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EDITORIAL

MOLLUSCICIDAL ACTIVITY OF CERTAIN SUDANESE MEDICINAL PLANTS USED IN FOLK – MEDICINE

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Abstract:

Objectives: In view of the promising potential of plant molluscicides, 10 plants indigenous to Sudan and of common use in Sudanese folk-medicine, were screened for their molluscicidal activity, using two local snail vectors, *Bulinus truncates and Biomphalaria pfeifferi*.

Results: At different concentrations up to 500 ppm., seven plant samples were found to be lethal to both of the snail species. The pet. ether/$CHCH_3$ (1:1) extracts of 6 plants were lethal as molluscicidal agents while only two plants showed 100% mortality to the snails as methanol extracts.

The two most active plants that killed both snail hosts ($\leq$ 50 ppm.), were obtained from the whole plant of *Ambrosia maritimae* (Asteraceae) and the fruits of *Croton zambesicus* (Euphorbiaceae). These two plants when phytochemically screened for their active constituents, they showed the presence of sterols and cardenolides.

Conclusion: Vegetable molluscicides can be grown and can be used by communities in endemic areas to combat schistosomiasis.

الملخص:

عند اختبار تراكيز مختلفة من مستخلصات عشر نباتات طبية سودانية لمعرفة تأثيرها ضد قواقع البلهارسيا *Bulinus truncatus* و *Biomphalaria pfeifferi* . كانت مستخلصات سبع من هذه النباتات قاتلة للنوعين من القواقع. كانت مستخلصات خليط المذيب المكون من الإيثر البترولي والكلورفورم (1:1) لست من النباتات قاتلة للقواقع في حين كانت مستخلصات كحول الميثيل لنباتين منهما أيضاً قاتلة. كما تبين أن أكثر المستخلصات فاعلية ضد النوعين من القواقع عند تركيز 50ppm،

كانت لنبات *Ambrosia maritima* من العائلة Asteraceae ولثمار *Croton zambesicus* من العائلة Euphorbiaceae.

كما أظهر المسح الكيميائي لهذين النباتين أنهما يحتويا على أستيرولات (Sterols) ومواد لها تأثير على القلب (Cardenolides).

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Introduction:

Schistosomiasis is a major health problem in most irrigated areas in tropical and subtropical countries of Africa and South America. The intermediate host, snails, thrive in relatively warm slowing water of most irrigation systems. There has been a resurgence of interest in the study of vegetable molluscicides of local origin. The attraction is largely based on the philosophy of self reliance and saving hard currency (EL-Hadi MA. *et al*, 1984).
Investigations have been published in the field of plant molluscicides (Archibald RG, 1933); (Mozley A, 1939); (Chao YW. *et al*,1958); (Fang MY. and Shengwuxue T, 1959); (Sherif AF. and EL-Sawy MF, 1969); (Lemma A, 1970); (Parkurst RM. *et al*, 1973); (Amin MA, 1976); (Mahran GH. *et al*,1974); (Dasaji SF. *et al*, 1977); (Adwewunmi CO and Sofowera EA; 1980); (Dubbois MA. *et al*, 1990); (Schall VT. *et al*,1992); (Conthout-J, etal,1994), (Nick A. *et al*,1995); (Hmamouchi M. *et al*, 2000); (Santos-AF and Santona AE, 2001) and (Bezerra JC. *et al*, 2002).

In Sudan, the relatively high molluscicidal activity of the seeds of Croton sp. has been noted by several Sudanese workers (EL-Kheir Y.M. and EL-Tohamy MS, 1979). Moreover, 50 Sudanese medicinal plants were screened for their molluscicidal activity, valuable results were obtained (EL-Hadi MA. *et al*, 1984).

The present study reports on the preliminary screening of 10 local medicinal plant extracts for molluscicidal activity using two local snail hosts; *Bulinus truncates* and *Biophalaria Pfeifferi*. Plant samples that showed 100% mortality to the snails are reported (Table1). The two plant samples that showed high molluscicidal activity ($\leq$ 50 ppm.) were further screened for phytochemical groups(Table 2) .

Material and Methods:
Plant material:

Plants used for this study were kindly supplied by the Medicinal and Aromatic Herbs Research Institute of the National Council for Research , Khartoum.

Snail species used for the test:
Two adult species of the snails were used, *Bulinus truncates* and *Biomphalaria pfeifferi*. Both were collected by means of a deep scoop from canals in the central part of the Gezira irrigated area.
Snail Size:
The Bulinus spp. varied between 5-6 mm in length and the Biomphalaria spp. varied between 7-9mm in width.
Screening technique**:**

Screening tests of the different extracts were carried out according to the method recommended by the W.H.O. (W.H.O. Tech, rep.ser.1961-214) and (W.H.O. Bull. 33, 578, 1965).
In this method, 5 healthy snails of uniform size were immersed in glass bottles; wide mouthed with perforated screw cap. Each bottle containing 350 ml of dechlorinated tap water to which different extract concentrations were added. The exposure time was 24 hours followed by a recovery period of 24 hours in normal dechlorinated tap water. Control tests were set up in dechlorinated tap water only.

Extraction Method:

20 g of the dried coarsely powdered plant material was successively extracted by maceration in conical flask using petroleum ether chloroform mixture (1:1), and methanol for 24 hours with continuous shaking. Each extract was filtered and evaporated separately under vacuum, and the volume was adjusted to 20ml.
Preparation of working solution:

1ml of the concentrated extract was shaken with dechlorinated tap water and the volume was adjusted to 100ml. This gave a solution of 10.000 parts per million (ppm.)(µg/ml.). Each 0.4, 2.0, 4.0, 8.0, 12.0, 16.0

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and 20.0ml. of this solution was added separately to 400ml. of dechlorinated tap water, this gave solutions of 10, 50, 100, 200, 300, 400 and 500 ppm respectively.

