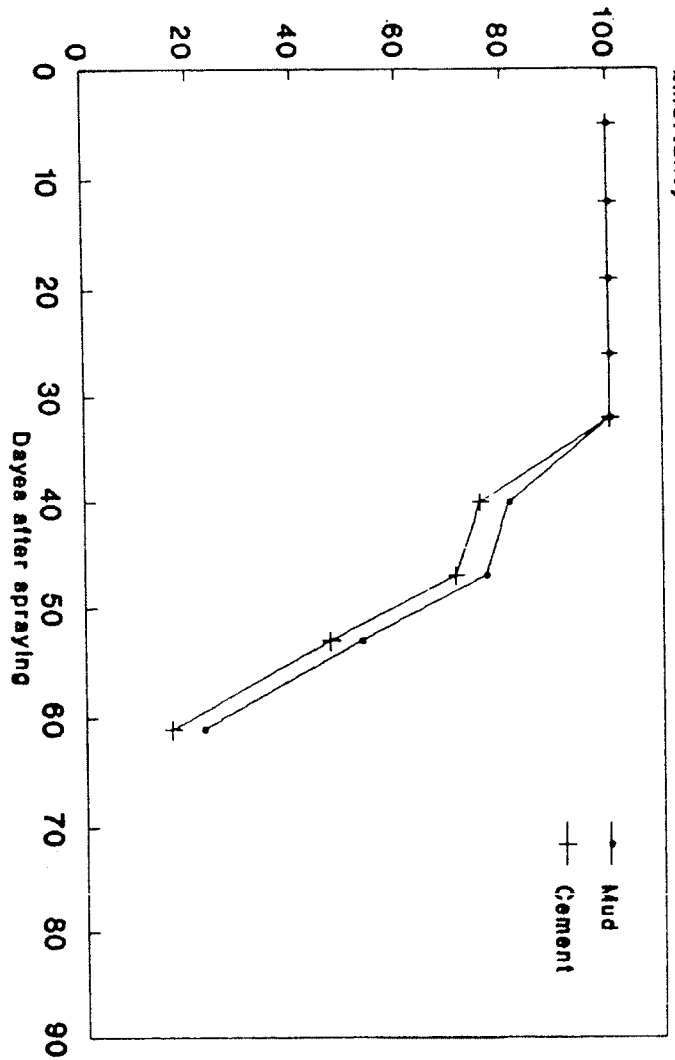


Fig 3. result of airborne effect of pirimiphos-methyl on different surfaces in Bandar-abbas, south of Iran