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PETKOLIN, A NEW OVICIDE WITH A SUMMARY ON OVICIDES AND PETKOLINS

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A summary of the toxicology of Petkolins and note on ovicides is given along with the finding that Petkolin A could be used as an ovicide against the mosquito, *Aedes aegypti* (L.).

The Petkolins (Petkolin A; Petkolin M, Petkolin S and Petkolin) which are chlorinated hydrocarbon (petroleum oil) type of insecticides [4–13,78–79] have proved effective pesticides against many arthropod pests in the laboratory as well as in the field, are comparatively safer for mammals and fish, and are also non-phytotoxic (Table 1).

Insect control requires striking the pest at the weakest link. Although the egg stage is most vulnerable in most cases it is the least studied one in the Arthropoda. We have studied in the laboratory the ovicidal properties of Petkolin against the mosquito, *Aedes aegypti*. In this insect the eggs are exposed to the toxic action of the ovicide, are susceptible to it, and a sufficient proportion of the population is exposed in the egg stage for treatment. Ovicides other than Petkolin are the dinitro compounds, petroleum oils, organophosphorous insecticides, chlorinated hydrocarbon and cyclodiene insecticides, carbamates, indopol polybutenes and various acaricides (Table 2).[1–3, 14–78, 81–91]

Material and Methods

The insect *Aedes aegypti* (L.) was reared in the insectary. *Aedes aegypti* eggs were taken from the insectary to test the ovicidal effect of Petkolin A. Different concentrations ranging from 0.005 to 0.05% of Petkolin A were prepared in water. A 2% stock solution of Petkolin A was prepared in acetone. From this stock solution further dilutions were prepared in 250 ml of water.

For dipping the eggs crystallizing dishes (size 10×5 cm) were used. Twenty five eggs of mosquito were dipped against each concentration of Petkolin A. Readings were taken after 24 hr. Each experiment was run in duplicate. All experiments were repeated ten times. Controls were also run for each experiment. The percent mortality was calculated by using Abbot's formula and L_c 95 (0.013) value was calculated by probit analysis (Fig. 1).

Results

Results with various concentrations are given in Table 3.

As a result of present investigation it is concluded that Petkolin A can be used effectively for the control of mosquito eggs. The concentration 0.025% of Petkolin A is most effective as it gives 100% mortality in case of mosquito eggs. No delayed hatching was observed.

TABLE 1.—TOXICOLOGY OF PETKOLIN.

Tested against	Remarks	References
Cotton aphid, *Aphis gossypii*	Petkolin A, Petkolin M and Petkolin S were tried against apterous agamic female. Petkolin S was as effective as BHC and more toxic than Endrin	4
White rats using Petkolin M	Much less toxic than BHC and DDT	13
Crop Pests: *Pyrilla, Bagrada picta,* maize borers, cotton jassids, cotton mites, grasshoppers (*Chrotogonus* sp.) *Plutella* sp. (caterpillars), cotton leaf rollers, cabbage butterfly, turnip hairy caterpillar, groundnut mites, potato jassids, wheat weevil, black ants, citrus leaf miner, date-palm scales, and date palm gall insects	Effective field control. Not phytotoxic against: Wheat (*Triticum aestivum* L); maize (*Zea mays* L.); sugar cane (*Saccharum officinarum* L.); cotton *Gossypium hirsutum* L.); tomatoes (*Lycopersicum esculentum* Mill.); cabbage (*Brassica oleracea* L.); beet roots (*Beta vulgaris* L.); bean (*Dolichos lablab* L.); mung bean (*Phaseolus aureus* Roxb.); smooth gourd (*Luffa aegyptiaca* Mill.); and pumpkin (*Cucurbita maxima* Duch.)	12, 9
Housefly, *Musca domestica* (L.)	The chlorinated fractions in the boiling range of 130–190°C were better insecticides than the lower boiling fractions	11
Albino rat	LD_{50} value for petkolin was 9000–1100 mg/kg by subcutanous injection	9
Cockroach, *Periplaneta americana;* mosquito, *Aedes aegyptii* larvae; and flies	Petkolin was more toxic than Makrolin against flies and mosquito larvae but less toxic against cockroaches	8,79,80,5–10

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TABLE 2.—COMMON OVICIDES.

