EVALUATION OF SOME INORGANIC SALTS AGAINST THE SMALL GARDEN SNAIL, *THEBA PISANA* (MULLER)

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Abstract

The inorganic salts of copper sulfate, sodium fluoride, sodium chlorate, sodium pyrophosphate and potassium cyanate were tested as bran bait formulation at the rates of 0.125, 0.25, 0.50, 1.0, 2.0 , 4.0, 6.0 and 8.0 % for the control of the small garden snail, Theba pisana (Muller) in the laboratory during 1992 activity season. Copper sulphate showed high mortality percentages (95-100%) at the concentrations 0.5% and 1.0% . The LC_{50} was 0.2554 and LC_{95} was 0.4964. Potassium cyanate was the least effective and the concentration 8.0 % produced 45% mortality. Sodium fluoride, sodium chlorate and sodium pyrophosphate produced 93.3 and 100, 91.0 and 100, 88.3 and 100% mortality, respectively, at the concentrations 6.0 and 8.0%. The LC_{50} and LC_{95} reached 1.130 and 6.073, 2.404 and 6.456 and 2.325 and 6.834, respectively.

INTRODUCTION

Snail infestation to fruit trees, vegetable crops and ornamental plants is increasing year after another all over the governorates of Egypt, especially in the northern belt of the Delta region (Kassab and Daoud , 1964; Bishara *et al.,* 1968 ; El-Okda, 1990 , 1981, and Hashem *et al.,* 1992, 1993).

Until 1984, mesurol, copper sulphate, aldicarb, methomyl, lindane, sevin, dipterex were the common means of snail control (Kassab and Daoud, 1964; and

El-Okda, 1978 a & b).

The aim of the present investigation is to evaluate some inorganic salts for the control of *T.pisana*.

MATERIALS AND METHODS

The inorganic salts used in this experiment were potassium cyanate, sodium fluoride, sodium chlorate, sodium pyrophosphate and the recommended salt, copper sulphate.

The above inorganic salts were prepared as bran bait formulations. Wheat bran was mixed with concentrations of salt water solution (0.125, 0.25, 0.50, 1.0, 2.0, 4.0, 6.0 and 8.0% active ingredients), then left for complete drying to be used as toxic poisons against the small garden snail, *T.pisana*. When used, one gram from each poison was wetted with some water and applied to five replicated glass jars (15 cm height X 8 cm diam.), each having 10 individuals of the snail species. Glass jars were covered with muslin, secured with rubber band and kept at laboratory conditions (26 ± 2°C and 65 ± 5 % R.H.).

The snails were daily provided with fresh poisoned bait. Mortality counts were recorded three times up to seven days. Mortality percentage was calculated according to WHO (1965) criterion.

RESULTS AND DISCUSSION

Effect of Five Inorganic Salts on Percentage Mortality of *T.pisana*

Data presented in table 1 show percentage mortality of T.pisana due to treatment with five inorganic salts in bran baits.

Good results were obtained with copper sulphate at the doses 0.5 or 1.0% where the mortality percentages reached 95.0 and 100% respectively. However, 25.3 and 50.6% mortality were obtained with the concentrations 0.125 and 0.25 % respectively.

Potassium cyanate at the concentrations ranging from 0.125 to 8.0 % resulted in 2.0 to 45.0% mortality.

Sodium fluoride, sodium chlorate and sodium pyrophosphate each at the doses

0.1, 25, 0.25 , 0.5, 1.0, 2.0, 4.0 , 6.0 and 8.0% showed the following ascending percentages of mortality : 7.33 , 18.00 , 33.33, 58.33, 81.66, 91.33, 93.33 and 100%; 3.33, 7.33, 16.66, 48.00, 58.33, 83.33, 91.00 and 100%; and 5.33 , 15.66, 33.33, 41.66, 50.66, 75.00, 88.33, and 100% , respectively.

Table 1. Percentage mortality of *Theba pisana* treated with inorganic salt bait formulation after 7 days from treatment.

