Research Article

Phytochemical and Antidiarrhoeal Screening of the Aerial Part of *Leptadenia pyrotechnica* (Forsk.) Decne

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Abstract

The hydro-methanolic extract (crude and defatted) of the aerial part of *Leptadenia pyrotechnica* (Forsk.) was subjected to preliminary phytochemical and antidiarrhoeal screening. The extracts showed the presence of tannins, cardiac glycoside, terpenoids, flavonoids and alkaloids. The antidiarrhoeal activity of the extracts was determined using castor-oil induced diarrhoea in albino rats. The dosages of 300, 600 and 1200 mg/kg bd.wt. of both the crude and the defatted extract significantly ($P < 0.001$) reduced the number of defecations in the treated groups compared to the negative control group. The defatted extract showed a higher activity 69.77% inhibition at 1200mg/kg bd.wt. than the crude extract, 65.12% inhibition at 600 mg/kg bd.wt. and 46.51% at 1200 mg/kg bd.wt. dose dependently. In addition, the control drug; diphenoxylate HCl (5 mg/kg bd.wt), showed 100% inhibition of the defecation. Therefore, this study revealed that the aerial part of *L. pyrotechnica* corroborated to its use locally as antidiarrhoael agent due to its efficacy on the albino rats induced with castor-oil.

Keywords: *Leptadenia pyrotechnica*, aerial part**,** phytochemical, antidiarrhoeal

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Introduction

The use of plant material as source of remedies in healthcare delivery dated back to human history [1]. The first generation accepted the use of plant as healing agent was depicted in cave painting in the lassaux cave in France which have been radio-carbonated to between 13,000-25,000BC [2]. The advent and introduction of orthodox medicine which grew rapidly following civilization, attempted to bellow the development of the customary use of plants and natural products in health care delivery system[3].

Leptadenia pyrotechnica (Forsk.) Decne is a typical desert shrub of Asclepiadaceae family. It is used in the folk medicine as antispasmodic, anti-inflammatory, antihistaminic, antibacterial, diuretic and expectorant [3, 4]. Modern pharmacological studies have demonstrated that *L. pyrotechnica* extract has analgesic, anti-inflammatory, anti-biotics, astringent and laxative effects. According to Verma et al. [5], all parts of *Leptadenia pyrotechnica* are used in the traditional medicine. Ethno medical reports revealed that the plant *L. pyrotechnica* possesses significant antioxidant, anti-inflammatory, antibacterial, anthelminthic, antilipoxygenase, cytotoxic, antitumour, hypoliprademic and antiatherosclerotic activity. Modern pharmacological studies have demonstrated that *L. pyrotechnica* extract has analgesic, anti-inflammatory, anabolic, astringent and laxative effects [6]. Kumar et al. [7] had also studied the anthelminthic activity on *L. pyrotechnica* and confirmed positive.

Chemical studies on *L. pyrotechnica* have shown the presence of bioactive constituents such as steroidal glycoside, cardiac glycosides, cardenolides, alkaloids, flavonoids, triterpenes, and poloxypregnane derivatives [4].

Experimental

Materials and Reagents

Plant Material

The fresh aerial part of *Leptadenia pyrotechnica* was collected on 1st July, 2014 from Yunusari L.G.A Yobe State, Nigeria. The taxonomic identification of the plant was done by Prof. S. S. Sanusi, Department of Biological Sciences, University of Maiduguri, Nigeria and the voucher number 14/CHM/005 was deposited in Research Laboratory, Department of Chemistry University of Maiduguri, Nigeria. The plant material was dried under shade and ground into coarse powder using wooden mortar and pestle.

Extraction of Plant Material

500 g of the air-dried powdered plant material was extracted by refluxing for 6 hours using hydro-methanolic solvent (80:20% v/v). The extract was then filtered, distilled, concentrated and dried under reduced pressure to produce a gummy mass tagged crude extract. The methanolic extract was later defatted using n-Hexane to obtain the n-hexane soluble and defatted portions for further analysis.

Phytochemical Screening

The crude and the defatted extracts were subjected to phytochemical screening using the standard methods of analysis [8, 9].

Experimental Animals

Twenty four rats weighing between 94.0-159.0 g were used for this study. These rats were purchased from the animals' house of the Faculty of Pharmacy, University of Maiduguri, Nigeria; the rats were denied food for 12 hours prior experiment but were allowed free access to water.

Castor-oil Induced Diarrhoea

Diarrhoea was induced to the rats using the method described by Offia and Chikwendu, [10]. The animals were separated in to five (5) groups of three rats each. Rats in groups I, II and III received 300, 600 and 1200mgkg^{-1} body weight of methanolic extract orally respectively. Those in group IV received 1 ml of normal saline orally, whereas those in group V were given 5 mgkg^{-1} (*i.p*) body weight of diphenoxylate HCl. The rats were housed singly in cages lined with white blotting paper. One hour after treatment, the rats were each treated with 1 ml castor oil orally. The rats were observed for 6 hours for watery (wet) or unformed faeces. The watery faeces of each rat were counted at the end of the experiment [10].

