

Diuretic activity of the methanolic extract of rhizomes of *Asparagus africanus* in rats

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Abstract

The methanolic extract of the rhizomes of *Asparagus africanus* was evaluated for its diuretic activity in rats. The extract at doses of 500 and 1000mg/kg body weight produced a statistically significant increase ($P < 0.05$) in the mean 24 hours urinary output when compared with the control group. There was also statistically significant increase in the excretion of electrolytes. Acute toxicity studies show that the extract was relatively safe.

Key words: *Asparagus africanus*, rhizomes, diuretic activity.

Introduction

Asparagus africanus Lam (family: Liliaceae) is an erect armed herb up to 5m high. It is widely distributed in tropical Africa, South Africa and Arabia (1). In traditional medicine the roots are used for various ailments such as gonorrhoea, syphilis, bilharziasis, and hemorrhoids. It is also used as diuretic and haematuric agent (2, 3). Three steroidal saponins have been isolated from the roots of *A. africanus* (4) and nine steroidal saponins known as asparagosides have been isolated also from *A. officinalis* (5). On the basis of the traditional use of the plant as a diuretic agent, the present study was carried out using methanolic extract of the rhizomes of the plant in an experimental model to substantiate the folklore claim.

Materials and Methods

Plant Materials:

The rhizomes of *Asparagus africanus* were collected from Samaru village, Zaria and authenticated at the herbarium of the Department of Biological Sciences, A.B.U. Zaria. A voucher specimen (No.900179) has been kept in the herbarium for future reference. The rhizomes were air-dried, powdered and stored in air-tight container prior to use.

Preparation of Extract.

The powdered rhizomes (300g) of *Asparagus Africanus* were continuously defatted with 2L of 60 - 80°C petroleum ether in a Soxhlet extraction apparatus. The marc was air dried and subsequently extracted exhaustively with 2L of methanol. The methanolic extract was evaporated under reduced pressure to a brownish semi solid residue which was referred to as ME. Preliminary phytochemical analysis of the extract indicated the presence of saponins,

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tannins and flavonoids. The extract was reconstituted in deionized water prior to the experiments.

Animal Used: Swiss albino mice (18–25g) and Wister albino rats (120–200g) of both sexes were used for the experiments. The animals were housed in the Animal house, Department of Pharmacology, Ahmadu Bello University, Zaria, Nigeria. The animals were fed with standard feed pellets and clean water ad-libitum. Procedures for animal handling were consistent with international guidelines.

Acute Toxicity Studies: Acute toxicity studies of the methanolic extract (ME) were carried out using the method of Lorke (6). Twenty-five mice were divided into five groups each consisting of five animals. They were fasted overnight and then administered the extract at the following doses: 0.5, 1, 2, 4, and 5g/kg, p.o. The animals were observed for 24h after treatment. The LD₅₀ was calculated as the square root of the product of the lowest lethal dose and highest non-lethal dose i.e. geometric mean of the consecutive doses for which 0 and 100% survival rates were recorded.

Diuretic Studies: The methods of Kau *et al* (7) and Biswas *et al* (8) with minor modification were used for the evaluation of diuretic activity in rats. The animals were fasted overnight before the experiment and then divided into five groups of six animals each. The first group served as control and was given normal saline i.p. at 25ml/kg body weight. The second group received frusemide 20mg/kg body weight. The third, fourth and fifth groups received the ME at doses of 200, 500 and 1000mg/kg body weight respectively orally. Immediately after the administration of the drugs, the rats were placed in metabolic cages specially designed to separate urine and fecal matter. The urine out put for 24h were collected and measured in ml. The average 24h urine out put for each groups were then calculated. The urine samples were also analyzed for electrolytes composition (Na⁺, K⁺ and Cl⁻). The values obtained for the ME were compared with those obtained for frusemide and control. The results were expressed as mean ± standard error of mean (SEM). The student t - test was used to analyze the data. P < 0.05 was considered to be statistically significant (9).

Results

The result of the acute toxicity studies of the extract in mice showed no mortality at the highest dose used which is 5g/kg body weight. General CNS depression and difficulty in respiration were observed at doses of 4g and 5g/kg body weight. The extract produced dose dependant increases in the mean 24h urine output with statistically significant increases at doses of 500 and 1000mg/kg body weight (p < 0.05) when compared with the control group (Figure 1). The extract also produced statistically significant increases in the excretion of electrolytes (Table 1).

Table 1: Effects of ME on Excretion of Electrolytes in the Urine

Treatment group	Sodium [mmol/L]	Potassium [mmol/L]	Chloride [mmol/L]
Control	40±2.28	20±2.38	120±5.13
Frusemide 20mg/kg	80±2.29*	35±1.89*	240±4.35*
ME 200mg/kg	43±2.23	22±2.39	140±3.25
ME 500mg/kg	50±2.59*	25±2.25*	180±6.12*
ME 1000mg/kg	60±2.6*	30±2.95*	200±3.12*

Note: * =statistically significant (p<0.05)

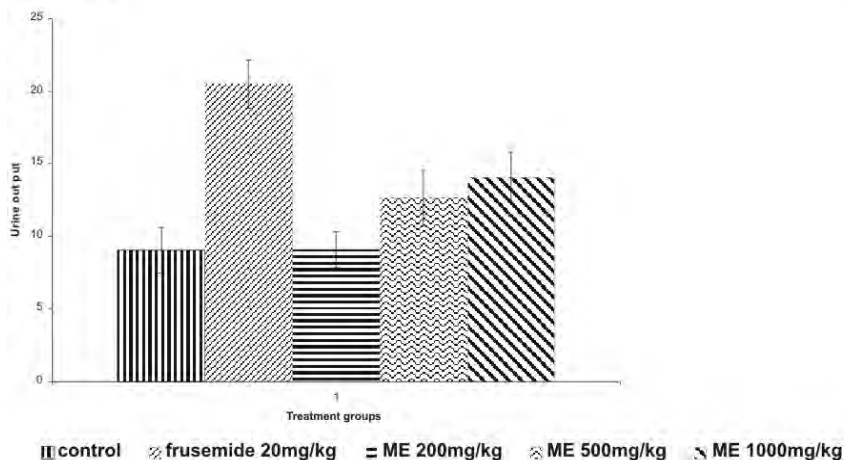


Figure 1: Effect of extract of the rhizomes of *A. africanus* on urine out put

Note: Increase at doses of 500 and 1000mg/kg body weight were statistically significant ($p < 0.05$).

Discussion

The result of acute toxicity studies showed that the extract was relatively safe since the LD_{50} appeared to be greater than 5g/kg body weight. The result demonstrated that the methanolic extract of rhizomes of *Asparagus africanus*, which contain mainly saponins, produced diuretic activity in rats probably by acting on the kidneys. The extract caused a dose related diuretic activity and displayed also a dose related increase in the excretion of electrolytes. The cardiac glycosides which are steroidal in structure are known to act as diuretic by dilating the capillaries of the kidneys and thereby increasing the volume of blood passing through the kidneys (10). Steroidal saponins have been reported to increase the excretion of electrolytes by stimulating the kidneys to higher activity (11). The diuretic effect of the extract was lower but comparable to that of frusemide. On the basis of this result, it can be concluded that the methanolic extract of the rhizomes of *Asparagus africanus* has diuretic properties, which support its use in traditional medicine.

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