Name	Tested against	Remarks	References
A. *Dinitro Compounds*			
DNOC	Several species of Lepidoptera, aphids, and the apple suckers, *Psylla mali*	0.025 to 0.1% of Na and K salts; applied as winter sprays to deciduous fruit trees	90,46
DNOC	Red-spider	pH of the spray solution important; ovicidal and phytotoxic activity increased under acidic conditions	25, 68
DNOC	*Ephestia*	100% mortality at pH 2 (undissociated) and no mortality at pH 5 (completely dissociated at pH 7)	36, 68
DNOCHP	Citrusred mite, rosy apple aphis and San Jose scale	In combination with petroleum oil in deciduous fruit orchards and citrus groves	20,22,37,59
DNBP	European red mite (Overwintering eggs)	Aqueous sprays on apple and other fruit trees	52
Dinitro-petroleum oil combination	European red mite and two-spotted spider mite	Dormant oil sprays prevented the build-up of a damaging midsummer population	26,27,28,64,3
The Dinitros	Pear psylla	Dormant sprays	50
DNOC and DNOCHP	Aphids	Dormant sprays against several species attacking deciduous fruit trees	26, 55
The Dinitros	Parasites (*Prospaltella perniciosi*) etc.	Destroyed overwintering stages of beneficial insects	16, 29
The Dinitros	Lepidoptera (*Pieris brossicae* etc)	Ovicidally effective; newly laid eggs are more easily killed	15,44,46,72,75
The Dinitros	Homoptera (Aphids)	Ovicides	26, 46
The Dinitros	Heteroptera (Hemiptera)	Ovicides	59, 75
The Dinitros	Coleoptera	Ovicides(in petroleum oil)	59
The Dinitros	Insects and mites	Accelerate O_2 uptake, uncouple oxidative phosphorylation and have a specific decreasing effect on the amino acid content of the poisoned insect	84, 21, 45, 58, 66, 18, 19, 17
DNOCHP	*Lygaeus* kalmii	78% mortality at pH 4 and 32% at pH 10	21
DNOC	*Selenia tetralunaria*	Na salt only slightly less toxic	45
B. *Petroleum Oils*			
,,	San Jose scale	Light lubricating oil emulsion	2
,,	Lepidoptera, Torticidae: grape berry moth, oriental fruit moth, codling moth, fruit tree leaf roller and red-banded leaf roller		84
,,	Miridae: apple red bug, *Lygidea mendax*	Egg embedded in the tissue of the host plant	84
,,	Phytophagous mites		30
	Peach tree borer, large milkweed bug, currant borer, green lacewing, corn earworm and European corn borer	Although oils are not commonly employed for control of these species. It is possible that paraffinic (chain) molecules form a better seal on the chorion of the egg than do naphthenic (ring) structures, resulting in greater interference in respiratory exchange	40,88,84,48, 83, 91

(*Continued*)

(Table 2 *Continued*)

C. *Organophosphorus Insecticides*			
Parathion	Peach tree borer, mexican bean beetle and southern armyworm	There is uptake of the ovicide from residual deposits on the bark by the chorion of the egg and susceptibility of the cholinesterase of the embryo to inlibition by the poison	84,82,70,85
Parathion	Currant borer	Seasonal control by a single application	89
Parathion and Malathion	Pear psylla	Early seasonal control	69
Organophosphates	Codling moth, oriental fruit moth, red-banded leaf roller, grape berry moth, plum curculo and cherry fruit fly		51,24,47,87,86, 77
,,	Aphids and mites	Also in combination with oil on deciduous fruit trees	65
Parathion	Two-spotted spider mite	A resistant strain developed, over 200 times, more resistant	1
Phosdrin	Cabbage looper, *Trichoplusiani*	Eggs more susceptible than larvae	61
Organophosphates	European corn borer, corn ear worm and large white butterfly	The use of systemics as ovicides deserves more attention	91,73,33,34,35
Parathion and Guthion	Pink bollworm	Better ovicides than certain chlorinated hydrocarbons	23
D. *Chlorinated Hydrocarbon and Cyclodiene Insecticides*			
DDT. Lindane and Endrin	Lepidopterous pests of cotton	Ovicidal activity at practical concentrations. Eggs continue developments death occurs at eclosion. They are nerve poisons	76
Aldrin and Dieldrin	*Metatetranychus ulmi*	Little value in field trials	62
E. *Carbamates*			
Carbaryl	Lepidoptera: oriental fruit moth cabbage looper and cotton pests	Embryonic development continues until eclosion when death occurs. They inhibit cholineterase of the nerve cord	24,61,76
F. *Indopol Polybutenes.*			
	European red mite, two-spotted spider mite and oriental fruit moth	Eggs on apple and pear hit by the lower viscosity compounds were killed by a physical entangling action. Resistance of a biochemical nature could not develop	41,54,84
G. *Acaricides*			
Tetradifon (Tedion)	Two-spotted spider mite	Treated females produce infertile eggs	53,56
Acaricides	Two-spotted spider mite	In a few cases the egg stage was the most susceptible but in most cases the least	39
DMC	Eggs and active stages of many species of mites	Has moderate residual action	68
Chlordenzilate	*Tetranychus urticae*	Equally effective against eggs, larvae and adults	43
Ovotran	Eggs and immature stages of mites	Ineffective to the adults. Long-lasting residual action	14,57,63
Chloroparicide	Acaricide	Primary ovicidal. Has limited systemic action and will penetrate through leaves	68
Sulfenone	mites	Commercially effective against both the egg and active stages	14,57, 63
Aramite	mites	Effective against eggs and active stages	14,57,63
Azobenzene	*Metatetranychus ulmi*	Azoxybenzene and hydrazobenzene are more toxic	38, 68
N, *N*-amyl, benzyl cyclohexylamine	*Metatetranychus ulmi*	Against eggs and adults	62

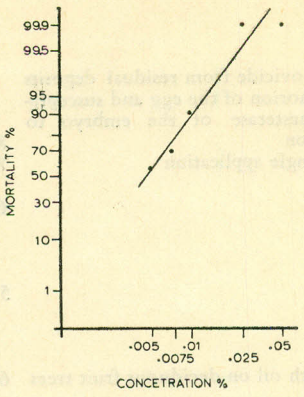

Fig. 1.

TABLE 3.—PERCENTAGE MORTALITY OF MOSQUITO EGGS WITH VARIOUS CONCENTRATIONS OF PETKOLIN A.

Temperature 93 °F; Humidity 58%; Readings taken after 24 hr.

Concentrations of Petkolin %	Number of egg treated	Numbers hatching	Percent mortality
0.005	25	9	55
0.0075	25	6	70
0.01	25	2	90
0.025	25	Nil	100
0.05	25	Nil	100
Control	25	20	—

As a result of present investigation Petkolin is recommended as a good ovicide for mosquitoes.

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