ANTIMICROBIAL AND ANTHELMINTIC ACTIVITY OF *ELECUSINE INDICA*

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ABSTRACT

Antimicrobial activity of Elusine indica was carried out using Agar well diffusion method on selected pathogens usually associated with diarrhea or other stomach problems such as Shigella dysenteriae Escherichia coli, Salmonella typhi, Staphylococcus aureus, Streptococcus facealis and Lactobacillus lactis. The aqueous extract was the most susceptible while the ethanol extract was the least susceptible to these microorganisms. The observed antimicrobial activity is concentration dependent. The work also shows that the plant has marked anthelmintic activity against Strongyloides stercoralis. The work therefore gives credence to the use of Eleusine indica against diarrhea and worm infections.

Keywords: *Eleusine indica, antimicrobial activity, anthelmintic activity, Strongyloides Stercorais*

INTRODUCTION

Eleusine indica (goose grass) is an invasive annual weed found all over the warmer areas of the world. It fruits round the year. Cats with stomach problems eat its leaves and get well after that. This aroused our interest in this plant species. *E. indica* is used in herbal medicine in different continents. It is used as antidiarrhea (Lans, 2007), diuretic and anthelmintic (Gunjar *et al,* 2012, Gruyal *et al,* 2014), and management of fertility (Ashidi *et al,* 2013). It has also been shown to have antidiabetic and antimalarial activity (Okokon *et al*, 2015) as well antioxidant and anti-inflammatory activity (Sagnia *et al*, 2014). The chloroform and methanol extracts of *E. indica* showed activity against *Staphylococcus aureus, Enterobacter aerogenes, Escherichia coli, Proteins vulgaris, Klebsiella agerogenes, Pseudomonas aerogenes* and unspecified *Streptococcus* and *Bacillus* species. (Alaekwe *et al*, 2015). The work is aimed at the determination of anthelminitic and antibacterial activity of *E. indica* against some pathogens dwelling in the alimentary canal.

MATERIALS AND METHODS

The aerial part of *Eleusine indica* was collected from a farmland within the University of Calabar campus. The plant was authenticated by Frank Adejoye of the Herbarium units of the Botany Department, University of Calabar. The plant material was washed, dried in the oven at 40^0C for three hours and powdered. The powdered plant material (240g) was soaked in methanol for 24h, filtered and distilled down to give the methanol extract (7.6g). The entire process was repeated using ethanol and water to give the ethanol and aqueous extracts respectively.

The proximate composition was determined using standard methods (Pomeranz and Meloan, 1996). The presence of the following classes of organic compounds were tested; flavonoids, tannins, saponins, alkaloids, cardiac glycosides, anthracene glycosides and anthraquinones, using standard methods (Harbone, 1973, Sofowora, 1993, Trease and Evans, 1989). Antibacterial activity of the methanol, ethanol and aqueous extracts of the aerial part of *E. indica* was tested against *Shigella dysenteriae, Escherichia coli, Samonella typhi, Staphylococcus aureus, Streptococcus facecalis* and *Lactobacillus lactis.* These were clinical isolates obtained from the microbiology unit of the University of Calabar Teaching Hospital. The bacteria were cultured and maintained by the method of Cruickshan *et al* (1977). The antimicrobial sensitivity was by the disc diffusion method (Baver *et al*, 1994). The plant extract (5mg) was mixed with sterile water ($50cm^3$) to get a $100mgcm^{-3}$ concentration. This was diluted to give 1.15, 0.3, 0.6, 1.2, 2.4 and 4.8 $mgcm^{-3}$ solutions of each extract. A sterile swab stick dipped into the appropriate test organisms suspended in normal saline was used to uniformly seed previously prepared Mueller Hinton Agar plates. Sterilized cork borer (5mm diameter) was used to make wells on the Agar plates. The different solutions of the extracts were used to fill each well using sterilized Pasteur pipette. The plates were incubated at 37^0C for 18h. The zone of inhibition around each well was measured and used to determine the microbial sensitivity to each extract (Olowosulu and Ibrahim, 2006). The experiment was carried out in triplicate.

The *in vitro* method used for anthelmintic test is a modified coproculture using the filter paper culture technique (Kotze *et al*, 2004, Tayler *et al*, 2002, Intapan *et al,* 2006). Children's stool samples were collected from University of Calabar Teaching Hospital. Stool sample (1.0g) was smeared on a slide, diluted, covered with a cover slip and observed under the microscope at x40 and x100 magnification. Stool sample I from a 1 ½ year old girl contained 4 living *Strongyloides stercoralis* and many larvae. The second stool from a 2 ½ year old boy contained only the larval stages of the worm. Each stool (0.1g) was smeared on different filter papers. The different filter papers were dipped into separate solutions of the three plant extracts at concentrations of 0.15, 0.3, 0.6, 1.2, 2.4 and $4.8mgcm^{-3}$ and kept for 4 days. They were air dried for 55h, after 4 days, and viewed under the microscope.

