



## PHYTOCHEMICAL AND ANTIHELMINTIC STUDIES OF THE LEAVES EXTRACT OF *SIDA ACUTA* BURM. F AGAINST *TAENIA saginata*

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### ABSTRACT

*Sida acuta* is considered as an agricultural weed, but it is a valuable plant in the traditional medicines of Asia and Nigeria. In the traditional medicine of India and Nigeria, the leaves and roots are used as a remedy for bacterial, fungal, intestinal helminth infections, dandruff, rheumatism, liver problems, kidney stones, nervous disorders, testicular swelling and elephantitis. The study was carried out to evaluate the phytochemical and antihelmintic studies of the leaves extract of *sida acuta* burm. f against *taenia saginata*. The methanol, acetyl acetate and n-hexane extracts were subjected to preliminary Phytochemical screening for the identification of different Phytoconstituents and was found to have alkaloids, steriods, flavonoids, glycosides, cardiac glycosides, saponins, tannins and anthraquinones. The different concentrations of methanolic, acetyl acetate and n-hexane extracts were subjected to anthelmintic study and the results were compared with that of standard drug Albendazole. Different concentrations of leaf extracts were tested to evaluate Anthelmintic activity using *Sida acuta*. Both the extracts were found to possess vermifugal activity with the methanolic extract showing higher efficacy compared to ethyl acetate and n-hexane extracts and the results were compared with standard drug Albendazole.

**Keywords:** Phytochemical Screening, *Sida acuta*, Anthelmintic activity, Albendazole

### INTRODUCTION

Plants have been used for alleviating human suffering from the very beginning of human civilization, and records of the use plants are available since about 5000 years ago (Odewade and Odewade, 2023). Traditional use of medicine is recognized as a way to learn about the potential for future medicines. Plants are tremendous source for the discovery of new products of medicinal value for drug development. Many compounds are secondary metabolites which are generally involved in plant adaptation to environmental stress conditions. Today several distinct chemicals derived from plants are important drugs used in one or more countries in the world. Many of the drugs are simple synthetic modifications or copies of the naturally obtained substances. A vast number of natural, plant-based extracts and chemicals proposed to have beneficial effects are present in Nigeria. Phytoconstituents are naturally occurring chemical compounds, responsible for colour, odour and therapeutic potential of plants. Plants synthesize these compounds as weapons for defense against biotic and abiotic stresses. Most of the phytoconstituents have antioxidant properties and protect cells against oxidative stress. Phytoconstituents also have commercial applications such as drugs, enzymes, preservatives, flavors, fragrances, cosmetics and fuels.

Phytochemical screening is an important tool in identifying chemical compounds of medicinal and industrial value (Varma, 2016).

There are thousands of different phytochemicals, and based on the chemical structures these are classified into various categories like alkaloids, carotenoids, phenolics, flavonoids, coumarins, steroids, tannins and others. Many phytoconstituents isolated from Malvaceae members belonging to categories such as flavonoids, phenolics, acids, and polysaccharides exhibit therapeutic activities (Abe, 2013).

### *Sida acuta* Burm.f.

*Sida acuta* is an erect, perennial under shrub or shrub, 1.5m height with linear leaves that are lance late, nearly glabrous, peduncles equal to the petioles lanceolate and flower yellow solitary or in pairs (**Plate 1**). It is predominant in roadsides, waste areas, grazing land, disturbed land and abandoned farmlands in Nigeria (Chinelo and Miracle, 2018). It is a malvaceous weed that frequently dominates improved pastures, waste and disturbed places roadsides. The Leaves are considered to possess demulcent, diuretic, and wound healing properties and are used in rheumatic affections.

Plate 1: *Sida acuta* leaves

<b>Kingdom :</b>	Plantae
<b>Division :</b>	Angiosperms
<b>Class :</b>	Dicotyledanay
<b>Order :</b>	Malvales
<b>Family :</b>	Malvaceae
<b>Genus :</b>	<i>Sida</i>
<b>Species :</b>	<i>acuta</i>

*S. acuta* is widely distributed in tropical areas and is widely used as traditional medicine in many cases. The plant is also used for spiritual practices. In India it has been extensively using different parts of the plant for treatment of dandruff, rheumatism, liver problems, kidney stones, nervous disorders, testicular swelling and elephantitis (Senthilkumar 2018). Juice of fresh leaves is used as anti-helminthic, anti-vomiting and gastric disorders.