Phytochemical screening:

Phytochemical screening for the secondary plant constituents present in the plant extracts were carried out using methods adopted in similar surveys (Farnsworth NR, 1960; Wall ME. etal 1954).

Results and discussion:

The plants screened for molluscicidal activity were selected according to their ethnomedical uses. Most of them are used traditionally to treat malaria and/or fever.

Table 1 shows the different concentrations at which seven plant samples proved to posses 100% mollscicidal activity to both of the snail vectors,at concentration up to 500 ppm.Three plant samples were found to be devoid of lethal activity.

Table1: Results of Molluscicidal Screening

No.	Btanical Name and Family	Lo cal Name	Morphological part tested	Geographical Source	Concentration in ppm. at which plant material showed100%mortality to the snails	
					Bulinus	*Biophalaria*
1.	Amaranthaceae Aerva javanica (Burn.F.) Juss. Exschutt	Um Shariaa	W.P.	Kh.S.	P/C 200 **Me** 200	200 200
2.	Aristolochiaceae Aristolochia bracteolata Lam.	Um Galagel	W.P.	G.S.	P/C 400 Me -	500 -
3.	Asclepiadaceae Solenostema argel (Del) Hayne	EL-Hargel	L.	N.S.	P/C - Me -	- -
4.	Asteraceae Pulicaria crispa (Forssk) Oliv.	EL-Rmeit	W.P.	Kh.S.	P/C 500 Me -	500 -
5.	Compositae Ambrosia maritima L.	Damsisa	W.P.	Kh.S.	P/C 50 Me -	50 -
6.	Cucurbitaceae Citrullus colocynthis (L.) Schrad	EL-Handal	S.	G.S.	P/C 400 Me -	500 -
7.	Euphorbiacea Croton zambesicus Mull. Arg.	Um- Geleigla	Fr.	C.S.	P/C 50 Me -	50 -
8.	Menispermaceae Tinospora bakis (A. Rich) Miers	Erg-EL-Hagar.	W.P.	C.S.	P/C - Me -	- -
9.	Ranunculaceae Nigella sativa (L).	Kamun-Aswad Habat EL-Baraka	S.	N.S.	P/C - Me -	- -
10.	Rubiaceae Gardenia lutea Fresen	UmGawy	Fr.S.	Kh.S.	P/C - Me 100	- 100

N.B. L: Leaf; W.P.: whole plant; Fr.: Fruit; Fr.P.: Fruit Pulp and S: Seed; Kh.S. : Khartoum state; G.S.: Cezira state; C.S.: central Sudan; N.S.: Northern state,P/C: pet.ether/$CHCL_3$ (1:1) extract ;Me :methanol extract.

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These plants are *Solenostemma argel*, *Tinospora bakis* and ***Nigella sativa.***

It was also noticed that the petrol/chloroform (1:1) extracts of 6 plants were lethal as molluscicidal agents , two of which (*Ambrosia maritima and Croton zambesicus*), were lethal molluscieides at concentration ≤ 50ppm. Two plants showed 100% mortality to the snails as methanol extracts, namely *Aerva*

Javanica and *Gardenia lutea*, while in only one plant sample the two extracts, were proved to be responsible for the activity (*Aerva Javanica*).

The mollscicidal activity of alcoholic or water extracts gives such drugs the merit over petrol extracts i.e. they can be prepared and applied to the water bodies at the transmission sites as concentrated aqueous solution or even in their crude powdered form as vegetable molluscicides.

The use of plant mollucicides to combat schistosomiasis could largely be based on self – help methodology , that directly involves the people who are most affected and would have most to benefit, a pattern leading to the sense of regional responsibility and pride (Lemma A. *et al*,1979).

The plants that showed high molluscicidal activity (≤ 50ppm.), were phytochemically screened (Table 2).

Table 2:phytochemical screening of the most active molluscicidal plant samples

No.	Botanical Name	Plant part tested	Sterols	Triterpenes	Alkaloids	Flavonoids	Cardenolides	Tannins	Saponins	Cyanogenic glycosides	Anthra-quinones
1.	*Ambrosia maritima*	W. P.	+	-	+	-	±	-	-	-	-
2.	*Croton zambesicus*	Fr.	±	-	-	-	±	+	-	-	±

N.B. W.P.: whole plant; Fr.: fruit; Negative test; ± : Slightly positive test; + : Strongly positive test

Both *Ambrosia maritima* and *Croton zambesicus* showed the presence of sterols and the highly toxic cardenolides. None of them was proved to contain triterpenes, flavonoids, saponins and cyanogenic glycosides while tannins and anthraquinones were detected in *Croton zambesicus.*

The molluscicidal activity does not appear to be confined to any particular family and also not restricted to any morphological part of the plant, although literature reports seem to suggest that the activity has been found mainly in fruits and seeds except for few cases eg. *Tephrosia vogelli* and *Polygonum senegalensis* (Mozely A, 1939) ; (Parkhurst RM. *et al*, 1973) and (Dosaji SF. *et al*, 1977).

It was observed that, in plant samples tested , more than one group of constituent was found in each morphological part tested . The molluscicidal activity may be due to one or more than one group of constituents .Hence further investigations are needed in this concept to determine the compound or compounds responsible for the molluscicidal activity .

It had been reported that,chalcone (Asafu M and John HO,1978) ,rotenone (Mozley A,1952) and saponins (Mozley A,1952) ; (Lemma-A. *et al*,1979)and (Kola AS. *et al*,1980) had molluscicidal activity.

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