RESULTS AND DISCUSSION

Table I show the proximate composition of the aerial part of *Eleusine indica.* The plant is low in protein (2.21%) but rich in minerals with ash content of 8.40%. The total carbohydrate is 80.19% with fiber content accounting for 27.5%. The leaf is therefore very rich in fiber and could be a good source of cellulose for the paper industry. Result of phytochemical screening is shown in table 2. The methanol, ethanol and aqueous extracts are very rich in flavonoids and alkaloids. Only the methanol extract contain little tannin. The concentration of cardiac glycoside is moderate in the methanol extract but low in the other extracts. Anthraquinones are present while saponins are absent in all the extracts. The phytochemical analysis of the methanol extract is close to the literature report (Alaekwe *et al,* 2015).

The antimicrobial activity of the methanol, ethanol and aqueous extracts are shown in table 3. *Shiegella dysenteriae* is resistant to all the extracts. *E. coli* is resistant to the ethanol extract but becomes susceptible to the methanol and aqueous extracts at a concentration of 2.4 and 4.8mgcm^{-3} respectively. *Salmonella typhi* is not susceptible to the methanol extract, but susceptible to the ethanol and aqueous extracts at concentrations of 2.4 and 4.8mgcm^{3} respectively. *Staphylococcus aureus* is resistant to the ethanol extract moderately susceptible to the methanol extract at a concentration of 4.8mgdm^{-3} but susceptible to the aqueous extract at 0.3mgcm^{-3} concentration. *Streptococcus facealis* is resistant of methanol and ethanol extracts and moderately susceptible to the aqueous extract. Finally *Lactobacillus lactis* is resistant to both aqueous and ethanol extracts and it is only susceptible to the methanol extract. It is observed that the aqueous extract showed highest while the ethanol extract showed the least activity. The observed antimicrobial activity of *E. indica* extracts against these pathogens justifies its use against stomach problems.

It was observed from the anthelmintic test that at the levels of 2.4 and 4.8mgcm^{-3} of the three extracts, all the worms and their larvae were completely dead. It was also observed that the proportion of the worm that survived decreases with increase in concentration of each of the extract. The plant extract can therefore serve as a herbal anthelmintic. Sir David Campbell in his inaugural lecture as a professor of *Materia Medica* in the University of Aberdeen in 1930 stated 'The instinctive practice of taking drugs is believed to exist among the lower animals." (Thomson,1976). The fact that cats successfully treat themselves of stomach supset by eating *Eleusine indica* leaves and the present work has shown that the plant has both antibacterial and anthelmiitic properties goes a milestone to prove the instinctive practice of taking herbal drugs by animals.

Table 1. *Proximate composition of Eleusine indica*

Parameter	Moisture content	Ash content	Crude protein	Lipid	Fibre content	Total carbohydrate
Percentage composition	50.91	9.40	2.21	7.14	27.56	80.19

Table 2. *Phytochemical analysis of Eleusine indica leaf extracts*

Phytochemicals	Methanol extract	Aqueous extract	Ethanol extract
Flavonoids	+++	++	++
Tannins	+	-	-
Saponins	-	-	-
Alkaloids	++	+++	++
Cardiac glycosides	++	+	+
Anthracene glycosides	++	-	+
Anthraquinones	+	+	++

Key: +++ = high concentration; ++ = medium concentration
+ = low concentration; - = absence

	Zone of inhibition at different concentration																	
Microorganism	4.8gcm^{-3}			2.4gcm^{-3}			1.2gcm^{-3}			0.6gcm^{-3}			0.3gcm^{-3}			0.15gcm^{-3}		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Shiegella dysenteriae	8	6	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6
E. coli	25	24	10	17	13	9	15	12	7	6	11	6	6	7	6	6	6	6
Salmonella typhi	10	21	22	8	12	6	6	6	6	6	6	6	6	6	6	6	6	6
Staphylococcus aureus	15	22	12	9	19	9	7	19	8	6	18	6	6	16	6	6	6	6
Streptococcus faecalis	10	28	13	10	20	10	8	19	9	6	16	8	6	8	6	6	6	6
Lactobacillus lactis	18	6	6	13	6	6	6	6	6	6	6	6	6	6	6	6	6	6

Figure 3. *Antimicrobial screening of Eleusine indica*

Key: A = Methanol extract; B = Aqueous extract; C= Ethanol extract

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