

HOUSE—SCALE TRIALS OF ALPHAMETHRIN (OMS—3004)
AGAINST DDT RESISTANT *ANOPHELES ACONITUS* IN CENTRAL JAVA

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ABSTRAK

Uji coba racun serangga alphamethrin (OMS—3004) tingkat perumahan (Stage IV) telah dilakukan untuk menanggulangi vektor malaria *Anopheles aconitus* di desa Kaligading, Kecamatan Boja, Jawa Tengah. Alphamethrin 5 % disemprotkan pada permukaan dinding dengan dosis 100 mg/m² dan 200 mg/m². Penilaian entomologi dilakukan dengan cara pengujian hayati kontak langsung, kontak tidak langsung dan penangkapan *An. aconitus* di kandang pagi hari. *An. aconitus* penuh darah hasil penangkapan dipelihara selama 24 jam untuk diperiksa kematiannya.

Hasil pengujian hayati kontak langsung menunjukkan bahwa umur residu racun serangga alphamethrin adalah cukup baik pada permukaan bambu maupun kayu. Umur residu yang efektif (kematian > 70 %) adalah selama 25 minggu setelah penyemprotan dosis 100 mg/m² dan selama 29 minggu setelah penyemprotan 200 mg/m². Efek fumigasi racun serangga alphamethrin adalah sangat lemah baik pada penyemprotan dosis 100 mg/m² maupun pada 200 mg/m². Kematian *An. aconitus* hanya sebesar 2 % pada 4 hari setelah penyemprotan dosis 100 mg/m² dan 4 % pada 4 hari setelah penyemprotan 200 mg/m².

INTRODUCTION

DDT is no longer effective to control malaria in some regencies of the province of Central Java, because of resistance of the vector, *Anopheles aconitus* to this compound (O' Connors and Arwati, 1974). Therefore, other insecticides are being evaluated as alternative to DDT.

The insecticide evaluated in house-scale trials is alphamethrin (OMS—3004) 5 % wdp. at a dosage 100 mg/m² and 200 mg/m².

The trial was carried out in Kaligading village, subdistrict Boja, Kendal regency, Central Java, one of our routine trial villages for insecticide resting known as an area where

Anopheles aconitus is highly resistant to DDT. (2% mortality only). This village is located 32 km south west of Semarang at an elevation of about 390 m. Since 1979 this area was used as stage V control area for other insecticides, having 148 houses with a population of 664 and 14 cattle shelters.

The monthly mean temperature ranged from 23^o to 32^o C and the relative humidity from 61 to 85% during the day.

MATERIAL AND METHOD

Insecticide applications.

Alphamethrin 5% wdp. was ap-

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plied to two houses which have cattle shelters inside at a dosage of 100 mg/m² and in another two houses with cattle shelters at a dosage of 200 mg/m². For each treatment, there was one reserved house for entomological evaluation. The houses and cattle shelters were sprayed inside to a height of 3 m, including the undersides of furniture, shelves and other horizontal surface. Outside walls were sprayed to the same height when protected by roof overhanging 1 m or more, and eaves were sprayed from the outsides to height of 3 m. The spraying was conducted on 29 September 1983.

All spraying was done by experienced sprayman, under close supervision, using Hudson X—Pert^R compression sprayers fitted with pressure gauges and Teejet^R 8002 HSSE nozzle tips having discharge of 750 ml/min at 40 psi. The spraymen wore overalls, ankle-length canvas shoes, semi-hard hat, surgical masks and uniform. Hands and face were washed with soap and water after each pump charge.

Entomological evaluation.

The entomological evaluations on house-scale trial were done to determine the duration of the residual effect and airborne effect. The evaluations were conducted in the morning, fortnightly, consisting of contact and air bioassay test by standard WHO methods (Anonymous, 1975), using laboratory reared blood fed *An. aconitus*.

Contact bioassays were carried out on wood and bambo surfaces, 5 cones with 10 — 15 mosquitoes per-cone in each sprayed surface exposed for 30 minutes and 2 cones in each unsprayed surface for the check.

In air bioassay test, two cages (12 cm³) with 20 — 25 mosquitoes per-cage were hung for 4 hours in corners of rooms of houses sprayed 50 cm from the ceiling and walls. Similarly, in the control two cages were placed in one unsprayed house.

Mortality counts were made after 24 hours for both types of bioassays. All bioassay results are presented as percent mortalities in individual tests.

Hand catches of anophelines resting in each treated and untreated cattle shelter were made 15 minutes for each hour from 07.00 — 11.00 and all blood fed *An. aconitus* held for 24 hours before mortality was assessed.

RESULT

Insecticide applications.

