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Acute Toxicity and Phytochemical Studies of *Cassia siamea* Extract in Rats

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Abstract: The toxicological effects of the ethanol extract of *Cassia siamea* were investigated in rats. Acute toxicity study was conducted following intraperitoneal administration of graded doses of the plant extract. LD₅₀ of *Cassia siamea* extract was found to be 9600 mg kg⁻¹ body weight. Mortality occurred in rats treated with high doses of 4000, 5000, 6000, 7000, 8000 and 16000 mg kg⁻¹ and appears to be dose dependent. Phytochemical analysis of ethanol extract of *Cassia siamea* leaf indicated that it contained alkaloids, glycosides, anthraquinones, steroids, tannins and saponins.

Key words: Rats, *Cassia siamea*, acute toxicity

INTRODUCTION

Cassia siamea (casalpinceae) is an angiosperm flowering herbs whose leaf is boiled alone or in combination with other herbs and used traditionally for the treatment of febrile illness^[1]. Although there is now widespread use of this plant among traditional healers for variety of animal and human disease^[2]. In developing countries it is important to know the therapeutic potentials of substances from natural sources^[3]. Since developing local medicines may be of greater value than importing the generally more expensive synthetic drugs, research on the efficacy and toxicity of plant products is particularly vital^[1]. Information of its toxicity in man and animal is lacking. The objectives of this study was therefore, to evaluate the acute toxicity in rats and to identify the active constituent of the leaf extract.

MATERIALS AND METHODS

Collection of plant materials and extraction preparation:

The plant materials from *Cassia siamea* were collected and identified by a plant taxonomist in Department of Biological Sciences, University of Maiduguri, Nigeria. The freshly cut leaves were oven dried at 60°C, powdered and soxhlated with 80% ethanol at 60°C. Extract were concentrated under reduced pressure in a vacuum rotary evaporator and dried further on a water bath at 60°C.

Phytochemical analysis: The phytochemical analysis was done according to standard methods^[4-6].

Animals and treatments: Thirty-five albino rats of both sexes weighing between 150 to 200 g were obtained from Department of Veterinary Anatomy Animal house University of Maiduguri. They were fed with growers mash (Sanders Nig. Ltd.) and water *ad libitum*. The rats were divided into seven groups (I, II, III, IV, V, VI and VII) of five rats each.

The acute toxicity studies were carried out *in vivo* and administration was by intraperitoneal route. Initial pilot studies were carried out to determine the maximum dose of leaf extract that did not produced death and minimum doses that produce 100% death. In between these dose ranges six dose (4000, 5000, 6000, 7000 and 16000 mg kg⁻¹ body weight) were selected for the study. Each group was placed in clean cage and injected with the leaf extract at dose. A control group was also injected with equivalent volume of saline solution.

The signs of toxicity in rats were observed. The number of rats that died within 24 h was noted and their LD₅₀ of the ethanol extract was calculated using the arithmetic method of Karba as modified by Aliu and Nwude^[7].

Statistical analysis: Results were presented as mean ± standard deviation. Analysis of variance was used to test between the means^[8].

RESULTS

The rats in the control group I were not affected throughout the 24 h of acute toxicity study. Thirty minutes after the administration of the extract there were

Table 1: Mortality rates in rats treated with *Cassia siamea* plant extract at different doses

Groups	Dose (mg kg ⁻¹)	Number of death	% mortality
I	Control	0	0
II	4000	0	0
III	5000	0	0
IV	6000	1	20
V	7000	3	60
VI	8000	3	60
VII	16000	5	100

Table 2: LD₅₀ calculated by arithmetic method of Karba^[7] Groups

	Dose (mg kg ⁻¹)	No. of rats	No. of death	Dose difference	Mean death	Dose diff x Md.
I	Control	5	0	0	0	0
II	4000	5	0	0	0	0
III	5000	5	0	1000	0	0
IV	6000	5	0	1000	0	0
V	7000	5	3	1000	1.5	1500
VI	8000	5	3	1000	3	3000
VII	16000	5	5	8000	4	32000

$$LD_{50} = \frac{\text{dose difference} \times \text{mean death}}{\text{Number of rat (n)}}$$

$$16000 - Dd \times Md.$$

$$n$$

$$16000 - 32000 \times 4$$

$$5$$

$$16000 - 128000$$

$$5$$

$$\frac{16000 - 25600}{9600}$$

$$LD_{50} = 9600 \text{ mg kg}^{-1}$$

signs of drooping eyes, decrease locomotion activity in groups II and III that were treated with 4000 and 5000 mg kg⁻¹ body weight and there was no death recorded. Whilec in group IV that received 6000 mg kg⁻¹, waltzing movement was observed and they shunned food. Groups V, VI and VII that received extract doses of 7000, 8000, and 16000 mg kg⁻¹ body weight, respectively showed pilo-erection, salivation, some stretched the abdomen and they also shunned food.

Mortality was observed in these groups 24 h after extract administration. Mortality was highest in groups V, VI and VII. The LD₅₀ was then calculated using the method of Karba modified by Aliu and Nwude to be 9600 mg kg⁻¹ (Table 1 and 2).

Phytochemical analysis: Alkaloids, glycosides, steroids are present in high concentrations. Tannins, anthraquinones are present in moderate concentration while saponins are present in low concentration (Table 3).

Table 3: Phytochemical constituent of *Cassia siamea* leaf extra

Test	Results
Alkaloids	+++
Glycosides	+++
Steroids/ triterpenes	+++
Tannins	++
Anthraquinones	++
Saponins	+

+++ Present in high concentration, ++ Present in moderate concentration, + Present in low concentration

DISCUSSION

Acute toxicity study of *Cassia siamea* ethanol extract showed that it caused mortality of experimental rats at a higher dose with an intraperitoneal LD₅₀ of 9600 mg kg⁻¹ body weight. This is an indication that the extract possesses high toxicity in rats. Physical signs of toxicity ranging from salivation, pilo-erection abdominal stretching movement and loss of appetite were observed. This may be due to the effect of the extract on the nervous system. According to the classification of Clarke and Clarke^[9], substances with LD₅₀ of 1000 mg kg⁻¹ are regarded as being safe or of low toxicity. In this study, toxicity signs were dose dependent. The fact that high LD₅₀ was obtained is an indication that the extract could be administered with some degree of safety, especially when administered through the oral route where the absorption might not be complete due to inherent factors limiting absorption in the gastrointestinal tract^[10].

The toxicity observed could result from any of the various organic chemicals like saponins glycosides, alkaloids and tannins as indicated by the result of phytochemical analysis done in this study. The apparent lack of sign of toxicity when the extract of this medicinal plant is given to humans for febrile illnesses may be a reflection of the oral route as well as the short duration of administration.

However, further work is still needed in this area.

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