

Research Note

## An Assessment of the Molluscicidal Activity of B-2 and Some Other Chemicals against *Oncomelania quadrasi*

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The efficacy of B-2 (sodium 2, 5-dichloro-4-bromophenol) against *Oncomelania nosophora*, the intermediate host of *Schistosoma japonicum*, was first reported by Kajihara *et al.* (1975). Further laboratory and field studies with B-2 revealed the promising molluscicidal activity against *O. nosophora* as well as its rather low toxicity to fish and mammals (Kajihara *et al.* 1979 a, b). It was also indicated that the residual concentration of B-2 in the soil after application decreased more rapidly than that of sodium pentachlorophenate (NaPCP) and that the residual level of the chemical in rice grains from the paddy field where the chemical was applied at most 4 times, did not exceed as low as 0.03 ppm. For aquatic snails, Taira *et al.* (1977) reported that B-2 showed a cidal effect against eggs, juveniles and adults of *Lymnaea ollula*, the intermediate host of *Fasciola* sp. in Japan.

The present paper deals with the molluscicidal effect of B-2 and other four chemicals

against *Oncomelania quadrasi*, the intermediate host of *S. japonicum* in the Philippines, in the laboratory. The results of a small scale field trial with B-2 are also presented.

In the laboratory experiments, B-2, three 2,5-dichlorophenol derivatives (B-2-0 type, I-00 and T-1) and Isoxathion emulsion were tested. The chemical formulae of the compounds used are as follows.

B-2: sodium 2, 5-dichloro-4-bromophenol (10% granular form and 10% liquid form).

B-2-0 type: 2, 5-dichloro-4-bromophenol diethanol amine salt (10% liquid form).

I-00: 2, 5-dichloro-4-iodophenol (10% liquid form).

T-1: 2, 4, 5-trichlorophenol (10% liquid form).

Isoxathion: 0, 0-diethyl-0-(5-phenyl-3-isoxazolyl) phosphorothioate (50% emulsion)

Formulations of the chemicals used in this test were soluble in water and desired concentrations were easily made in distilled water. *O. quadrasi* were collected from 2 different habitats in Leyte, Philippines. To bring the snails in contact with the chemicals, Komiya's immersion technique (Komiya, Hosaka and Yasuraoka, 1962) was adopted. Thirty snails were exposed to each of several consecutive twofold dilutions of each chemical at 25-28 C for 48 hr. Duplicate or triplicate tests with each chemical were carried out and the LC<sub>50</sub>

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Table 1 Molluscicidal effects of the chemicals on *Oncomelania quadrasi*

Chemicals used	Habitats of snails collected	LC <sub>50</sub>	LC <sub>90</sub>
B-2	A	0.48 ppm*	0.57 ppm*
	A	0.47 ppm	0.61 ppm
	B	0.55 ppm	0.68 ppm
B-2-0 type	A	0.38 ppm	0.54 ppm
	B	0.42 ppm	0.57 ppm
I-00	A	0.44 ppm	0.54 ppm
	B	0.47 ppm	0.61 ppm
T-1	A	0.61 ppm	0.93 ppm
	B	0.46 ppm	0.63 ppm
Isoxathion	A	1.57 ppm	8.48 ppm
	B	1.61 ppm	4.66 ppm

\* Concentrations are based on the active ingredient of the chemical.

and the LC<sub>90</sub> were computed. Table 1 shows the LC<sub>50</sub> and LC<sub>90</sub> based on the concentration of the active ingredient of the chemicals in each test. Although the LC<sub>50</sub> of B-2 varied with the time and place of snails collection, differences were not significant statistically. The effectiveness of 2, 5-dichlorophenol derivatives against *O. quadrasi* appeared to be almost similar to that of B-2. The molluscicidal activity of Isoxathion was lower than those of B-2 and its related derivatives.

In the field trial, a 10% granular form of B-2 was applied in each of the quadrates which were made of wooden frame of 1 square meter and set in the habitat of *O. quadrasi* in Leyte. The chemical was sprayed at doses of 10 g, 20 g and 40 g per a quadrate by hand as evenly possible. Post-treatment samplings of the snail were made 1, 2, 3 and 4 weeks after application of the chemical. As shown in Table 2, the treatment with a dose of 20 g/m<sup>2</sup> gave a snail mortality rate more than 80% even 4 weeks after application. Mortality rates of snails from the quadrate with 10 g and 40 g/m<sup>2</sup> were somewhat inconsistent with doses used and are probably due to a flooding in part by heavy rainfall during the period of the field trial.