## MATERIALS AND METHODS

### Plant Collection and Authentication

The leaves of *Sida acuta* (leaves) was collected from abandoned land at the back of Isa Kaita college of Education Dutsinma local government Katsina state, Nigeria. The plant were identified and authenticated at herbarium unit, department of Biology Federal University Dutsinma by an expert. The leaves were separated from the whole plant, washed with distilled water to remove any form of impurities from the sample, air-dried, pulverized and stored in clean polythene bags at ambient temperature. The dried samples were crushed and grinded into powdery form.

The intestinal worms (*Taenia saginata*) were collected from Dutsin-ma abattoir, washed with normal saline solution to remove all faecal materials and were authenticated at Parasitology Research Unit, Biology Department, Federal University Dutsinma Katsina State Nigeria.

### Extraction

A portion (150g) of the dried leaves parts of *S. acuta* was percolated in 400 cm<sup>3</sup> each of methanol, ethyl acetate and n-hexane for two weeks. Each extract was filtered and evaporated to dryness at 40°C using rotary evaporator. Each residue was then allowed to cool, weighed and stored in refrigerator until needed.

### Phytochemical screening

The extracts were screened for the presence of alkaloids, flavonoids, steroids, glycosides, cardiac glycosides, anthraquinones, tannins and saponins.

### Alkaloids

A quantity (1cm<sup>3</sup>) of 1% aqueous HCl was added to 3cm<sup>3</sup> of each extract in a test-tube and the mixture heated for 20 min, cooled and filtered. 1cm<sup>3</sup> portion of the filtrate was treated with two drops of Wagner's reagent. Formation of cream or

brown precipitate respectively indicated the presence of alkaloids (Sofowora, 1993).

### Flavonoids

A portion (1g) of the extract was added to 1cm<sup>3</sup> of 10% NaOH. Formation of a yellow coloration indicated the presence of flavonoids (Sofowora, 1993).

### Glycosides

A portion (0.5g) of the extract was dissolved in 2.5ml H<sub>2</sub>SO<sub>4</sub> (2.5cm<sup>3</sup>), boiled, allowed to cool and neutralized with 20% KOH. 5cm<sup>3</sup> of Fehling's solutions A and B (1:1) was added to the neutralized mixture and then boiled. Formation of brick-red precipitate indicated the presence of glycosides (Sofowora, 1993).

### Cardiac glycosides

To a portion (0.5g) of each extract in a test-tube, 2cm<sup>3</sup> of chloroform and 1cm<sup>3</sup> of concentrated H<sub>2</sub>SO<sub>4</sub> were added to form a lower layer. Formation of a reddish-brown ring at the interface indicated the presence of aglycone portion of cardiac glycosides (Sofowora, 1993).

### Steroids

A portion (1g) of each extract was dissolved in 1cm<sup>3</sup> of ethanol. Then 1cm<sup>3</sup> of concentrated H<sub>2</sub>SO<sub>4</sub> was added to the solution. Formation of a red coloration indicated the presence of steroids (Salihu and Ado, 2013)

### Saponins

A portion (1g) of each extract was added to 5cm<sup>3</sup> of distilled water and vigorously shaken for 2 min. Formation of froth indicated the presence of saponins (Sofowora, 1993).

### Anthelmintic activity

#### Worm Collection and Authentication

The antihelminthic assay was performed on *Taenia saginata*. All the worms were of approximately equal size (5cm). They were collected from Katsina abattoir and washed in Petri dishes containing 0.9% neutral phosphate-buffered saline (PBS) maintained at 37±1°C in a glass-panelled microbiological incubator.

**Anthelmintic Assay**

Anthelmintic activity was evaluated by exposing the *Taenia saginata* to different concentration Leaf extracts of *Sida acuta*. The Anthelmintic activity was performed according to the method of Ghosh *et al* (2005) with slight modifications. The Methanolic, ethyl acetate and n-hexane extracts of *Sida acuta* were dissolved in minimum amount of Water and then volume was adjusted. 50 ml of formulation containing two different concentrations of each of the extract (50 and 100 mg / ml ) of both Extracts were prepared and 3 worms (same type) were placed in the petridishes. The standard drug and extract solutions were prepared freshly before starting the experiment. Time for paralysis was noted when no movement could be observed except when the worms were shaken vigorously. Time for death of worms were recorded after ascertaining that worms neither moved when shaken vigorously nor when dipped in warm water (50 °C) followed by fading away of their body colours. Albendazole (20 mg / ml) was used as reference standard

