

Control of *H. elaterii* by *Citrulluscolocynthis* L. fruit aqueous extract

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Abstract

This study aimed to to investigate the potentialities of using the bitter apple *Citrullus colocynthis* fruit aqueous –extract against *H. elaterii*. The effect of the extract on the development of the Larvae fourth stage (L4s) (duration in days) and food-consumption rate, were studied. Concentrations of 2.5, 5, 6, and 7% (w/v) of the extracts were prepared. L4s were fed on snake-cucumber leaf-discs treated with extracts for 24, 48 hr or for the whole L4 duration. For the rest of the L4 duration, L4s were offered untreated leaf-discs. The results of HF-aq-extract on the L4s revealed that the extracts of the fruits could be used as insecticides having the properties of repellency at all tested concentrations.

Keywords: Natural Insecticides; *H. elaterii*; Plant extract; *Citrullus colocynthis* (L) Schard.

1. Introduction:

Citrullus colocynthis (The bitter apple) [Family: Cucurbitaceae]. It is perennial herbs usually trailing, available in almost all parts of the Sudan as wild plant. The Sudanese and people in other parts of the world use the fruit for different purposes including medical uses [1 – 6].

Botanical insecticides are reviewed, with an emphasis on natural products that have received regulatory approval. Traditionally these products including nicotine, rotenone, sabadilla and ryania. Despite major research interest a decade ago, antifeedants, especially neem and azadirachtin based products have made a relatively modest impact in the field. Essential oil products have recently emerged as the most important botanical insecticides. Research has demonstrated the potential of a number of other experimental plant natural products as botanical insecticides including piperamides, acetogenins, thiophenes, and limonoids [7 – 8].

A wide range of technologies were available for the extraction of active components and essential oils from medicinal and aromatic plants. The choice depends on the economic feasibility and suitability of the process to the particular situation. The various processes of production of medicinal plant extracts and essential oils such as decoctions, infusions, fluid extracts, tinctures, pilular (semisolid) extracts and powdered extracts [9]. In this work we used immersion in water for extraction of natural insecticide.

This study aimed to *H. elaterii* pest control by using natural insecticides extracted from *Citrullus colocynthis* (L) Schard.

2. Materials and Methods

2.1 Collection of tested plant

Yellow mature HF was collected during Feb. 2002 from Atra Village adjacent to the Al - Nashishiba farm at University of Gezira.

2.2 Preparation of Samples

The collected samples were dried to drying under shade, then, they were mechanically broken into small

pieces and rinded by using an electric blender. The prepared powder contains all the fruit contents, viz. pulp, seeds and rind. Preparation of Handal Fruit Powder (HFP) was done few days before use, so as to reduce volatilization, because it was noticed from practice that freshly prepared powder has stronger odor than the old one, even though both were grinded from the same fruits.

2.3 Aqueous extraction of *Citrullus colocynthis* L

The process of extraction was done 24 hrs before the time of application. To prepare extract of 2.5% (w/v) concentration, each 10 g of HFP was dissolved in 100 ml of distilled water (This doesn't make 2.5%, it makes 10% w/v) then the mixture was stirred in the shaker for 24 hrs, and then filtered. For the preparation of the 5% concentration, 20 g of HFP was dissolved in 100 ml and the same above mentions steps were followed. The same procedure was adopted for the preparation of extract with 6%, 7% concentration by dissolved 30g and 40g of HFP respectively each in

100 ml of distilled water for 8 hr. We reduced the time of extraction for 8 hr to reduce the ratio of extraction for the concentration which we need. (in 8 hr The extract of HFP is not 100%).

2.4 Characterization of Natural Insecticides Extracted

Natural substance extracted from *Citrullus colocynthis* (L) Schard is brown in color and it has a pungent smell. Its efficiency as a pest control (*H. elaterii*) was investigated on feeding of the *H. elaterii* larvae. Concentrations of 2.5, 5, 6, and 7% of the extract were prepared. L4s were fed on snake-cucumber leaf-discs treated with each concentration for 24, 48 hr or for the whole L4 duration. For the rest of the L4 duration, L4s were offered untreated leaf-discs, in order to observation the amount consumed from HF extracted.