Results and Discussions

The preliminary phytochemical screening of the extracts showed the presence of Tannins, Cardiac Glycoside, Terpenoids, flavonoids and alkaloids but saponins glycoside and phlobatannins were absent as shown in **Table 1.**

The results of the mean feacal droppings and the percentage inhibition as shown in **Table 2,** revealed that the methanolic extract of *Leptadenia pyrotechnica* (crude and defatted) showed antidiarrhoeal activity due to the significant ($P < 0.001$) reduction in the number of wet feaces or diarrhoea induced by the castor oil. The activity of the crude extract is proportional to the doses at 300 and 600 mg/kg bd.wt. but it decreases at 1200 mg/kg bd.wt. when compared to the negative control group. Although, in the case of the defatted extract, the activity increased with

increase in the doses of the extract administered (300 mg/kg bd.wt., 600 mg/kg bd.wt. and 1200 mg/kg bd.wt.) compared to that of the negative control group. The use of n-hexane to defat the crude extract could have affected the level of some active secondary metabolites as observed during the phytochemical analysis of the defatted extract. This could be the reason for the direct increased activity of the defatted extract. Therefore, the recommended doses for the crude and the defatted extract are 600 and 1200 mg/kg bd.wt. respectively.

The extract meets some of the criteria for acceptance of a drug as an antidiarrhoeal [11]; these criteria include inhibition of the production of wet or unformed faeces in animals and inhibition of gastrointestinal propulsive action [12]. The antidiarrhoeal properties of some medicinal plants have been attributed to their phytochemical constituent like tannins and some flavonoids [13]. The presence of these secondary metabolites alkaloids, saponins, sterols and terpenes are also responsible for the antidiarrhoeal property of the extract [14]. Phytochemical screening on the methanolic extract of *Leptadenia pyrotechnica* showed the presence of some antidiarrhoeal secondary metabolites. These are tannins, flavonoids, alkaloids and cardiac glycoside. These phytochemicals could be responsible for the antidiarrhoeal activities displayed by the extract. Tannins and tannic acids also denature proteins forming tannates which decreased the intestinal mucosa permeability [15].

Table 1 Phytochemical result of the crude and defatted extracts on aerial parts of *Leptadenia pyrotechnica*

S/No.	Test	Observations	Crude extract	Defatted extract
Tannins	Ferric chloride	Blue-black	+	+
	Lead ethanoate	White-precipitate	+	+
	Hydrochloric acid	Red precipitate	+	_
Phlobatannins	Goldbeater's skin	Brown	+	+
		White precipitate	_	_
Anthraquinone Glycoside(Borntrager's)	Free anthraquinone	Reddish brown ppt.	_	_
	Combined anthraquinone	Reddish brown ppt.	_	_
Cardiac glycoside				
Terpenoids	Salkowski	Yellow	+	+
	Liebermann-Burchard's test	Violet ring	+	+
Saponins glycosides				
	Distilled Water	Violet	+	+
	Fehling's solution	Pale-Yellow	_	_
		Deep-Yellow	_	_
Flavonoids	Shinoda's	Orange	+	+
	Ferric chloride	Violet	+	+
	Lead ethanoate	Buff-Coloured	+	+
	Sodium hydroxide	Yellow colour	+	+
Alkaloids	Dragendorff's reagent	Orange-red ppt.	+	+

Key: + = Present – = Absent

Table 2 Effects of crude and defatted extract on castor oil induced diarrhoea in albino rats

Extract/drug	Dose (mg/kg bd. wt.)	Mean faecal droppings ± SEM	% inhibition
Normal Saline	-	14.33 ± 2.08[a]	-
Crude	300	10.00 ± 2.65[b]	32.23
Crude	600	5.00 ± 1.00[b]	65.12
Crude	1200	7.67 ± 1.53[b]	46.51
Defatted	300	7.67 ± 1.53[b]	46.51
Defatted	600	4.67 ± 1.15[b]	60.47
Defatted	1200	4.33 ± 1.15[b]	69.77
Diphenoxilate HCl	5	0.00 ± 0.00[c]	100

Mean with same superscript letter in the same column is significantly ($P < 0.001$) the same

Conclusions

From the results of this study, it can be surmised that the antidiarrhoeal activity of the methanolic extract of the aerial part of *L. pyrotechnica* could not be unrelated to the presence of some active secondary metabolites which aids significant ($P< 0.001$) reduction in the level of faeces induced by castor oil across the dosages. Further studies need to be carried out in order to isolate, purify and further determine mechanism of action of the extract in management of diarrhoea.

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