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Research Article

Chemical Composition, Phytochemical Screening and Anti-Insecticidal Activity of Aqueous and Ethanolic of *Solenostemma argel* Extracts

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ABSTRACT

At the present work extraction, fractionation, phytochemical screening, chemical composition and anti-insecticidal activity of stems of aqueous and ethanolic of Solenostemma argel (S. argel) extracts were studied. The results obtained showed that S. argel contains different medicinal species such as phytosterols, triterpenoids, alkaloids, flavonoids, and saponins. All fractions of the stems of Solenotemma argel were tested against the activity of third larvae of Tribolium castaneum. Among these, the ethyl acetate extract of ethanolic extract showed high activity.

Keywords: *Chemical composition, Phytochemical screening, Anti-insecticidal activity Solenostemma argel.*

INTRODUCTION

Solenostemma argel (S. argel) belongs to the Asclepiadaceae family; it is used in alternative medicine as antispasmodic and anti-rheumatic agent (Idris et al., 2011 & Dall et al., 2011). it is used in treatment of hypercholesterolemia, urinary tract infection, cough, cold and measles (Shayoub et al., 2013).

The plant has effect on insects (Awad et al., 2012); it was used against mosquito species (Feiha et al., 2009; Stngeland et al., 2011; & Sameh & Abdelhalim, 2011). It was advertised to have antioxidant activity and antimicrobial properties (Shafek & Mahalel, 2012). Chemical investigation revealed the presence of kaempferaol, flavonoids, (Shafek & Michael, 2012), alkaloids and quercetin (Ahmed 2009). Pyrgene glycosides (Hassan et al., 2001 & Plaza et al., 2005). The stems of *S. argel* were also characterized by having fiber, carbohydrates and protein. This in addition of minerals as calcium cupper, potassium, magnesium and calcium.

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MATERIALS AND METHODS

Plant material

Solenostemma argel stems were taken from Albakheet-Northern State of Sudan during 2017, stems were dried, cleaned and grinded, and the powder obtained was stored in room conditions.

Extraction and fractionation

S. argel stems crude ethanolic extract:

Stems of *Solenostemma argel* were extracted with absolute ethanol, extraction being repeated to get maximum yield. Combined extract was evaporated to dryness and the residue was dissolved in water and extracted successively with n-hexane, chloroform, ethyl acetate and n-butanol.

S. argel stems crude aqueous extract:

The dried powder was extracted from *Solenostemma argel* stems with hot water for six hours using a magnetic stirrer apparatus (m s a). After filtration, the extract was evaporated to dryness and the residue was dissolved in water and extracted successively with n-hexane, chloroform, ethyl acetate and n-butanol.

Chemical composition

Minerals contents

Solenostemma argel stems were dried in an oven at 70 ^{o}C to a constant weight and then ground into a powder with mortar and pestle (Maimon et al., 2012). For total digestion of plant samples, dry ashing-aqua regia method was used. 1g of dried plant samples were weighed and placed in silica crucible in a muffle furnace for 4hours at 500°C until white ash appeared. Sample is removed and cooled in the dessicators. Moisten sample with 1ml of concentrated nitric acid (HNO3) and evaporated to dryness at 150°C by using hot plate. Evaporated sample was placed in the heated furnace at 400°C for 15 minutes. After that, the digested sample was solubilized with 5 mL of aqua regia of the digestion method required the beaker used to be covered with watch glasses to 55 prevent evaporation of the sample (Chen & Ma, 1998). The samples of plants were then filtered using Whatman no.1 filter paper and made up to 50 mL with distilled water for further analysis. A blank was prepared with an equal amount of acids. All reagents were of analytical grade and contained very low concentrations of trace metals. Sample solutions and reagent blanks were analyzed for Fe, Zn, Mn, Ca, Mg, and Cu by using atomic absorption spectrophotometry (AAS) To determine heavy metal concentrations. All analyses were replicated three times. Significant differences between concentrations of heavy metals, following different sampling stations were analyzed.

Table 1: Results of the minerals content of stems of *S. argel* plant

					Micro elements (1mg)) in 50 ml.	
sample	**Ca**	**Cu**	**Fe**	**Mg**	**Mn**	**Zn**
Argel	**21.10**	**0.014**	**1.055**	**29.95**	**0.059**	**0.052**
					Macro elements (1mg)).	
Sample	**N%**	**P%**	**S%**	**K%**	**----------**	
Argel	**1.96**	**0.48**	**0.050**	**0.81618**	**----------**	

Anti-insecticidal activity

Different fractions of crude ethanolic and crude aqueous extracts of *S argel* were evaluated for the anti- insecticidal activity against the third larval instar of *Tribolium castaneum, as* the test insect. Each fraction was separately mixed with Sorghum grains in ratio of 10:100 grams (wt / wt) in petri-dish. The petri-dishes were shaken manually to produce homogenous mixture. Ten larvae were placed in each petri-dish; the experiment was subjected to the complete randomized design (C R D), and mortality of larvae was recorded after 24 hours (Table. 2and 3). Each experiment was measured in triplicates. The mortality percentage of larvae was calculated by the method of (Hag-ElTayeb, 2009).