2.5 Statistical analysis

The statistical analysis for data was done by t – test.

3. Results and discussion:

3.1 Effect of Handal Extracts on Feeding:

3.1.1 Feeding for 24 hr only:

At 2.5% and 5% HF-aq-extr, the larval feeding activity was greatly affected. The larvae consumed of 134 mg and

168 mg/day, respectively, compared to 296 mg consumed by the control larva in the same day. However, at the higher concentrations of 6% and 7%, the larvae consumed an amount ranging between 76 and 156 mg/day (Table 3.1 and Fig. 3.1).

Table 3.1: The effect of the HF-aq-extract on feeding of the L4 of *H.elaterii* Larvae were offered extract-treated leaf discs for 24 and 48 hr.

Conc (% w/v)	Food Consumption Rate											
	Day											
	Hr	1st		2nd		3rd		4th		5th		Total
		mg	%	mg	%	mg	%	mg	%	mg	mg	%
2.5	24	134d	33.5	246b	61.4	182c	45.5	0.0d		p	562	140.5
	48	174c	43.5	230b	57.5	246a	61.5	0.0c		p	640c	160
5.0	24	168b	42.0	218c	54.5	218b	54.5	212a	53.0	pp	816b	204
	48	110e	27.5	204c	51.0	168c	42.5	144a	36.0	pp	628c	157
6.0	24	156c	39.0	d 64	16.0	14a	3.5	6c	1.5	pp	240e	60
	48	206b	51.5	d 64	16.0	156c	39	b 10	2.5	pp	338b	84.5
7.0	24	76e	19.0	e 48	12.0	48b	12.0	b 66	16.5	pp	256d	64
	48	166d	44.5	e 14	3.5	e 6	1.5	b 8	2.0	pp	194e	48.5
Cont-rol		296a	74	356a	89	343a	85.5	Pp0.0c		p	994a	248.5

* Means followed by the same letter are not significantly different at 5% level of significance according to Duncan's Multiple range test (DMRT).

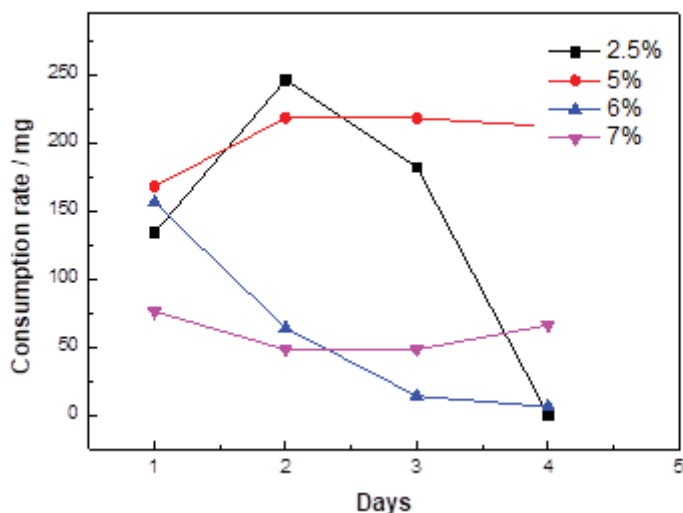


Fig 3.1: The duration of the HF-aq-extract on feeding of the L4 of *H.elaterii*: Offered treated discs for 24 hr only (disc initial wt = 400 mg). After the first-day of the treatment, the larvae completed their duration on untreated leaf-discs.

- On the 2nd day, the L4 consumed an amount of 246 and 218 mg when 2.5% and 5% (w.v) concentrations were used, respectively. This amount decreased with the increase of the concentration to which the larva was subjected during the 1st day of the experiment (table 3.1).
- At the higher concentrations of 6% and 7%, the L4 consumed between

64 mg and 48 mg, compared to 356 mg consumed by the control larva in the same day.

- During the 3rd day, the L4 consumed 182, 218, 14 and 48 mg at 2.5%, 5%, 6%, 7%, respectively, compared to 343 mg consumed by the control larvae.

