# Toxicity of The Dried Parts of *Pulicaria crispa* Herb (Tagar) on *Lymnaea cailludi*, Anopheline larvae, *Oreochromis niloticus* Fingerlings And Tadpoles

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# الآثار السامة للأعضاء الجافة لنبات التقر على قواقع ليمنيا كايودى ويرقات بعوض الأنوفليس وأصبعيات سمك البلطى وصغار الضفادع

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## المستخلص

تم اختبار سُمية أوراق وأزهار وسيقان نبات التقر الجافة – كل على حده– على قواقع ليمنيا كايودى البالغة الناقل الوسيط لطفيل الفاشيولا، ويرقات البعوض الأنوفليس وأصبعيات سمك البلطى وصغار الضفادع (أبو ذنيبة). جُمع النبات من منطقة شمبات وتم تجفيف أعضاءه –كل على حده– هوائيا في الظل، ثم سُحقت وأُستخدمت بجرعات مختلفة. اعتمد تقدير النشاط السام للنبات على حساب الجرعات النصفية القاتلة ($LD_{50}$) والجرعات القاتلة لـ 95% من الحيوانات($LD_{95}$).

أظهرت الأوراق الجافة سُمية عالية على القواقع وأبو ذنيبة، وسُمية منخفضة على يرقات الأنوفليس، ولم تظهر سُمية على أصبعيات البلطى. أظهرت الأزهار الجافة سُمية عالية على أبوذنيبة، وسُمية منخفضة على القواقع ويرقات البعوض، ولم تظهر سُمية على الأصبعيات. السيقان الجافة كانت سُميتها منخفضة على القواقع ويرقات البعوض وأبوذنيبة، بينما لم تظهر سُمية على الأصبعيات.

# Toxicity of The Dried Parts of Pulicaria crispa Herb (Tagar) on Lymnaea cailludi, Anopheline larvae, Oreochromis niloticus Fingerlings And Tadpoles

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**Abstract**

The toxicity evaluation and *molluscicidal* activity of the dried parts of *pulicaria crispa*( leaves, flowers and stems) was tested against *Lymnaea cailludi* adult snails" the intermediate host of Fasicioliasis" and non – target organisms (Anopheline larvae, fingerlings fishes and tadpoles). The plant was collected from Shambat area, air dried under shade and ground to powder, then used in different concentrations. The assessment of the plant activity was based on calculating the doses for 50% and 95% of the animals tested (LD50 and LD95). Dried leaves showed high *molluscicidal* potency against *Lymnaea cailludi* snails and tadpoles, low activity against Anopheline larvae and without toxic effect against fingerling fishes, Dried flowers have shown high toxicity against the tadpoles, low toxicity against the snails and Anopheline larvae and no toxicity against fishes. Dried stems have shown low toxicity against the snails, Anopheline larvae and tadpoles with no toxicity against fishes

## Introduction:

Fascioliasis, or liver fluke disease is considered as one of the major health problems of cattle, sheep, goats and to a less extent in humans (Haroun, 1975). The disease is transmitted in Sudan by various species of *Lymnaea* snails. Integrated fascioliasis controlling programmes were adopted including mechanical, chemical and biological measures. Yet, *molluscicidal* control remains an important strategy in the control of the snails. Uses of plants *as molluscicides* have received more attention due to the high cost of synthetic ones and their hazardous impact on the environment ( Webbe and Lambert, 1983). Ali, (1997) and Fatah El Bab, (1999) proved that water extract of the dried parts of Pulicaria crispa was effective against *Biomphalaria pfeifferi* and *Bulinus truncatus* snails, respectively. However Atta El Mannan,(2001) reported that Pulicaria *crispa* showed high *molluscicidal* potency against snail without toxic effect to non target organisms. Recently, Abd Alla et al, obtained molluscicidal activity of three plants (Calotropis *procera ,Nicotiana tabacum and Trigonella foenum* ) against *Bulinus truncatus* snails. The objectives of this study were to investigate the toxic effects of different dried parts (leaves, flowers and stems) of *Pulicaria crispa* on *Lymnaea* cailludi snails, Anopheline larvae ,*Orechromis niloticus* fingerlings and tadpoles.

## Materials and Methods:

1- Collection and maintenance of animals

*Lymnaea cailludi* snails were collected from Sudan Academy for Administration Sciences (Khartoum). Mass and individual screening were carried out to detect the natural infection. Non infected snails were maintained in glass aquarium containing well aerated water, fed on dried lettuce and kept for at least five days to acclimatize.

