EFFICACY OF THREE PYRETHROIDS AS LARVICIDES AGAINST RICELAND MOSQUITO LARVAE IN FIELD PLOTS[1]

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Three pyrethroids were evaluated for larvicidal properties against *Psorophora columbiae* (Dyar & Knab) larvae in ricefield plots. The research was conducted in 1978 at the Rice Branch Experiment Station in Stuttgart, Arkansas. The insecticides investigated were Pydrin® 2.4 EC; decamethrin 2.5 EC; and permethrin 25% WP. Temephos served as the standard and was applied at 17.9 gm/ha. Pyrethroids have recently received considerable attention as adulticides; however, little is known of their efficacy and residual activity as larvicides. Pydrin® and permethrin are currently labeled for use against various agricultural or livestock insects. They offer promise as mosquito adulticides as does decamethrin. Should these compounds be used against mosquito adults it would be pertinent to know their effect on larvae since sprays used against mosquito adults are often applied over water containing larvae. No tests have been reported against *Ps. columbiae* larvae with pydrin and decamethrin.

METHODS

The application rates were: Pydrin® 2.4 EC applied at 5.6 gm/ha; decamethrin 2.5 EC applied at 0.56 gm/ha; and permethrin 25% WP applied at 5.6 gm/ha. Temephos served as the standard and was applied at 17.9 gms/ha.

The test plots were arranged in a randomized block. Each rice plot was approximately 6.096 m by 6.096 m from levee center to levee center. Water was maintained at an average depth of 10.16 cm on the growing surface and 22.86 cm in the levee ditch. The average volume of water treated was 2.824 cubic meters.

Three replications were made for each of the 4 insecticides in addition to untreated control plots. All formulations were applied by hand sprayer. The insecticide was mixed with water and applied at 4.2 liters total mixture per plot. The chemical, after vigorous mixing in the tank, was applied equally over the pan and levee ditch of the test plots.

Posttreatment bioassays were conducted in each plot at 24 hr, 48 hr, 72 hr, and 1 week. Bioassays on the temephos plots continued into a 2nd week since residual control occurred past the end of the 1st week. At the start of each bioassay, 10 field collected *Ps. columbiae* mosquito larvae in late 3rd or early 4th instar were placed in holding containers in each plot.

RESULTS

This study demonstrated that, except for Pydrin®, good to excellent initial kill was obtained; however, residual efficacy was limited.

Temephos provided 100% mortality through 72 hours. However, only 43% control was obtained 2 weeks posttreatment (Table 1). Pydrin® provided only 40% control 24 hr posttreatment, but had increasing effect through the 7th day posttreatment. Permethrin gave 86% initial kill at the 24 hr posttreatment, but showed little residual control after the 24 hr posttreatment test. The permethrin data agree with data reported by Thompson and Meisch (1978). Decamethrin

Table 1. Efficacy of temephos, Pydrin®, decamethrin, and permethrin against *Psorophora columbiae* mosquito larvae contained in rice plots, Stuttgart, Arkansas, 1978.

		Ave. % mortality of 3 replications days posttreatment			
Insecticide	Dosage	1	2	3	7
	gm ai/ha				
Temephos	17.90	100	100	100	80
Pydrin® 2.4 EC	5.60	40	20	53	66
Decamethrin 2.5 EC	0.560	100	80	100	23
Permethrin 25% WP	5.60	86	30	20	46
Control	—	0	10	0	0

[1] This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation for use by the U.S. Department of Agriculture nor does it imply registration under FIFRA as amended. Mention of a commercial or proprietary product does not constitute an endorsement of this product by the USDA. Published with the approval of the Director, Arkansas Agricultural Experiment Station, Fayetteville, Arkansas. This study was conducted under the auspices of S-122 a regional project aimed at management of riceland mosquitoes.

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gave excellent control through the 72 hr test, but became ineffective after 1 week. Although decamethrin was applied at a lower dosage than the other insecticides, it was the most active of the pyrethroids tested.

Against permanent water breeding mosquito species, long residual efficacy is usually desired. However, compounds that exhibit quick, short term effectiveness may sometimes be desired especially against floodwater species. These preliminary data suggest that rapid control can be acquired with permethrin and decamethrin. Additional research is certainly warranted on all the compounds.

Reference Cited

Thompson, G. D. and M. V. Meisch. 1977. Efficacy of permethrin as a larvicide and adulticide against ricefield mosquitoes in Arkansas. J. Econ. Entomol. 70:771–774.

ERADICATION OF THE BLACK FLY, *SIMULIUM NEAVEI*, FROM KENYA

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Prior to 1938 onchocerciasis and its vector, *Simulium neavei*, were unknown in Kenya, although Dry (1921) noticed that a small black fly was observed to bite people in the region of rivers and streams in the Kericho district, western Kenya, and stated that the local population attributed skin disease to the effects of the bite of the fly.

Onchocerca volvulus was identified later in a nodule by Dr. Geoffrey Timms (pathologist of the Medical Research Laboratory, Nairobi) and the presence of onchocerciasis in western Kenya was confirmed by Hawking (1939). Another focus of the disease was discovered in Kodera, South Nyanza, and McMahon (1940) carried out a comprehensive survey in a place where infection was so heavy that it was known as the "Valley of the Blind." A prolonged survey established the precise incidence of the disease and the distribution of the adult vector (*S. neavei*), but failed to discover its breeding place, which was suspected to be in rivers. The exact site remained a mystery. One river, the Riana south of Kisii, was dammed and its course diverted in order to expose the river bed and the base of waterfalls, but although larvae and pupae of other species were found, *S. neavei* was not included.

The war years (1939–1945) interrupted intensive investigations, although Dr. J. J. C. Buckley made restricted observations during this period. In an experiment carried out in 1943 he removed the riverine forest along the Yaba and Riana rivers in a minor, southern extension of the Kodera focus. This achieved complete eradication of *S. neavei* as no flies have been captured since that time (Buckley 1951).

Later, in 1946, intensive entomological investigations were resumed in Nyanza Province. It was thought at first that the essential first step was to find where *S. neavei* breeds, but an accidental occurrence made us anxious to start work immediately. In 1946, during the course of the first antimalarial campaign with DDT on a large scale in rural Africa, the emulsion had to be carried on donkeys across rivers and streams. On one occasion a donkey stumbled and the emulsion spilt into the river. We seized the opportunity to discover if the well-known breeding places of other *Simulium* species were eliminated and found that they had been completely destroyed. Accordingly, a small pilot scheme was instituted in the Kodera district, which entailed dosing the rivers Sanda and Kitare in the Valley of the Blind with DDT at the rate of 2.5 p.p.m.[2] for periods of 30 min. for a total of 13 applications, between January and June, 1946. The last adult fly was captured on 23 March, and none has been caught since. Eradication was thus achieved in this focus.

This result made it certain that *S. neavei* bred in rivers, and with this knowledge we decided to treat one of the larger foci. The Kakamega/Kaimosi area in North Nyanza was chosen. The first attempt was made in 1947 when all shaded rivers and streams in an area of 1500 sq. miles were treated with 11 applications of DDT at the rate of 1–2.5 p.p.m./30 min. However, *S. neavei* reappeared within a

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[2] River discharges were accurately measured with the use of Cipolletti weirs, and the concentration of DDT was precisely determined as a result.