Field Trial Tests On The Efficacy And Residual Effects Of Bistar® 10wp On Mosquitoes And Other Household Arthropod Pests

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Abstract

A field test on the efficacy and residual effect of Bistar® 10WP on mosquitoes and other household arthropod pests was conducted at Agu-Owa and Ugbo-Oghe communities in Enugu East Local Government Area of Enugu State, Nigeria. Eighteen four-bedroom apartments noncontiguous with each other and infested with bedbugs and other homestead arthropod pests were selected for the studies from the two communities. In each area, Bistar® 10WP was sprayed in the inside wall surfaces of 3 four-bedroom apartments, lamba cyhalothrin (ICON), was sprayed in another set of 3 four-bedroom apartments and the last 3 houses were used as controls. Pre-and post insecticide application vector monitoring were carried out in the two areas to determine the homestead vector abundance. Insecticide bioassay was carried out to determine the residuality of Bistar® 10WP. Pre-insecticide application vector studies revealed 532 homestead arthropod pests with cockroaches 293(55.08%) and bedbugs 201(37.78%) constituting the bulk of the collections. Post-spray vector evaluation revealed no homestead arthropod in the sprayed areas except in the controls. Bioassay studies showed that Bistar® 10WP compared well with ICON in its efficacy and residuality. Bistar® 10WP was highly accepted by the people as it was odourless and non-irritating to the body and sense organs. More studies were recommended on its efficacy in controlling aquatic and field pests like Glossina species.

INTRODUCTION

Homestead arthropod pests constitute biting nuisance, noise and stinging annoyance contamination of human foods and drinks as well as transmission of public health diseases to man. Such diseases include malaria, typhus fever, dysentery and cholera, yellow fever, dengue haemorrhagic fever, and a host of other arboviruses. Organochlorine and organophosphate insecticides used in controlling them are not only highly toxic to man but they are also not easily biodegradable in the environment and sometimes infiltrate into the food chain (Hill, 1987). Consequently the pyrethrum and their synthetic analogues (pyrethroids) that are easily biodegradable, environmentally friendly and practically less poisonous to mammals are being developed for the control of these pests (Pfadt, 1985). Among these pyrethroids are the commonly used alletrin, permenthrirl and ICON (Iambda-cyhalothrin) (Lines et al 1985, 1987, Rozendeal, 1989). These insecticides are costly and not easily available to the general populace who need them for the control of these pests (Okigbo and Igwe, 2007). To improve the situation, effort is directed to development of new pyrethroids that are not only effective but are also cheap and easily available. Some new products such as Ultrad® and Talstar® have been developed and tested. Most recently, Bistar® 10WP is developed and is being tested.

The aim of the present study was to determine the efficacy and persistence of Bistar® 10WP as residual insecticide for the control of household arthropod pests.

MATERIALS AND METHODS

Bistar® 10WP is a wetable, colourless powder. It is odourless and non-irritating to both the body and sense organs. The active ingredients are Bifenthrin 10WP-10% and Inert ingredients-90%. Application was according to the manufacture's instruction. About 62.5g of the wetable power was dissolved in 10 litres of clean water in a Hudson sprayer tank. The inner surfaces of living and sleeping rooms were sequentially sprayed in overlapping vertical columns until the surfaces were covered with insecticide. Crevices of household furniture including mattresses and furniture edges were sprayed to control bedbugs.

PRELIMINARY STUDIES

Preliminary studies were conducted in two urban slums of Ugbo-Oghe and Agu-Owa, all in Enugu East Local Government Area of Enugu State. This was to determine the presence of household pests in the area. Houses with bedbugs, cockroaches and serious complaints of mosquito bites were specially selected.

SELECTION OF SPRAY SITES

Three noncontiguous houses with at least four rooms, each measuring approximately 12ft by 12ft were selected at Ugbo-Oghe. In the first house, 4 rooms with one or two of them having bedbugs as well as serious complaints of mosquito bites at night were chosen for spray of Bistar® 10WP. The second house with similar conditions as the first was sprayed with ICON as a standard residual pyrethroid. Another set of 4 rooms from the third house with similar conditions as the first and second houses were used as controls. The same design was replicated 3 times at Agu-Owa and Ugbo-Oghe respectively.

ETHICAL CONSIDERATIONS

The houses were chosen for the study based on their suitability and the consent of the residents. Before insecticide application, the occupants of the houses were properly informed about the insecticides, safety precautions and number of hours that must elapse before entering the houses. The occupants participated in moving out household furnitures, covering or removing food materials and cooking utensils as well as other household items. Control groups were later compensated by spraying their houses after the study period.

MONITORING OF INSECTICIDE ACTIVITIES

Visits were conducted to the spray sites daily to monitor the activities of the insecticides on the household pests. The occupants of the houses were interviewed on the possible adverse effects of the insecticides.

BIOASSAY STUDIES

Bioassay studies were carried out at bi-weekly intervals to determine the persistence of the insecticides on the wall surfaces. Three-day old colony-reared adult Aedes aegypti mosquitoes were exposed to the sprayed wall surfaces using the WHO standard bioassay test kits. A set of 60 adult mosquitoes (20 for control and 20 each for ICON and Bistar® 10WP sprayed walls), were used at every test. Each test was replicated twice at each occasion. At every test, the exposure of the mosquitoes to the wall surfaces lasted for 20 minutes. The insects were returned to the laboratory and watched for 24hr to determine the mortality rates after exposure.

