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MOLLUSCICIDE ACTIVITY OF THE "AVELÓS" PLANT (*EUPHORBIA TIRUCALLI*, L.) ON *BIOMPHALARIA GLABRATA*, THE MOLLUSC VECTOR OF SCHISTOSOMIASIS

PEDRO JURBERG, JANUÁRIO BISPO CABRAL NETO & VIRGÍNIA T. SCHALL

An aqueous solution of the latex of Euphorbia tirucalli *collected at sites receiving large amounts of sunlight showed molluscicide action on* Biomphalaria glabrata, *with* LD_{50} *obtained at the concentration of 28,0ppm and* LD_{90} *at the concentration of 85,0ppm. The toxicity of the product for fish was similar to that of Bayluscide and of copper sulfate used for comparison.*

However, the wide distribution of the plant, its easy propagation and the simple procedure for extraction of the active substance, which is biodegradable, favor "avelós" as a promising agent in the control of schistosomiasis.

Key words: *Euphorbia tirucalli* – molluscicide plant – *Biomphalaria glabrata* – schistosomiasis control

The control of molluscs that are intermediate hosts of *Schistosoma mansoni* in endemic areas of Brazil is based on the use of imported industrialized chemical products.

Recent studies on molluscicide plants, however, have indicated their potential use for mollusc control, especially in self-supporting long-range campaigns involving the participation of large contingents of local labor. In these cases, basic sanitation, chemotherapy and health education are used in association with mollusc control, with a significant reduction in campaign costs (Lemma, 1970; Kloos & McCullough, 1982).

Numerous studies can be cited to show the interest to find the molluscicide effect of plants in Brazil, including the studies by Amorim & Pessôa (1962); Barbosa & Mello (1969); Rouquayrol, Souza & Matos (1973); Pereira & Souza (1974); Rouquayrol et al. (1980).

The molluscicide effect of Euphorbiaceae have already been studied. Silva, Souza & Rouquayrol (1971) demonstrated that aqueous and alcoholic extracts of *Euphorbia gymnoclada*, also known as "avelós", didn't show a molluscicide effect. Pereira, Souza & Mendes (1978) have studied the molluscicide effect of an hexanic extrat of *Euphorbia cotinifolia*, and Kloos & McCullough (1982) quoted in their review the species *Euphorbia lactea*, as studied by Abou-el Hasan et al. (1980).

The present study demonstrates the effect of a plant of the family Euphorbiaceae on schistosomiasis vector snails. When compared to other plants tested and reported in the review by Kloos & McCullough (1982), this plant shows a few desirable characteristics as a molluscicide, such as wide distribution in Brazil and in other continents, high toxicity for the target organisms, and abundance near nurseries. In some regions of Brazil the plant is used as a living fence and can be used the year long, and its latex is easy to extract.

MATERIAL AND METHODS

Snails: the tests were performed on eggs and adults (8 to 16mm) of *Biomphalaria glabrata* (N = 1980) from Touros (state of Rio Grande do Norte, Brazil) maintained in the laboratories of the Department of Biology, Instituto Oswaldo Cruz – FIOCRUZ.

Plant: the plant used was collected at sunny sites and is catalogued in the herbarium index of the patrimony of the Oswaldo Cruz Foundation as *Euphorbia tirucalli*, L. (no. 76), popularly known as "avelós".

Latex dilution: "avelós" latex was obtained by incisions or cuts in the branches and collected in test tubes containing 3ml distilled water. After collection of 1ml of the exudate, the final volume was brought up to 10ml with distilled water, thus representing a 10% (v/v) solution

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Instituto Oswaldo Cruz, Departamento de Biologia, Caixa Postal 926, 20000 Rio de Janeiro, RJ, Brasil.

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from which all other dilutions were obtained. The solution was stored in the refrigerator and used within a period of 48 hours.

Toxicity: the tests were carried out as recommended by the WHO (1965), with snails placed in Erlenmeyer flasks (500ml) containing 400ml of each dilution and 10 animals per flask. No barrier was used to prevent the animals from leaving the solution, but sufficient lettuce to feed the snails throughout the experiment was provided in all assays. After 24 hours of exposure, the snails were washed and transferred to an identical volume of water, were they were allowed to recover for more than 24 hours.

After each period, the number of animals adhering in this time to the flask wall above the surface of the solution was recorded and the percentage of animals found under these conditions was taken as the exit index.

Egg masses tests were carried out on 1 to 7-day old egg masses collected and placed on small styrofoam plates (40 x 40mm) previously dated and distributed among 23 aquaria, which were then transferred to crystallizers with stabilized water. When the desired developmental time was reached, the number of oviferous capsules and eggs was determined, and the egg masses was transferred to Becker flasks containing 100ml of each test solution. Exposure lasted 24 hours, after which the egg masses was washed and transferred to stabilized water until hatching. Egg masses viability was defined according to percent hatching. All tests were carried out in a biochemistry oxygen demand incubator from General Electric (model 347) lighted by two 15W fluorescent lamps left on from 6:00 a.m. to 6:00 p.m. and turned off during the remaining hours. Temperature was maintained at 27°C throughout the experiments. Light periodicity was controlled with a SERMAR Cronomat model time programmer.

