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Short Communication

**ASSESSMENT OF THE MOLLUSCICIDAL ACTIVITIES OF
TRIBROMOSALAN, CARTAP AND CHLOROTHALONIL
AGAINST *ONCOMELANIA HUPENSIS***

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SUMMARY: Molluscicidal activities of Tribromosalan, Cartap and Chlorothalonil were evaluated in the laboratory and the field against *Oncomelania hupensis*, the intermediate host of *Schistosoma japonicum* in China. The three chemicals were very effective against *O. hupensis* in the laboratory. The molluscicidal activities found in the field trials suggest that Tribromosalan and Cartap may be used as practical molluscicides. Dosage of 10 g/m² of Tribromosalan in spring only and 20 g/m² of Cartap in both spring and autumn would be recommendable as practical mollusciciding doses for the control of *O. hupensis*.

Molluscicidal activities of three chemicals, Tribromosalan (3,4',5-tribromosalicylanilide), Cartap (S,S'-[2-(dimethylamino)-trimethylene] bis (thiocarbamate)) and Chlorothalonil (Tetrachloroisophthalonitrile) against *Oncomelania nosophora*, the intermediate host of *Schistosoma japonicum* in

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Table I. Molluscicidal effects of three chemicals on *Oncomelania hupensis* in the laboratory

Chemical	Season of snail collection	LC ₅₀ in ppm* (95% confidence limits)	LC ₉₀ in ppm* (95% confidence limits)
Tribromo-salan	Spring	0.068(0.059-0.077)	0.089(0.078-0.10)
	Autumn	0.320(0.280-0.360)	
Cartap	Spring	0.32(0.24-0.41)	0.43(0.33-0.56)
	Autumn	0.61(0.45-0.82)	
Chloro-thalonil	Spring	0.13(0.11-0.15)	0.17(0.15-0.19)

*Concentrations are based on the active ingredient.

Japan, were first reported by Kajihara et al (1,2). They noted high molluscicidal activities of the three chemicals against *Oncomelania* snails. Tribromosalan is an anthelmintic and Cartap and Chlorothalonil are used as agricultural drugs in Japan. These chemicals are registered as agricultural drugs or anthelmintics and are commercially available.

The present paper deals with the molluscicidal activities of the three chemicals, Tribromosalan, Cartap and Chlorothalonil against *O. hupensis*, the vector snail of schistosomiasis in China. The results of field trials with the three chemicals are also presented.

O. hupensis snails used for the laboratory experiments were collected from Junshan Isle, Yueyang, China and were conditioned in the laboratory for two weeks. To bring the snails in contact with the chemicals, Komiya's immersion technique (3) was adopted. Thirty snails were exposed to each of consecutive twofold dilutions of each chemical at 24-26 C for 48 hr. Duplicate or triplicate tests were carried out with each chemical and LC₅₀ and LC₉₀ (50% and 90% lethal concentrations, respectively) were computed. Table I shows the results based on the concentration of the active ingredient of the chemicals. The LC₅₀ values of Tribromosalan and Cartap varied with the season of snail collection, however, the molluscicidal effects of the chemicals on *O. hupensis* were high. The

Table II. LC₅₀ values of Tribromosalan, Cartap, Chlorothalonil and B-2 (Phebol) against *Oncomelania* snails determined in the laboratory

Snail	Chemical	Season of snail collection	LC ₅₀ (ppm)*	Reference
<i>O. hupensis</i>	Tribromosalan	Spring	0.068	
		Autumn	0.320	
	Cartap	Spring	0.32	
		Autumn	0.61	
<i>O. nosophora</i>	Chlorothalonil	Spring	0.13	
	B-2	Spring	0.38	(4)
	Tribromosalan	Spring	0.068	(2)
		Autumn	0.350	
	Cartap	Spring	0.42	(2)
		Autumn	0.36	
	Chlorothalonil	Spring	0.14	(1)
	B-2	Spring	0.38	(5)
		Autumn	0.65	

*Concentrations are based on the active ingredient.

molluscicidal activity of Tribromosalan was higher than that of Chlorothalonil. The activity of Cartap seemed to be lower than those of Tribromosalan and Chlorothalonil. The LC₅₀ values of the three chemicals and B-2 (Phebol) against *O. hupensis* (4) and *O. nosophora* (5) are shown in Table II. The LC₅₀ value of each chemical against *O. hupensis* was almost equal to that of each against *O. nosophora*. B-2 is known to be effective in the control of *Oncomelania* snails and commonly used as a molluscicide in Japan (4-6). The molluscicidal activities of Tribromosalan, Cartap and Chlorothalonil against *O. hupensis* appeared to be similar to or higher than that of B-2 in the laboratory. Yasuraoka et al. (7) noticed that the susceptibility of *O. nosophora* to molluscicides varied with the season of the year and that the snail susceptibility increased in spring and

Table III. Molluscicidal effects of three chemicals against *Oncomelania hupensis* in the field

Chemical	Dose (g/m ²)	Mean mortality of snails on 7 and 14 days after chemical application	
		Spring	Autumn
Tribromo- salan	5	85.5 (%)	27.7 (%)
	10	90.6	29.5
	20	92.2	41.7
Cartap	5	49.0	46.9
	10	72.3	71.5
	20	83.1	89.1
Chloro- thalonil	5	36.1	13.2
	10	46.8	14.9
	20	52.5	22.8

decreased in autumn. The results obtained in the present study on the seasonal variation of the susceptibility of *O. hupensis* to the chemicals were similar to those found with *O. nosophora*. Attention should be paid to the seasonal variation of the susceptibility of snails in evaluating the molluscicidal activity of any chemical.

Field trials were performed in two localities, Junshan Isle and Chuengfeng Farm, Hunan Province, in China. To find the seasonal variation of the susceptibility of snails, three chemicals were tested in the field twice a year, in spring and in autumn. Sixteen quadrates each of 6 m² were made in each snail habitat. The quadrate was surrounded with a man-made canal and the grass was mowed to about 5 cm before chemical application. The active ingredients of Tribromosalan, Cartap and Chlorothalonil were 90, 50 and 75%, respectively. Each chemical was suspended in water and sprayed with a handy sprayer in each quadrate at a dose of 2.5 to 40 g of consecutive twofold dose per square meter. Post-treatment samplings of the snail were made in either 3, 7 and 14 days or 7, 14 and 21 days after application of the chemical. The results of the field trials are summarized in Table III. The mortalities of snails in the quadrate treated with Tribromosalan in spring were higher than 85%; in autumn, the rates were lower

than 42%. The treatment with Cartap at a dose of 20 g/m² showed a snail mortality rate higher than 83% regardless of the season. The treatment with Chlorothalonil resulted in low mortalities of snails, lower than 53%, even in the quadrat applied with 20 g/m² of the chemical. From the results of the field trials, the doses of 20 g/m² of Cartap both in spring and autumn and 10 g/m² of Tribromosalan in spring only would be recommendable as practical mollusciciding doses for the control of *O. hupensis* in China.

As mentioned above, B-2 is known to be an effective molluscicide in the control of *Oncomelania* snails and is applicable to the rice paddy-field without causing any disadvantageous problems for the environment (6,8). The molluscicidal activities of Tribromosalan and Cartap against *O. hupensis* appeared to be similar to that of B-2. These chemicals have satisfied the safety standards and are registered as agricultural drugs or anthelmintics in Japan. Tribromosalan and Cartap may be used as practical molluscicides in the control of *O. hupensis* without serious environmental pollution.

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