3.2.2 Feeding on treated discs for 48 hr

On the first-day of treatment, the L4 consumed 166 mg (41.5%) at 7%, compared to 296 mg (74%) out of the offered 400 mg (100%) consumed by the control L4 other treatments lower than 7%, reduced the food consumption. For example,

the 2.5% forced the L4 to eat as little as 43.5% of the offered food, and the 5% resulted in 27.5% consumption rate (table3.1).

On the 2nd day, the L4 consumed 230 (57.5%), 204 (51%), 64 (16%) and 14 (3.5%) mg/day at 2.5%, 5%, 6% and 7%, respectively. During the 3rd day, the larva consumed 246 (61.5%) mg/day of the untreated discs at 2.5 %, and stopped feeding and transformed to a pre pupa in the 4th day. The larva consumed 168 mg (42.5%), 156 mg (39%)

and 6 mg (91.5%) at 5%, 6% and 7%, respectively. On the 4th day, the L4 consumed an amount of 144 mg (36%), 10 mg (2.5%) and 8 mg (2%) at 5%, 6% and 7%, following the same order, whereas the control L4 has already transformed to the pre pupa stage. The total amount consumed by the control L4 was 944 mg; however, 640 mg was consumed for the 2.5%, while only 194 mg was consumed by those larvae offered discs treated with 7% of the aq-extr. (Table 3.1 and Fig. 3.2).

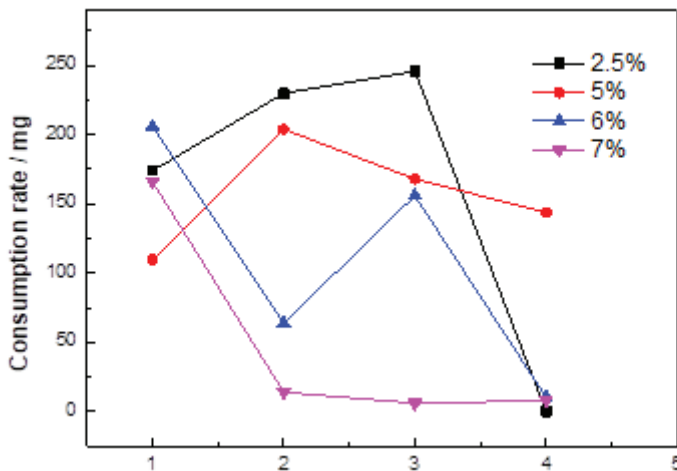


Fig 3.2: The duration of the HF-aq-extract on feeding of the L4 of *H. elaterii*: Offered treated discs for 48 hr only (disc initial wt = 400 mg). (Concentration 8 in figures 3.1 above and 3.2 mean control).

The statistical analysis showed that there are significant differences between the different treatment and control. Also, there are significant differences among the treatments themselves, except at 5%, 6% in the 3rd day and 6% and 7% in the 4th day where no significant differences were detectable.

The total amounts consumed by the L4 within its duration, on treated and untreated leaves, were significantly different from that of the control larvae.

B. Pravin et al, mentioned the effect of Handal fruits aqueous-extract on different purposes [1]. Handal fruits aqueous-extract has shown promising results in the present work as an antifeedant or a repellent, manifesting some growth regulatory effects.

All the tested concentrations affected the larval feeding, but at different degrees. The treatments significantly reduced the larval feeding, even at 2.5%, and the larva rejected the treated food completely.

4. Conclusion

This study aimed to investigate

the potentialities of the bitter apple (handal/hanzal) *Citrullus colocynthis* fruit aqueous –extract (HF-aq-extr) as an insecticide (*H. elaterii*), using the fourth larval instar (L4). The effect of the HF- aq- extracts on the development of the L4s (duration in days) and food-consumption rate, were studied. Concentrations of 2.5, 5, 6, and 7% of the extracts were prepared. L4s were fed on snake-cucumber leaf-discs treated with each concentration for 24, 48 hr or the whole L4 duration. The results of HF-aq-extract on the L4s showed that promising results in the present work as an antifeedant or a repellent, manifesting some growth regulatory effects which it proved in our other work.

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