The formulation presented no mixing problems, no application problems and the suspensibility was good. There were no toxicological problems to the spraymen, inhabitants or the domestic animals.

Entomological evaluations.

Results of bioassay test for all treatment are shown in Table 1 and Table 2. Mortalities of 70% or more on contact bioassay test were maintained for 25 weeks on all surfaces treated with 100 mg/m² (Table 1) and for about 29 weeks on all surfaces treated with 200 mg/m² (Table 2).

Bioassays of the airborne effect of alphamethrin showed only 2% mortalities at dosage 100 mg/m² and only 4% mortalities at dosage 200 mg/m² four days after spraying.

The result of anophelines collec-

Table 1. Percentage mortality of *An. aconitus* in bioassay test in house-scale trial with alphamethrin 5% dosage 100 mg/m².

Days after spraying	Contact bioassay ¹		Air bioassay ¹
	Wood	Bamboo	
4	97,2(70)	95,4(63)	2,(50)
18	97,1(68)	96,8(62)	2(50)
32	97,1(67)	97,1(68)	
46	94,6(71)	98,6(74)	Discontinued
60	90,6(68)	88,0(66)	
74	90,6(68)	85,3(64)	
88	93,3(70)	70,6(53)	
102	92,0(69)	84,0(63)	
116	96,0(72)	72,0(54)	
130	91,0(51)	59,6(31)	
144	68,2(43)	70,0(42)	
159	87,8(58)	78,6(48)	
172	79,1(57)	68,8(42)	
186	38,2(71)	76,6(46)	
200	76,0(57)	74,6(56)	

¹ Number of mosquitoes tested in parenthesis.

Table 2. Percentage mortality of *An. aconitus* in bioassays test in house — scale trial with alphamethrin 5% dosage 200 mg/m².

Days after spraying	Contact bioassay ¹		Air bioassay ¹
	Wood	Bamboo	
4	97,2(70)	97,2(70)	4(50)
18	97,1(67)	95,5(64)	4(50)
32	100,0(72)	100,0(66)	
46	100,0(72)	100,0(72)	Discontinued
60	100,0(75)	98,6(74)	
74	100,0(75)	90,6(68)	
88	100,0(75)	93,3(70)	
102	100,0(75)	93,3(70)	
116	100,0(75)	93,3(70)	
130	96,8(61)	95,0(58)	
144	100,0(63)	100,0(56)	
159	91,8(56)	96,5(56)	
172	94,9(56)	98,3(51)	
181	98,0(56)	100,0(54)	
200	100,0(75)	96,(72)	

¹ Number of mosquitoes tested in parenthesis.

Table 3. *An. aconitus* fed collected in cattle shelters treatment with 100 mg/m² and 200 mg/m² and in unsprayed cattle shelter and percentage mortality after holding for 24 hours.

Days after spraying	100 mg/m ²		200 mg/m ²		Check	
	No. Collected	Mortality	No. Collected	Mortality	No. Collected	Mortality
4	0	0	0	0	9	0/9
18	0	0	0	0	26	0/26
32	0	0	0	0	26	0/26
46	0	0	0	0	47	0/26
60	0	0/6	1	0/1	72	0/47
74	1	0/1	0	0	55	0/55
88	15	1/15	6	1/6	108	5/108
102	13	0/13	1	0/1	107	0/107
116	40	2/40	0	0	123	0/123
130	14	0/14	2	0/2	61	2/61
144	26	0/26	1	0/1	40	0/40
159	53	5/53	0	0	99	6/99
172	32	2/32	0	0	178	0/178
186	32	0/32	0	0	210	0/210
200	69	0/69	0	0	209	0/209

tions in cattle shelters treated with 100 mg/m² and 200 mg/m² (Table 3) showed that blood fed *An. aconitus* appeared about 60 days after spraying, while in unsprayed cattle shelters they were found in every collection. Thereafter the number of blood fed *An. aconitus* increased in 100 mg/m² sprayed houses but low densities were found in 200 mg/m² sprayed houses. Mortality of blood fed *An. aconitus* after holding for 24 hours was very low and ranged from 0 to 10 %.

DISCUSSION AND CONCLUSION

The result of this trial showed that this synthetic pyrethroid compound, alphamethrin, has no vapor effect, but it has long residual life. The residual effectiveness of this insecticide (70% mortality or greater) were maintained for 25 weeks at dosage 100 mg/m² and for about 29 weeks at dosage 200 mg/m² in all surfaces sprayed. Past experience has shown that any insecticide which can be effective against *An. aconitus*

must have vapour toxicity effect. But this study indicates potential of the compound and the results can be expected to be more encouraging if stage V trials can be carried out with this compound.

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