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Short Communication

Potential of cypermethrin or diazinon and their combined action with piperonyl butoxide (PBO) against *Periplaneta americana* L

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Cockroaches are high priority urban pests because their aesthetically unappealing damage stored products and household goods and transmit diseases. (Ebeling, 1978). It becomes a public health problem due to their association with human waste and disease and their ability to move from sewers into homes and commercial establishment. They are well known pest of considerable economic and medical importance (Cameron, 1956). Cockroaches also a mechanical vector of several communicable diseases like gastroenteritis and food poisoning (Bitter, 1949; Eades *et al*, 1954) transmit *Bacillus staphylococci* poliomyelitis viruses and destructive mould (Sylverton *et al*., 1952; Morrel, 1991). There are almost 4,00 species of cockroaches (Service, 1980) . Among them American cockroach, *Periplaneta americana* L. is an obnoxious, omnivorous and filthy domestic pest of tropical zone

Various control measures has been applied to control cockroaches. Chemical control methods using synthetic insecticides has been conventionally used for controlling cockroaches in most part of the world (Pal, 1994; Schofield, 1993) but failure of the cockroaches control program is resistance of the insects due to repeated use of different insecticides. The development of resistance against insecticides by cockroaches and other arthropods of medical importance since 1960's have been later reported by the WHO (1985).Thus alternative cheaper vector control methods which require little or no soplusticated technology, but give excellent results (Minjas & Sarda, 1986). The present paper describes the effect of diazinon and cypermethrin and their combined action with a known synergist PBO against the American cockroach, *P. americana* under laboratory condition.

Bioassays were carried out by micro topical application using a Hamilton micro syringe (ml) with canulae (G 36X3) using the procedure of Georghiou & Bowen (1966), Heinrichs *et al* (1980), A micro-syringe calibration using mercury was done before the tests. Each bioassay included a minimum of five concentrations of insecticides and an acetone treated control. The mixture of inscticides and piperonyl butoxide (PBO) were used in different ratios(viz.1:1,1:2 and 1:5). Five-day-old adult cockroaches were used for bioassay. Treatment was made by applying 1.0 µl solution of test insecticides to the dorso-thoracic region of individual insect under anesthetic condition with five replications. After treatment the insects were placed in glass beakers (500 ml.) containing a small amount of food in an incubator at 30º C.

Initial bioassays were carried out to establish the effect of single treatment. It was observed that cypermethrin was more toxic than diazinon. The topical LD_{50} values of diazinon was 511.55 ng/insect where as it was recorded as 313.04 ng/insect in cypermethrin (Table 1). Ho *et al*, (1994) studied the toxicity of diazinon against the cockroach and reported that the diazinon was more effective to control cockroach. Lukua & Manokora (1997) studied the toxicity of some pyrethroid insecticides against the cockroach and reported that the cockroaches died immediately after application of permethrin.

Combining PBO both diazinon and cypermethrin indicated a synergistic action at 1:5 ratio followed by 1:2 and 1:1 ratios. The cotoxicity coefficient values also indicated that there was an increase in synergism with increase PBO ratios. The isobole for mixtures of both test insecticides with PBO are of similar shape indicating that a similar response was talking place. The effect of PBO to insects has been studied by several investigators. It is now generally recognized that PBO produces to synergistic effect by inhibiting the detoxifying enzymes within insect body (Casida, 1970; Davenport & Wright, 1985).

In the present investigation PBO increased the toxicity of both diazinon and cypermethrin against *P. americana.* This result therefore, suggests that inhibition of oxidative detoxification might be involved to some extent. The results of synergism are similar to those reported by Dai & Sun (1984), Chapman (1985) Meyer *et al*, (1987), Scott & Georghoiu (1986)

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Table 1. LD_{50}, regression equation, Co-toxicity coefficient (CC) of mixtures of cypermethrin or diazinon and piperonyl butoxide (PBO) at different ratios applied to *P. americana.*

Insecticide	LD_{50} (ng/insect)	Ratio Insecticide:PBO	Combined LD_{50} (ng/insect)	Insecticides LD_{5}(ng/insect)	PBO LD_{50} (ng/insect)	Cotoxicity Coefficient
Diazinon	511.56	1:1	911.17	455.50	455.50	112.305
		1:2	642.90	214.30	428.60	238.70
		1:5	630.61	105.10	525.50	486.718
Cypermethrin	313.04	1:1	141.83	70.917	70.917	372.33
		1:2	175.17	58.390	116.781	1475.00
		1:5	269.92	44.987	224.938	2840.74

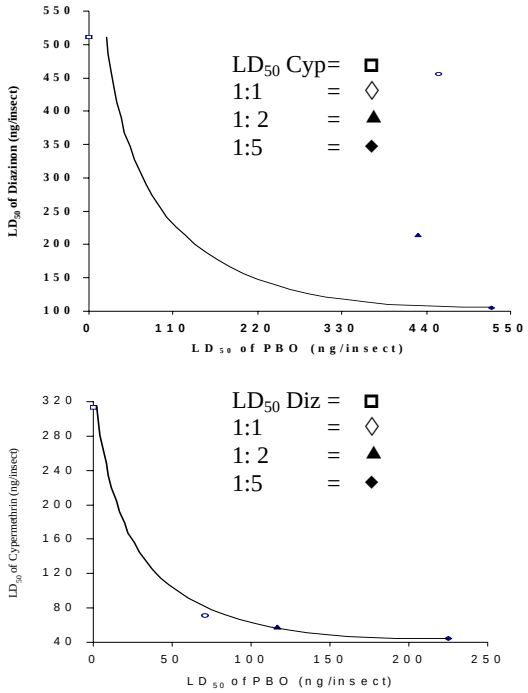

Fig.1: Isobolograms of diazinon (Above) and Cypermethrin (Below) with PBO against *P. americana* adults.

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