**RESULTS AND DISCUSSIONS****Phytochemical Screening of Leaf Extracts of *Sida acuta*.**

The preliminary photochemical screening of the methanolic, ethyl acetate and n-hexane leaf extract of *S. acuta* showed the

presence of following various phytoconstituents (Table 1). The results showed the presence of alkaloids, steriods, flavonoids, glycosides, cardiac glycosides, saponins, tannins and anthraquinones. The study of Senthilkumar *et al* (2012) on aqueous extract of *sida acuta* leaf reveals the presence of alkaloids, steriods, flavonoids, phenols, terpenoids, and cardiac glycosides. However saponin, tannin and anthraquinones were found to be absent. The chloroform and ethanolic extract of *S. acuta* showed the presence of carbohydrates, alkaloids, phytosterols, saponins and fixed (Palaksha, 2012). Alkaloids have been known to have antiviral and antitumor activities (Salihu, 2008). Flavonoids which have been found to have broad spectrum activities were detected in the methanol, ethyl acetate and n-hexane fractions of *S. acuta* (Joseph, 2011). Glycosides and cardiac glycosides have been reported to have antimicrobial properties (Salihu, 2008). Anthroquinones have been reported to have great antimicrobial properties, provide a source of stable free-radicals and complex irreversibly with nucleophilic amino acids in protein, leading to inactivation of the protein and loss of function (Majori, 1999). Saponins are effective in the treatment of syphilis and certain skin diseases (Oyewale, 2004).

**Table 1: Results of phytochemical screening of extracts**

S/NO.	Phytoconstituents	Methanol	Ethyl acetate	n-hexane
1	Alkaloids	+++	++	+
2	Flavanoids	++	+	+
3	Glycosides	++	++	+
4	Cardiac glycosides	++	+	-
5	Steroids	+++	++	+
6	Saponins	+	+	-
7	Tannins	++	+	+
8	Anthraquinones	+	+	-

+++ :Present in large quantity, ++ :Present in moderate quantity, + :Present in small quantity, - :Absent

**Anthelmintic Assay**

The different concentrations of Leaf extracts of *Sida acuta* were evaluated for Anthelmintic activity using adult Indian earthworm model. The extracts exhibited a dose-dependent inhibition of spontaneous motility (paralysis). It is evident from (Table 2) that methanolic leaf extracts of *Sida acuta* demonstrated paralysis as well as death of worms in less time compared to Ethyl acetate leaf extracts of *Sida acuta*. With higher doses (100 mg/ml) the effects were comparable with the that of Albendazole (20mg /ml). The results indicate that extract possesses vermicial activity and thus, may be useful as an anthelmintic.

Helminthes are recognized as a major problem to livestock production throughout the tropics. Parasitic helminthes affect human being and animals by causing considerable hardship and stunted growth. Most diseases caused by helminthes are of a chronic and debilitating in nature (Dewanjee *et al*, 2007). Preliminary Phytochemical analysis detected presence of alkaloids, phytosterols, tannins, flavonoids, saponins, etc and these constituents may be responsible for Anthelmintic activity. The origin of many effective drugs is found in the traditional medicine practices and in view of this several studies have undertaken pertaining to testing of natural compounds for their proclaimed Anthelmintic activity.

**Table 2: Anthelmintic activity of leaf Extracts of *Sida acuta***

Treatment Group	Dose in mg/ml	Time taken for paralysis (Min)	Time taken for death (Min)
Methanolic Extract	50	15±1.01	20±1.50
	100	7.80±2.05	10±2.00
Ethyl acetate Extract	50	21.50±1.02	45±1.05
	100	15.80±2.10	25±2.00
N-Hexane Extract	50	25.30±2.00	50±1.04
	100	20.00±1.80	40±2.00
Standard (Albendazole)	20	25±2.05	40±1.20

All values represent Mean ± SD; n=3 in each group

**CONCLUSION**

Methanol is most bio-active against *Taenia saginata* looking at the paralysis and death time having the lowest time at varying concentrations. Followed by, ethyl acetate extracts and lastly the n-hexane extract. All the plants were active against the *Taenia saginata*.

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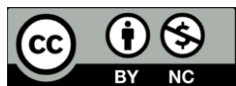
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