LD_{50} and LD_{90} were calculated by the method of Lichtfield & Wilcoxon (1949).

Toxicity for fish – Fish *(Lebistes reticulatus)* were collected from lakes on the FIOCRUZ Campus and maintained in stabilized water for eight days for acclimation. For testing, 10 animals were placed in Becker flasks containing 200ml of each solution and the number of dead animals detected after 24 hours of exposure was recorded. Comparative tests were carried out with various concentrations of Bayluscide and copper sulfate.

RESULTS

"Avelós" latex proved to be toxic for *B. glabrata* at concentrations higher than 15 ppm, with LD_{50} at 28 ppm and LD_{90} at 85 ppm (Table I). When the latex was tested more than one week after extraction, no molluscicide activity was detected. Latex collected from plants in the shade also had no molluscicide activity.

Under the experimental conditions used (Table II), the lethal effect showed by the product on the egg masses of *B. glabrata* was lower than the effect on the adult snails.

The exit index was 7.6% for 1,810 snails tested, and 3.2% for the controls (N = 170).

The toxicity of "avelós" latex for fish was very high, but was comparable to that of copper sulfate or Bayluscide (Table III).

TABLE I

Activity of the "avelós" latex on *Biomphalaria glabrata* (8 to 9 mm of diameter). (N = 270)

ppm	Mortality (%)
0	0,0
15	30,0
30	60,0
45	63,0
60	73,0
80	86,6
100	93,3
120	100,0
150	100,0

TABLE II

Activity of the "avelós" latex on eggs of the *B. glabrata*. Spawn viability was defined according to percent hatching after exposuring lasted 24 hours with the latex of *E. tirucalli*

Spawn's age (days)	Latex concentration (ppm)	Eggs (N)	Hatching (N)	Percent hatching (%)
4 – 5	0	154	130	84,4
	25	153	112	73,2
	50	145	103	71,0
	75	130	88	67,7
	100	130	83	63,8
6 – 7	0	120	102	85,0
	50	112	92	82,1
	100	85	71	83,5
	200	101	65	64,4

TABLE III

Toxicity of "Avelós", Copper sulfate and Bayluscide against fish *(Lebistes reticulatus)* after exposuring lasted 24 hours with the latex of *E. tirucalli*

Moluscicide	ppm	Mortality (%)
Avelós	0	0
	1	0
	2	100
	3	100
	4	100
Baylucide	0	0
	1	90
	2	100
	3	100
	4	100
Copper Sulfate	0	0
	1	70
	2	90
	3	100
	4	100

The test were carried out with one replica (20 animals per dilution).

DISCUSSION

Correia (1931) reported that "avelós" originates from Africa and was carried to tropical countries, including Brazil, where it is found in the states of Ceará and Bahia and along the coast of the state of São Paulo. Its latex is used as a substitute of gutta-percha, as an antisyphilitic and as a laxative; its use, however, is dangerous and assumed to cause blindness. The plant is also used as a living fence.

Several Euphorbiaceae are known in Brazil by the name "avelós". Brito & Thomas (1980) named *E. tirucalli* as "avelós" and studied the anti-inflammatory properties of the plant in a pharmacological investigation. Cruz (1982) gave the name "avelós" to *Euphorbia entheurodoxa*

L. and reported on the anticancerigenous effect of the plant as well as on its use as a living fence to corral cattle. Computerized information provided by the "Flora/CNPq" Program reports that *E. tirucalli* is used as a living fence in the state of Pernambuco (Olinda, Caruaru and Limoeiro). Personally, I (P. Jurberg) have seen it used as a living fence in the vicinity of Campos (state of Rio de Janeiro).

Saha, Savini & Casinathan (1961) showed that "avelós" has an oxytocic property (0,009 cc as much response as 0,003 U.I. of oxytocin) which is much lower than that of green papaya *(Carica papaya)* in order of 0,00022 cc.

Rizzo & Porfirio (1971), in a study on *Euphorbia spendens* and *E. cotinifolia*, noted the irritating action of the two plants, especially for the eye, this effect being more marked in the latter.

Despite the irritating action the latex of "avelós" may have on eyes and skin, the plant is suitable for testing in the field as a molluscicide according to the concepts of Kloos & McCullough (1982), i.e. distribution in endemic areas, easy propagation by cutting, easy extraction of the active principle, in addition to the fact that it does not cause snail escape (Malek & Cheng, 1974).

In the present study, the latex of "avelós" collected at sunny sites showed molluscicide action in laboratory tests, although it showed no action on snail eggs. Its high toxicity for fish (which are killed by a dose ten times lower than that needed to kill the snails under the same experimental conditions) is analogous to that observed for copper sulfate and Bayluscide in comparative tests.

RESUMO

Uma solução aquosa de *Euphorbia tirucalli* (avelós) coletada em locais ensolarados mostrou atividade moluscicida para *Biomphalaria glabrata* obtendo-se a LD_{50} a uma concentração de 28,0 ppm e a LD_{90} a 85,0 ppm. A toxicidade do produto para peixes foi similar a de Bayluscide e sulfato de cobre testados comparativamente.

Pela larga distribuição da planta e sua fácil propagação e extração da substância ativa, e pela ausência de efeito residual, a planta pode ser considerada como promissora para testes de campo em locais restritos.

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