Tables 2: Results of mortality of third larval instars of *Tribolium castaneum*, in 24 hrs against fractions of crude aqueous extract

Fractions	Parameter				
	R_1	R_2	R_3	∑	Mortality%
n- hexane	2	1	2	5	16.7%
$CHCl_3$	3	4	3	10	33.3%
Ethyl acetate	3	4	2	9	30%
n- butanol	1	0	0	1	3.3%
Aqueous extract	0	1	1	2	6.7%
Control	0	1	1	2	6.7%

Tables 3: Results of mortality of third larval instars of *Tribolium castaneum*, in 24 hrs. against fractions of crude ethanolic extract

Fractions	Parameter				
	R_1	R_2	R_3	∑	Mortality%
n- hexane	1`	2	1	4	13.3%
$CHCl_3$	3	2	3	8	26.7%
Ethyl acetate	5	3	4	12	40 %
n- butanol	1	0	0	1	3.3%
Ethanolic extract	1	2	2	5	16.7%
Control	0	0	0	0	0 %

Preliminary Phytochemical screening

The presence or absence of chemical constituents**;** saponins, tannins, cumarines, alkaloids, triterpenes, steroids, flavonoids and anthraquinones of crude ethanol extract and crude aqueous extract of S. argel were detected by using phytochemical screening, Evans standard method (Evans et al., 2009), see table. 4 and 5.

Table 4: phytochemical screening of crude aqueous extract and chloroform fraction

Components	Parameter	
	crude aqueous extract	chloroform fraction
Saponins	+++	+++
Cumarines	+	+
Alkaloids	++	++
Tannins	++	++
Flavonoids	++	+++
Steroides	++	+++
Triterpenes	+++	+++
Anthraquinones	-	-

(+++) means high concentration, (++) medium conc., (+) low conc. and (-) not detectable

Table 5: phytochemical screening of crude ethanolic extract and ethyl acetate fraction

Components	Parameter	
	crude ethanolic extract	ethyl acetate fraction
Saponins	+++	+++
Cumarines	++	+
Alkaloids	+++	+++
Tannins	++	++
Flavonoids	++	++
Steroides	+	+
Triterpenes	+++	+++
Anthraquinones	-	-

(+++) means high concentration, (++) medium conc., (+) low conc. and (-) not detectable

RESULTS AND DISCUSSION

Minerals contents of stems of the *S. argel* are given in Table 1.The results indicated that Ca (21.10), Cu (0.014), Fe (1.055), Mg (29.95), Mn (0.059) and Zn (0.052) as microelements. In addition, N (1.90), P (0.48), S (0.050) and K (0.81618) as macro elements.

Over very long times plants developed chemicals to protect themselves from insects and other pests. In recent years, a strong tendency among researchers is to use plant extracts against insect vectors and pests as a substitute for chemicals to avoid many negative effects of chemicals. *S. argel* ethanolic extract is more effective than *S. argel* aqueous extract, it was showed very strong positive with larval mortality.

Each extract of the various fraction of the stems of *Solenostemma argel* was tested against the 3rd larval instars of the *Tribolium castaneum* to determine its mortality rate during 24 hours. It was found that the different fractions exhibited relatively high levels of anti-insecticidal activity against the test insect compared with that of the control group.

When crude aqueous extract testing against third larval instars of *Tribolium castaneum*, the chloroform extract was the most active and then it was subjected to preliminary phytochemical study. The results of the preliminary phytochemical study are presented in Table. 4. In the chloroform extract fraction of the stems of *S. argel*, coumarins were present in low concentration, alkaloids and tannins in medium concentration, saponins, flavonoids, steroids and triterpenes in high concentration, while anthraquinones were not detected. As for, testing of crude ethanolic extract against third larval instars of *Tribolium castaneum***,** shows the ethyl acetate extract was the most active, so it was subjected to preliminary phytochemical study. The results of the preliminary phytochemical study are presented in Table. 5. In the ethyl acetate fraction of the stems of *S. argel*, steroids and coumarins were present in low concentration, flavonoids and tannins in medium concentration, saponins, alkaloids, and triterpenes in high concentration, while anthraquinones were not detected.

CONCLUSION

This study shows the presence of some major and trace elements in the stems of *S. argel*. The ethyl acetate fraction of ethanolic extract had the highest inhibitory activity of the test larva of *Tribolium castaneum* compared with those solvents of extract fractions. When this highest effective fraction was subjected to preliminary phytochemical study showed high concentration of saponins, alkaloids, and triterpenes.

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