RESULTS

PRELIMINARY STUDY

The preliminary study results revealed the abundance of homestead arthropod pests in the two urban slums (Table 1). A total of 532 arthropod pests were collected, 273(51.32%) from Ugbo-Oghe and 259(48.68%) from Agu-Owa. Bedbugs and cockroaches constituted a large bulk of the total collections in the two areas.

Figure 1

Table 1: Pre-spray collection of homestead arthropod pests at Agu-Owa and Ugbo-Oghe

Arthropods collected	Ugbo-Oghe	Agu-Owa	Total
Cockroaches	156	137	293
Bedbugs	96	105	201
Scorpions	2	0	2
Spiders	3	5	8
Houseflies	10	6	16
Mosquitoes	6	5	11
Centipede	0	1	1
Total	273(51.3%)	259(48.7%)	532

POST-SPRAY EVALUATION

Two days after spraying, collection of arthropod pests was carried out inside then sprayed rooms and the control rooms. None of the arthropod pests collected during the preliminary studies was collected in both places sprayed with either ICON or Bistar® 10WP. The only collections were from the control areas (Table 2).

Figure 2

Table 2: Post-spray collections of homestead arthropod pests at Ugbo-Oghe and Agu-Owa

Location	Arthropods collected	Bistar®	Treatments ICON	Control
Ugbo-Oghe	Cockroaches	-	-	10
	Budbugs	-	-	26
	Scorpions	-	-	-
	Spiders	-	-	2
	Houseflies	-	-	6
	Mosquitoes	-	-	2
	Centipedes	-	-	-
Agu-Owa	Cockroaches	-	-	13
	Budbugs	-	-	26
	Scorpions	-	-	-
	Spiders	-	-	4
	Houseflies	-	-	3
	Mosquitoes	-	-	3
	Centipedes	-	-	-
Total		0	0	99

BIOASSAY TEST

The mortality of mosquitoes exposed to ICON and Bistar®

10WP sprayed walls is shown in table 3. After 2 weeks, the mortality rates of 3-days old adult Aedes aegypti mosquitoes exposed to ICON and Bistar® 10WP sprayed walls were 68.89% for ICON and 67.22% for Bistar® 10WP. At 4 weeks, the mortality rates were 28.8% for ICON and 25.00% for Bistar® 10WP. By the end of 6 weeks, the mortality rate for both ICON and Bistar® was 13.06% respectively.

Figure 3

Table 3: Mortality rates of mosquitoes exposed to ICON and Bistar® 10WP sprayed-walls at Ugbo-Oghe and Agu-Owa at biweekly intervals

Period after spray	Insecticide sprayed	No of mosquitoes exposed	No of the deaths after 24hrs	% Mortality
2 weeks	ICON	360	248	68.89
	Bistar®	360	242	67.22
	Control	360	8	2.22
4 weeks	ICON	360	104	28.89
	Bistar®	360	90	25.00
	Control	360	0	0.00
6 weeks	ICON	360	47	13.06
	Bistar®	360	47	13.06
	Control	360	3	0.83

PERCEPTION OF THE OCCUPANTS OF SPRAYED HOUSES

The residents of the sprayed houses were overwhelmed with joy as they could sleep without mosquito and bedbug bites and disturbances. More surprising to all of them was that menacing cockroaches were wiped off. However residents in houses sprayed with ICON continued to complain of its irritation of the nose and eyes for the first two days. No such complaints were received from houses sprayed with Bistar®.

DISCUSSION

Bistar® 10WP compared well with ICON in its efficacy in knockdown and killing effects on the mosquitoes and other arthropod pests in the households. ICON is a pyrethrum-based standard insecticide used in common with permethrin, deltamethrin, resimethrin and other pyrethroids in mass malaria control programmes using insecticide impregnated bednets, 8 curtains for the control of mosquitoes in households (Sexton et al, 1990). Bistar® 10WP is also a pyrethrum based insecticide and like other pyrethroids, it has low mammalian toxicity, easily biodegradable without any record of insecticide resistance from insect vectors and pests (Snow et al., 1985). Unlike ICON which is irritating to the eyes and sense organs, Bistar® 10WP was highly accepted by the people as it was odourless and non-irritating to the sense organs. One hardly knew that an insecticide was sprayed in the area except by observing killed insects. Bistar® 10WP was also found as good as ICON in residuality indicating that Bistar® 10WP could be effective in preparation of insecticide impregnated bednets and curtains for the control of malaria and other vector-borne diseases. Many investigations have revealed that permethrin impregnated bednets and curtains have resulted in lower prevalence of malaria parasitaemia in children, fewer clinical episodes of fever, reduced spleen size and in some cases reduced malaria incidences and prevalence (Graves et al., 1987, Gouck et al., 1967 and Sexton et al., 1990). More studies is recommended on its effectiveness in aquatic conditions for the control of larval stages of mosquitoes and Simulium vectors of River blindness. It is also recommended for trial in field vectors such as Glossina species, houseflies and ticks.

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