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FIELD TRIALS OF A SLOW-RELEASE COPPER MOLLUSCICIDE IN KHUZESTAN, SOUTH-WEST OF IRAN.

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Key Words: Bulinus Truncatus-Lymnaea gedrosiana- Slow-release copper mollurcicde-Schistosoma-Shall

ABSTRACT

In the field trials of slow-relase nollusicide, copper content McCkechnie Chemical Inc. 30 $cuso^4$ $5H_2O$ or 7.5 cu pellet/sinking material 7 days release life were tested against the cemmon aquatic snails Bulinus truncatns, Physa acuta and Lynnaea gedrosiena in stagnant water bodies in Khuzestan province, south-west of Iran. Snail densities before treatment and 7 days after mollucicide application were determined by 10 deep nets per man.The results of the present trials as shown on Tables 1,2,3 and 4 indicate that the effect of different concentration of copper based slow-relased mollnscicide (7.55 cu) is different for different species of aquatic snails. The maximum concentration to acheive 100 ppm. mostality rate was 20^{ppm}. for Lymnaea gedrosiana, 100^{ppm}. for Physa acuta and over $120^{ppm.}$ for Bulinus truncatus. The high

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susceptibility of *lymnaea* snails to this chemical is very promising for the control of livestock trematodes infection in this area.

INTRODUCTION

Slow-release molluscicides may posses some of the characteristics of an ideal molluscicide in that they are safe to transport and are easy to handle and disperse in different habitats. However, since field trails of slow-release molluscicides have been few in number,[5,10] the question of whether these formulations fulfill any of the other requirements of an ideal molluscicide is unanswered. Controlled-release copper molluscicides are available in quantity from several sources. These molluscicides have been subjected to rather extensive alboratory evaluation, but with very limited field trials. A major need exists for large scale evaluation under varying field conditions. Also information regarding the effect of copperion on non-target biota exposed continuously to low concentrations of copper is lacking. In this study, slow-release copper content McCkechnie chemicals Inc. 30% $CuSo_4$, $5H_2O$ or 7.5% Cu^{+2} pellet/sinking material 7 days release life were tested against *Bulinus truncatus*, *Lymnaea gedrosiana* and *Physa acuta* the intermediate snail hosts of *Schistosoma haematobium*, *S. bovis*, *Ornithobilharzia turkestanicum* and *Fasciola gigantica* flukes in Khuzestan province south-west of Iran.

MATERIALS AND METHODS

Our stock of molluscicide was obtained from McCkechenie Chemical Limited, Copper melters and refiners manufactures of copper sulfate in Windes Cheshire England. The molluscicide used was composed of 30% So_4cu, $5h_2O$ or 7.5% cu^{+2} in a sinking pellets material. For these experiments 14 ponds (a natural snail habitats)in different parts of Khuzestan province were selected. Marked sampling stations at each side of the ponds were sampled using a wire mesh nets. All molluscs were counted in 10 nets per one man and then were returned to the same palces. After the first sampling and determination of snail densities the necessary amount of pellet Formulation of molluscicide was added to each pond to obtain the desired concentration of chemical by calculating on the bases of mean depth and dieameter and estimating the amount of water content in each pond. Seven days after molluscicide application, the ponds were sampled again, the collected snails were brought to the central laboratory and washed with clean water; the snails were counted and kept in fresh water for several days in order to detrermine whether the snails were alive or dead.

RESULTS

Pre-treatment snail densities were determined in each pond before application of molluscicide and a post-treatment snail densities were conducted 7 days after treatment. In the control un-treated ponds, the snail densities were determined exactly in the same manner as for the treated ponds. After several sets of experiments the comprehensive results were demonstrated in Tables 1,2,3 and 4. The result given in Table 2, indicate that live <u>Bulinus truncatus</u> snail exposed to the concentration of 10^ppm^ declined in number 7 days after chemical application, droping from 46 live snails per 10 net to 4. In control ponds there were no changes in the snail desity. When <u>Physa acute</u> snails were exposed to the chemical in concentrations of 85^ppm^. and 110^ppm^, 7 days after treatment, there was a marked decrease in the number of live snails, dropping from 329 to 8 and from 48 to 0, respectively. In Table 2 As was shown in Table 3, <u>Lymnaea gedrosiana</u> snail when exposed to 85^ppm^. and 100^ppm^., no live snails were observed 7 days after molluscicde application. In the control un-treated ponds no changes i- the snail density were observed. For obtaining further information on the effect of this molluscicide on the <u>Lymnaea</u> snail and determining the optimum concentration for the field application against the <u>Lymnaea</u> snail, another experiment was designed. The results of this experiment indicated that as the concentration increases from 4^ppm^ , the motality rate of <u>Lymnaea</u> snail increased, and in 20^ppm^ concentration, a 100% mortality rate was achieved in 7 days after molluscicide application (see Table 4).In the control un-treated ponds there was even slight increase of <u>Lymnaea</u> population.