The dose of 25 g/m<sup>2</sup> of B-2 in the 10% granular form has been adopted as a standard molluscicidal dose for *O. nosophora* in Yamana-shi (Kajihara *et al.* 1979). A dose of 20 g/m<sup>2</sup> or 25 g/m<sup>2</sup> in the 10% granular form would be suitable for the practical use of B-2 in the control of *O. quadrasi*.

An ideal molluscicide should be lethal to target snails and applicable in a suitable formulation but it should not be toxic to non-target animals and should not produce environmental pollution. B-2 showed to be very effective not only against *O. nosophora* and *L. ollula* but also against *O. quadrasi* and is available in either liquid, powder or granule

Table 2 Results of small scale field trial with B-2, 10% granular form, against *Oncomelania quadrasi*

Quadrate	Dose (g/m <sup>2</sup> )	Mortality of snails											
		1 week after application			2 weeks after application			3 weeks after application			4 weeks after application		
		No. of exam.	No. of dead	% mort.	No. of exam.	No. of dead	% mort.	No. of exam.	No. of dead	% mort.	No. of exam.	No. of dead	% mort.
A	10	25	25	100	18	15	83.3	21	15	71.4	28	16	57.1
B	10	24	20	83.3	19	16	84.2	15	11	73.3	16	12	75.0
C	20	22	22	100	14	13	92.8	9	9	100	25	24	96.0
D	20	21	21	100	33	30	90.9	29	24	82.8	20	17	85.0
E	40	11	11	100	6	6	100	14	8	57.1	7	7	100
F	40	21	20	95.2	11	11	100	26	17	65.4	16	10	62.5
G	0 (control)	63	19	30.2	15	8	53.3	8	3	37.5	33	7	21.2
H	0 (control)	6	2	33.3	6	0	0	19	1	5.3	20	2	10.0

form. The cost of application is, furthermore, expected to be low. Toxicity of B-2 to non-target animals seems rather low and the residual levels of the chemical in the soil and rice grains are also significantly low (Kajihara *et al.* 1979b). It is thus suggested that B-2 is a promising molluscicide in the control of *O. quadrasi* and that the chemical can be applied at most 4 times even during the planting season in the rice paddy-field without causing any serious disadvantage in the environment and the agricultural products.

The molluscicidal activity of 2,5-dichlorophenol derivatives, B-2-0 type, I-00 and T-1, against *O. quadrasi* was similar to that of B-2. However, toxicity of these chemicals to non-target animals and their residual levels in the soil and agricultural products are unknown. Further studies on these points will be needed for application of the chemical in the field as a molluscicide.

Although Isoxathion showed rather low molluscicidal activity against *O. quadrasi*, the chemical is commercially available and commonly used as an insecticide in Japan. If the case requires, this may be used as a practical molluscicide.

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B-2 および数種薬剤の *Oncomelania quadrasi* に対する殺貝効果について

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ミヤイリガイ (*Oncomelania nosophora*) に対し、殺貝効果が高いとされている B-2 と 3 種の 2,5-dichlorophenol 誘導体、および殺虫剤である Isoxathion 乳剤の、フィリッピンにおける日本住血吸虫中間宿主 *Oncomelania quadrasi* に対する殺貝効果を室内で検討した。B-2 については、フィリッピン、レイテ島において小規模な野外効果試験も行った。

その結果、B-2 は *O. quadrasi* に対しても高い殺貝効果を示し、殺貝剤として野外で使用する薬剤であ

ることがわかった。

3 種の 2,5-dichlorophenol 誘導体は、室内試験で B-2 とほとんど同様の効果を示した、

Isoxathion 乳剤は、これらの薬剤と比較し、殺貝効果はやや劣るが、我が国では殺虫剤として登録されており、また広く使用されている薬剤であり、或種の条件下では、殺貝剤としての使用も可能であるといえる。