DIRECT IMPACT OF AGRICULTURAL INSECTICIDE APPLICATION ON ANOPHELINE LARVAE POPULATION WITH SPECIAL REFERENCE TO *AN. ACONITUS* DONITZ IN RICE FIELD

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ABSTRAK

Telah dilakukan tes kerentanan dan tes bioassay dengan Basudin·60 EC terhadap larva *An. aconitus* di desa Margopatut (300 meter di atas permukaan laut), sebelah timur kaki gunung Wilis, Kecamatan Sawahan, Kabupaten Nganjuk, pada bulan Juni 1983.

Hasilnya menunjukkan bahwa larva *An. aconitus* sangat rentan terhadap insektisida tersebut. Tes bioassay juga membuktikan bahwa kematian 100% pada larva itu terjadi sesudah 24 jam sejak penyemprotan. Pengurangan jumlah larva pada sawah-sawah yang disemprot adalah 72%.

Dari hasil penelitian ini jelas bahwa Basudin 60 EC dapat mengakibatkan pengaruh yang baik dalam penurunan jumlah larva *An. aconitus* di sawah-sawah.

INTRODUCTION

Anopheles aconitus Donitz which breeds in rice fields, has been known as the main malaria vector in inland areas of Java. Recently this species has disappeared in some areas of East Java, but it is still abundant in hilly areas of Nganjuk Regency.

Since 1973 the farmers in the lowlands of East Java have been using pesticides, such as Thiodane, Diazinon, Agrethion, Sevin, etc. to control rice hoppers *(Nilaparvata lugens)* and other insect pest in rice fields. In Nganjuk regency the favoured pesticide used in lowland areas is Basudin 60 EC. This pesticide is hardly used in hilly areas of Nganjuk.

The disappearance of *An. aconitus* in the lowland rice fields in recent years in Nganjuk Regency, suggests that agricultural pesticide, particularly Basudin could be one of the contributing factors towards the disappearance of this mosquito in the lowland areas. To confirm this observation, a study on the impact of Basudin 60 EC application on *An. aconitus* larvae and to find out its susceptibility level to the insecticide was carried out.

STUDY AREA

In June 1983 a study was carried out at Margopatut village (elev 300 meters) in the eastern foothills of Mount Wilis, Sawahan subdistrict, Nganjuk Regency. Two plots of rice field were selected one for spraying and the other as check or control. The check plot was situated in a slightly higher terrace than the treatment plot to avoid the contamination of pesticide from the treated plot. Each plot of ricefield was about 250 eq. meter with water depth of about 10 cm. At the time of the field trial, the paddy

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(rice plant) was about two months old and the plants were about 50 cm high.

MATERIALS AND METHODS

Basudin 60 EC susceptibility test to mosquito larvae.

Basudin 60 EC is an organophosphorous compound produced by Ciba Geigy Ltd. which contains 600 gr per liter Diazinon. This pesticide is approved by the Ministry of Agriculture to control paddy pests, such as *Tryporyza spp*, *Leptocorsica acuta*, *Nilaparvata Lugens*, etc. One ml. was taken from the original stock of Basudin 60 EC and diluted in water to formulate seven different concentrations (Table 1), for the susceptibility test of the larvae.

Third and early fourth stage mosquito larvae were used. The larvae were collected from rice fields in the study plots. The larvae were kept in small plastic trays (15 x 20 cm). Exposure was made by introducing the larvae into each of the different Basudin concentration for 24 hours. After the exposure, dead larvae from each of the Basudin concentration were counted.

Spraying

The spraying was carried out by the farmer who is familiar with spraying agricultural pesticides in the rice fields. Compression sprayer fixed with downward directed nozzle tip owned by the farmer was used. Basudin 60 EC of 16 ml mixed with water up to 10.000 ml was formulated to solution to spray a plot of rice field of 250 m^2. The concentration of this solution was 0.096% or 960 ppm.

Entomological Evaluation

Estimation of the larval density in the two rice field plots were made before and after spraying. Dippers (diameter 11 cm) were used to collect larvae in the two plots, each with 500 dips and carried out by four mosquito scouts.
In the treated plot the larval density was 0,65 per dip before treatment, while in the check plot it was 0.11 larvae per dip. The larvae collected were released back to the rice field after counting.

For bioassay test, larvae were put in cages (20 x 20 x 20 cm each) made of mosquito netting. In the treated plot three cages each with nine third and early fourth instar larvae, and in the check plot two cages of 12 and 15 larvae were used. Twenty four hours after treatment, all larvae in each of these cages were removed, identified and dead larvae counted.

RESULTS

Susceptibility test.