DISCUSSION

Small-scale field evaluations have demonstrated that candidate controlled-release molluscicides are efficacious under varying environmental conditions. It is not in doubt that, properly formulated such materials release the toxic agent at a slow, continuous rate over an extended period of time. Furthermore, snails exposed to copper sulfate or any other slow-release molluscicide like organotin and organolead at ultra-low concentrations will cause the snails succumb to through a chronic intoxication[3]. Molluscicides as conventionally used, suffer a number of disadvantages such as: non-persistence of the molluscicidal effect, high cost of application arising from non-persistency and undesirably high levels of environmental impact, manifestated in the contamination of bottom soils and distructions of non-target biota, including fish and other elements of the food chain. The use of controlled-release molluscicides would appear to overcome some of the above disadvantages. Control- release formulations can be posessed in any form taken by rubber, plastic goods or granulation pellets. The basic controlled-release molluscicides available for field evaluation contains formulation of TBTO, and Copper. Application and monitoring techniques for slow-release molluscicide in field condition still must be developed. The greatest needs at this time are: The development of application methods and regiments under field conditions and a better understanding of the environmental chemodynamics of such systems.[1,4,7]

The results of the present tests indicate that the effect of different concentration of copper based slow-release molluscicide (7.5% Cu) differs for different species of aquatic snails in various conditions. The maximun concentration to acheive 100% mortality rate was 20^{ppm} for L. gedrosiana., 100^{ppm} for Physa acuta and over 120^{ppm} for B. truncatus. It has also been reported that slow-release 50% copper content molluscicide 4mg/litre in laboratory trials demonstrated 100% mortality rate on Biomehalaria snail, but in field trial 100 mg/kitre has produced this mortality(6). In our previous studies (8) we demonstrated the high susceptibility of Lymnaea gedrosiana snail to Fasciola gigantica and Ornithobilharzia turkestanicum miracidia, and the Lymnaea snail can act as the natural intermediate snail host for these fluke infections in Khuzestan. So, the use of Copper slow-release molluscicide in a large scale in the area can be a promising measure for the prevention and control fluke infections in livestock.

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TBTO= Hexabutyldistannoxane

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Table 1- Field trial of the effect of different concentration of slow-release copper based molluscicide on *Bulinus truncatus* in Khuzestan, south-west of Iran.

Ponds No.	concentra-tion ppm.	No. of liver *Bulinus truncatus*	
		Before treatemnt	7 days after treatment
I	1	21	12
II	120	46	4
I	control	76	83
II	"	35	49

Table 2-Field Trial of the effect of different concentration of Slow release copper based molluscicide on Physa acuta in Khuzestan, south-west of Iran.

Ponds No.	concentration ppm.	No. of live Physa acuta	
		Before treatment	7 days after treatment
I	85	329	8
II	110	48	0
I	Control	205	86
II	"	158	113

Table 3- Field Trial of the effect of different concentration of Slow-release copper based molluscicide on <u>Lymnaea gedrosiana</u> in Khuzestan, South-west of Iran.

ponds No.	concentration ppm.	No. of live *Lymnaea gedrosiana*	
		Before treatment	7 days after treatment
I	85	68	0
II	110	70	0
I	control	60	58
II	"	68	68

Table 4-Field trial of the effect of different concentration of slow-release copper based molluscicide on *Lymnaea gedrosiana* in Khuzestan, south-west of Iran.

ponds No.	concentration ppm.	No. of live *Lymnaea gedrosiana*	
		Before treatment	7 days after treatment
1	4	93	237
2	8	28	56
3	12	18	4
4	16	22	6
5	20	81	0
1	Control	77	96
2	"	64	55
3	"	63	186
4	"	55	90
5	"	61	76