Anopheline larvae (second and third larval stages) were collected from Shambat area (Khartoum North) and maintained in dechlorinated tap water in plastic dish in the laboratory for one day before use. The dish was covered by gauze and the larvae were fed on organic matter.

Fingerlings of *Oreochromis niloticus* were caught from White Nile River and brought to the laboratory at Fisheries Research Center (El Shagara, Khartoum). They were maintained in cement ponds for five days to acclimatize and were fed on wheat bran.

*Buffo* spp. tadpoles were collected from Wad Nobawi "Omdurman" and maintained in glass aquaria contained dechlorinated tap water inside the laboratory for two days and fed on green algae.

2- Collection of plant materials

Only plants with identified floral parts of the herb *Pulicaria crispa* were collected from Shambat area "Khartoum North" and brought to the laboratory where their leaves, flowers and stems were picked and separately dried in shade for at least three days. Each dried part was ground to powder using pestle and mortar.

3- Sampling of dried plant materials

The powdered parts of *Pulicaria crispa* herb were accurately weighted and kept in separate nylon bags. The following weights: 100, 200, 300, 400, 500 and 1000 mg were used for molluscicidal, larvicidal potency tests and tadpoles toxicity tests, while , 3, 6, 9, 12, 15, and 30 gm were used for *Oreochromis niloticus* toxicity test.

4- Molluscicidal potency tests

Three replicates of 10 snails were put in plastic dishes, each containing one liter of dechlorinated tap water and 100, 200, 300, 400, 500 and 1000 mg from each plant part separately at 27-28°c. Control groups of 10 snails were kept in separate dishes. The doses use for each dried material were: 100, 200, 300, 400, 500, and 1000 ppm.

The behavior of the snails was observed for five hours and the mortality was recorded after 24 hours.

5- Larvicidal potency tests

Three replicates of 10 Anopheline larvae were put in a plastic dish containing one liter of dechlorinated tap water and 100, 200, 300, 400, 500, and 1000 mg from each plant part separately at 27-28°c. Control groups containing 10 larvae in dechlorinated tap water were kept. Therefore, the doses used for each dried material were: 100, 200, 300, 400, 500, and 1000 ppm.

The behavior of the larvae was observed and the mortality was recorded after 24 hours.

6- Toxicity test of *Oreochromis niloticus* fingerlings

Three replicates of 10 fingerlings fishes were put in a glass aquarium containing 30 litres of dechlorinaled tap water and 3, 6, 9, 12, 15 and 30 gm from each plant part separately at 27-28°c. Control groups contained 10 fingerlings in 30 liters of dechlorinated tap water were kept. The doses used for each dried material were: 100, 200, 300, 400, 500, and 1000 ppm respectively. Each glass aquarium was supplied with

a compressor for aeration about 10 hours daily. The behavior of the fish was observed for about 10 hours and the mortality was recorded after 24 hours.

7- Toxicity tests of tadpoles

Three replicates of 10 tadpoles were put in a plastic dish containing one liter of dechlorinated tap water and 100, 200, 300, 400, 500 and 1000 mg from each plant materials separately at 27-28˚c Control groups contained 10 tadpoles in one liter of dechlorinated tap water. Therefore, the doses used for each dried material were 100, 200, 300, 400, 500, and 1000 ppm, respectively.

The behavior of the tadpoles was observed and the mortality was recorded after 24 hours.

**Table (1)** Experimental protocol of potency test

| Group | No. of Animals | No. of Replicates | No. of Concentrations | Temp. |
|---|---|---|---|---|
| Lymnaea cailludi Snails | | | | |
| Experimental | 10 | 3 | 6 | 27-28 ˚c |
| Control | 10 | 3 | Dechlorinated tap water | 27-28 ˚c |
| Anopheline larvae | | | | |
| Experimental | 10 | 3 | 6 | 27-28 ˚c |
| Control | 10 | 3 | Dechlorinated tap water | 27-28 ˚c |
| Oreochromis niloticus | | | | |
| Experimental | 10 | 3 | 6 | 27-28 ˚c |
| Control | 10 | 3 | Dechlorinated tap water | 27-28 ˚c |
| Tadpoles | | | | |
| Experimental | 10 | 3 | 6 | 27-28 ˚c |
| Control | 10 | 3 | Dechlorinated tap water | 27-28 ˚c |

**Results and Discussion:**

**1. Effect of leaves dried materials**

The lethal doses that caused 50% and 95% mortality of *Lymnaea cailludi* snails ($LD_{50}$ and $LD_{95}$) were: 336 and 591 ppm, respectively (**Table 2**), while LD50 and LD95 that affected Anopheline larvae were: 2291 and 7762 ppm respectively (**Table2**). The same experiment against *Oreochromis niloticus* fingerlings showed no mortality at doses from 100–1000 ppm (**Table 2**). $LD_{50}$ and $LD_{95}$ against the tadpoles were: 485 and 846 ppm respectively (**Table 2**).