Contration (%)				% Mortality				
Inorganic salt	0.125	0.25	0.5	1.0	2.0	4.0	6.0	8.0
Copper sulphate	25.33	50.60	95.00	100.0	100.0	100.0	100.0	100.0
Sodium fluoride	7.33	18.00	33.33	58.33	81.66	91.33	93.33	100.0
Sodium chlorate	3.33	7.33	16.66	48.00	58.33	83.33	91.00	100.0
Sodium pyrophosphate	5.33	15.66	33.33	41.66	50.66	75.00	88.33	100.0
Potassium cyanate	2.00	5.30	11.66	15.00	18.33	30.66	35.00	45.00

In general, copper sulphate, sodium fluoride, sodium chlorate, and sodium pyrophosphate showed the following high mortality percentages : 95.0-100%, 93.33-100%, 91.00-100%, at concentrations 0.5-1.0% for the first salt and 6.0-8.0% for the other three.

The Correlation Between Concentration and Mortality Percentage of *T.pisana* and the Lethal Concentration

Table 2 shows the correlation between the concentrations of the five inorganic salts and the mortality percentages of *T.pisana* as well as the LC_{50} and LC_{95} of the snail individuals.

High significant correlation between the increase in percentage mortality and the increase in concentration was indicated (Table 2).

The concentrations causing 50% mortality of *T.pisana* individuals (LC_{50}) were 0.2254, 1.1303, 2.404, 2.325 and 8.7539 % for copper sulphate, sodium fluoride sodium chlorate, sodium pyrophosphate and potassium cyanate, respectively. The respective LC_{95} values were 0.4964, 6.732, 6.4556, 6.8339 and 18.2077%.

Table 2 . Regression equation, correlation coefficient (r); LC_{50} and LC_{95} of some inorganic salt bait formulations against the land snail, *Theba pisana* (Muller).

Bait formulation	Regression equation Y = a + b X	(r)	LC_{50}	LC_{95}
Copper sulphate	Y = 2.3118+186.734 X	0.9988**	0.2554	0.4964
Sodium fluoride	Y = 39.7097+9.1040 X	0.8481**	1.1303	6.0732
Sodium chlorate	Y = 23.2941+11.1076 X	0.9178**	2.4043	6.4556
Sodium pyrophos-phate	Y = 26.7953+9.9800 X	0.9694**	2.3250	6.8339
Potassium cyanate	Y = 8.3315+4.7600 X	0.9850**	8.7539	18.2077

In Egypt, Kassab and Daoud (1964) obtained almost similar results with copper sulphate, and percentage mortality of *Helicella vestalis* individuals reached 100% when this chemical was sprayed at the rate of 0.5 %.

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تقييم فعالية الأملاح غير العضوية لمكافحة قوقع الحدائق الصغير (ثيبا بيسانا)

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إختبرت فعالية خمسة أملاح غير عضوية هى : كبريتات النحاس ، فلوريد الصوديوم ، كلورات الصوديوم ، بيروفوسفات الصوديوم ، سيانات البوتاسيوم لمكافحة قوقع الحدائق الصغير (ثيبا بيسانا) فى صورة طعوم من الرده تحتوى على تركيزات من الأملاح ١,٢٥ ، ٠,٢٥ ، ٠,٥ ، ١,٠ ، ٢,٠ ، ٤,٠ ، ٦,٠ ، ٨,٠ ٪. وأجرى البحث فى المعمل بالدقى - محافظة الجيزة خلال موسم نشاط ١٩٩٢.

أظهرت كبريتات النحاس تفوقا فى نسبة الابادة للقوقع بلغت ٩٥-١٠٠٪ عند تركيز ٠,٥ - ١,٠ ٪ وبلغ التركيز القاتل لـ ٥٠٪ من الأفراد ٠,٢٥٥٤ ٪ فى حين كان التركيز القاتل لـ ٩٥٪ من الأفراد ٠,٤٩٦٤ . وفى المقابل أظهرت سيانات البوتاسيوم أقل نسبة ابادة للقواقع حيث بلغت ٤٥٪ فقط عند تركيز ٨٪. فيما بين هذين الملحين كانت نسبة الابادة ٩٣,٣ - ١٠٠٪ ، ٩١,٠ - ١٠٠٪ ، ٨٨,٣ - ١٠٠٪ للأملاح الثلاثة فلوريد الصوديوم ، كلورات الصوديوم ، وبيروفوسفات الصوديوم على التوالى وذلك عند تركيزى ٦,٠ ، ٨,٠٪. وقد بلغ التركيز القاتل لـ ٥٠٪ ، ٩٥٪ من الأفراد باستخدام الثلاثة أملاح ١,١٣٠ ، ٢,٤٠٤ - ٦,٤٥٦ ، ٢,٣٢٥ - ٦,٨٣٤ على التوالى .