The results of susceptibility test revealed 100% mortality of *An.aconitus* larvae were achieved from concentration of 0.25 ppm to 1.00 ppm; more than 90% mortality from 0.0625-0.125 ppm and about 50% mortality from 0.016–0.0625 of Basudin 60 EC (Table 1). In the control, all the 49 *An.aconitus* larvae were alive.

Table 1. Susceptibility level of *An. aconitus* larvae to Basudin.

Concentration (in ppm)	No. Tested.	No. Dead	Mortality (in %)
1.000	57	57	100
0.500	52	52	100
0.250	50	50	100
0.125	47	44	94
0.0625	58	54	93
0.016	25	9	21
0.004	27	5	18
0.000 (Control)	49	0	0

Bioassay test

The results of bioassay test showed that all the 27 *An.aconitus* larvae (9 larvae in cash cage) put in treated plot of rice field were dead after 24 hours. In the check area all the 27 larvae were alive after 24 hours (Table 2).

Table 2. Result of Biossay test on *An. aconitus* larvae to Basudin 60 EC application.

Cage No.	Treated plot			Untreated plot		
	No. Tested	No. Dead.	% Mort.	No. Tested	no. Dead.	% Mort.
1	9	9		100	12	0	0
2	9	9		100	15	0	0
3	9	9		100	—	—	—
Total	27	27		100	27	0	0

Density of Anopheles larvae

Twenty hours after treatment the density in the treated plot was 0.218 per dip as against 0.652 before treatment, while in the check plot it was 0.110 against 0.116. Using the check plot for correction, the reduction of larvae density in Basudin 60 EC treated plot was about 0.719 or 72% (Table 3).

DISCUSSION AND CONCLUSION

It was apparent from the results of the susceptibility and bioassay test, that Basudin 60 EC, showed to be effective for *An. aconitus* larvae.

Although 100% mortality was achieved in the bioassay test, the reduction of larvae density of the treated plot was only 72%. This indicates that possibly the concentration of Basudin in the treated plot was not evenly distributed during spraying.

From interviews of the farmers, pesticides including Diazinon are being used continously and regularly in the lowland rice fields, while in the hilly areas pesticides are irregularly used. This is because in general the economic status of the farmers in the hilly areas are lower than those in the plan areas. Based on the results of the present study and from interviews, it is quite probable that the disappearrance of *An.aconitus* in the plane areas was due to the use of agriculture pesticides, particularly Diazinon.

Tabel 3. **Density of *An. aconitus* larvae before and 24 hours after spraying of Basudin 60 EC on Rice field.**

Collectors	Before spraying			After spraying		
	No. Dips	No. Larvae	Per Dip	No. Dips	No. Larvae	Per Dip
Treated Plot						
1	125	82	0.66	125	28	0.22
2	125	49	0.39	125	12	0.1
3	125	144	0.91	125	17	0.13
4	125	70	0.56	125	25	0.2
Total	500	325	0.652	500	109	0.218
Untreated Plot						
1	125	23	0.18	125	11	0.09
2	125	9	0.07	125	12	0.1
3	125	13	0.1	125	17	0.14
4	125	10	0.08	125	18	0.14
Total	500	55	0.110	500	58	0.116

It must be noted that the present study was a tough preliminary observation. More accurate observations are needed to confirm the findings of the present observation.

SUMMARY

Susceptibility and bioassay test with Basudin 60 EC on *An.Aconitus* larvae were carried out at Margopatut village (elev.300 meters) in the eastern foothills of Mount Wilis, Sawahan subdistrict, Nganjuk regency in June 1983. The *An.aconitus* larvae more found to be highly susceptible to the insecticide. Bioassay tests also revealed that 100% mortality on the same mosquito larvae was achieved after 24 hours of spraying. The larvae reduction in the treated ricefield plot was 72%. It was obvious from the results of this study that Basudin 60 EC could have a favourable impacts in the reduction of *An.aconitus* larvae in rice fields

ACKNOWLEDGEMENTS

The aouthor wishes to express his gratitude to Dr. Lim Boo Liat, WHO—Consultant for Indonesia and Dr.Soetopo, Director, Central Research of Health Service Development for their assistance in preparing this paper.

REFERENCES

1. Anonymous (1875) Manual on Practical Entomology in Malaria, Part I & II WHO., Geneva, 191 pp.

2. ————————(1982) pestisida untuk Pertanian, Departemen Pertanian, Jakarta, 216 pp.
3. Chow, C.Y. and R.M. Ibnoe & ST. Josopuro (1960) Bionomic of Anopheline mosquite in Inland area of Java, with special Reference to *Anopheles aconitus* Don. *Bull. Ent. Res.* 50 : 647-660.
4. Reid, J.A. (1968) Anopheline Mosquitoes of Malaya and Borneo, The Institute for Medical Research Malaysia, 520 pp.

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