2. **Effect of flowers dried materials**

$LD_{50}$ and $LD_{95}$ against *Lymnaea cailludi* snails were: 695 and 4024 ppm respectively (**Table 2**). On the other hand, $LD_{50}$ and $LD_{95}$ against Anopheline larvae were: 4026 and 8461 ppm respectively (**Table 2**).The flowers dried materials showed no mortality against *Oreochromis* niloticus fingerlings at doses from 100 – 1000 ppm (**Table 2**), while LD50 and LD95 against the tadpoles were: 385 and 688 ppm respectively (**Table2**).

3. **Effect of stems dried materials**

$LD_{50}$ and $LD_{95}$ against *Lymnaea caillu*di snails were: 1420 and 7332 ppm, respectively (Table 2), while $LD_{50}$ and $LD_{95}$ against Anopheline larvae were: 2762 and 5261 ppm respectively (table 2). The same tests against *Oreochromis niloticus* fingerlings showed no mortality at doses from 100 – 1000 ppm (Table 2), while $LD_{50}$ and $LD_{95}$ against the tadpoles were: 1509 and 4130 ppm respectively (table 2).

**Table (2)** $LD_{50}$ and $LD_{95}$(ppm)of Pulicaria crispa dried parts against *Lymnaea cailludi* snails , Anopheline larvae , *Oreochromis niloticus* fingerlings and tadpoles:

| Dried Plant part | Lymnaea cailludi snails | | Anopheline larvae | | Tadpoles | | Oreochromis niloticus fishes | |
|---|---|---|---|---|---|---|---|---|
| | $LD_{50}$ | $LD_{95}$ | $LD_{50}$ | $LD_{95}$ | $LD_{50}$ | $LD_{95}$ | $LD_{50}$ | $LD_{95}$ |
| Dried leaves | 336 | 591 | 2291 | 7762 | 485 | 846 | - | - |
| Dried flowers | 695 | 4024 | 4025 | 8461 | 385 | 688 | - | - |
| Dried stems | 1420 | 7332 | 2762 | 5261 | 1509 | 4130 | - | - |

The results were similar to those obtained from the study of molluscicidal test of *Pulicaria crispa* plant against *Biomphalaria pfeifferi* (Ali, 1997) with LD50 values equal to 575, 620 and 647 ppm for dried leaves, flowers and stems respectively. Also similar results were reported using *Bulinus truncatus* snails (Fatah El Bab, 1999), with LD50 values equal to 229 , 334 and 481 ppm, respectively. On the other hand the results showed that dried flowers, leaves and stems were toxic to the tadpoles in this order , while the same tests showed no toxicity to *Oreochromis niloticus* fingerlings.

The results showed that leaves being superior to flowers and stems as molluscicides, which might be due to the larger surface area of the leaves which might have resulted in more rapid release of any toxicant and higher solubility of active ingredient(s). Similar results were also obtained by Kloos et al., (1987) who screened 50 local medicinal agricultural plants in Kenya and found that a higher molluscicidal activity was observed in leaves.

Developmental stages of the plants may vary in their toxic ingredient contents (Ali, 1997). In the present study, only flowering *Pulicaria crispa* plants were used, the results might vary if other developmental stages of the plant were used, for example: plants with fruits, young or old leaves. Ndamba et al., (1994) reported the importance of harvesting berries of *Phytolacca dodecandra* at green unripe stage of development for maximum molluscicidal potency.

Phytochemical studies in Quatar (Rizk, 1986) revealed that *Pulicaria crispa* contains triterpene, sesquiterpene lactones, tannins and alkaloids which suggest molluscicidal activity.

In conclusion, this study proved that dried leaves of *Pulicaria crispa* showed high activity against *Lymnaea cailludi* snails, low activity against tadpoles and Anopheline larvae and no activity against Oreochromis niloticus fishes.

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