ACUTE TOXICITY AND PHYTOCHEMICAL STUDIES OF CASSIA OCCIDENTALIS. LINN. EXTRACT IN RATS

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Abstract

The toxicological effects of the aqueous leaf extract of *Cassia occidentalis* Linn were investigated in rats. Acute toxicity study was conducted following intraperitoneal administration of graded doses of the plant extract. LD_{50} of *Cassia occidentalis* extract was found to be 1680mg/kg body weight. Mortality occurred in rats given the extract at high doses of 1200, 1800, 2600 and 3200mg/kg and appeared to be dose dependent. Phytochemical analysis of the aqueous extract of *Cassia occidentalis* leaf indicated that it contained tannins, anthraquinones, sterols, glycosides, saponins and alkaloids.

Key words:- *Cassia occidentalis* Linn, rats, acute toxicity.

Introduction

Cassia occidentalis Linn (caesalpiniaceae) is an angiosperm flowering herb whose leaf is boiled alone or in combination with other herbs and used traditionally for treatment of febrile illnesses (Ethkin and Ross, 1983). Animals that roam around in search of food also browse on the leaf especially during dry season when there is scarcity of food (personal observation).

Although there is now widespread use of this plant among traditional healers for a variety of animal and human diseases (Hussain, 1991), information on its toxicity in man and animal is lacking. The objectives of this study are therefore, to evaluate the acute toxicity in rats and to identify the active constituents of the leaf extract.

Materials and Methods

Sample preparation. The plant was collected within Sokoto metropolis (Runjin Sambo Area). The leaves, were air dried at room temperature for two weeks, crushing of the dried leaves into powder was done using a pestle and mortar. Forty grammes of the powdered leaves were weighed into conical flask and 400mls of distilled water added, the mixture was shaken and allowed to stand for 30 minutes. It was then boiled for 1hour, cooled and shaken before filtration using a dry whatman filter paper into a measuring cylinder. The aqueous extract was then concentrated by evaporation using water bath at 60°c and stored at 4°c until used.

Experimental animals

White Wistar albino rats weighing 110-130gm obtained from the Animal House, Department of Pharmacology, Usmanu Danfodiyo University, Sokoto, Nigeria were used for the studies. The animals were brought to the laboratory one week before the commencement of the experiment for acclimatization. They were fed standard rat feeds and water *ad-libitum*

Acute toxicity studies

Acute toxicity studies were carried out *in vivo*. All solutions were prepared using distilled water and administration was by the intraperitoneal route. Initial pilot studies were carried out to determine the maximum dose of leaf extract that did not produce death and the minimum doses that produce 100% death. In between these dose ranges, five dose (600, 1200, 1800, 2600 and 3200mg/kg body weight) were selected for the study using 5 rats in each group. Each group was placed in clean cage and injected with the leaf extract at its corresponding dose. A control group was also injected with equivalent volume of distilled water. The signs of toxicity in rats were observed. The number of rats that died within 24hours were noted.

The LD_{50} of the aqueous leaf extract was calculated using the arithmetic method of Karber as modified by Aliu and Nwude (1982)

Phytochemical analysis

The presence of saponins, tannins, anthraquinones, emodols, polyuronides, alkaloids, glycosides, sterols and triterpenes were detected by simple qualitative chemical tests according to the methods of Harbone (1973), Sofowora (1984) and Kinjo *et al* (1994)

Statistical analysis

Results were presented as mean ± standard deviation. Analysis of variance was used to test the variation between the means (Mead and Curnow, (1983).

TABLE 1 Mortality rate in rats given *Cassia occidentalis* plant extract at different doses.

Group (n=5)	Plant extract dose mg/kg bodyweight	Number of deaths	% Mortality
1	600	0	0
2	1200	1	20
3	1800	2	40
4	2600	4	80
5	3200	5	100

Results

Acute toxicity study. Rats in the control group were not affected throughout the 24hr of acute toxicity study. There were no deaths of rats in groups 1 given plant extract at dose of 600mg/kg body weight. However, at doses of 1200, 1800,2600

TABLE 2 LD_{50} Calculated by Arithmetic Method of Karber (Aliu and Nwude, 1982).

Group (n=5)	Plant Extract dose mg/kg body weight	Dose difference	Dead (D.d(mg)	Mean Rats	Dose difference dead (m.d)	X.m.d.
1	600		0	0	0 0	
2	1200		600	1	0.5	300
3	1800		600	2	1.5	900
4	2600		800	4	3.5	2800
5	3200		600	5	6.0	3600
	TOTAL					7600

$$LD_{50} = LD_{100} - \frac{Dd\,Md}{n}$$

$$= 3200 - \frac{7600}{5} = 1680$$

LD_{50} = 1680 mg/kg body weight.

and 3200mg/kg given to the rats in groups 2,3,4 and 5 respectively, some deaths were recorded dose dependently (Table 1). The LD_{50} was calculated to be 1680mg/kg (Table 2). Signs and symptoms of toxicity observed in affected treated rats in order of severity included depression, drowsiness, hind limb and fore limb paralysis, sleep, difficulty in breathing and death

is an indication that the extract possesses low toxicity. According to the classification of Clarke and Clarke (1977), substances with LD_{50} of 1000mg/kg are regarded as being safe or of low toxicity. In this study, toxicity signs were dose dependent. The fact that high LD_{50} was obtained is an indication that the extract could be administered with some degree of safety, especially when administered

TABLE 3 Chemical constituents of *Cassia occidentalis* leaf extract

Tests		Result
Saponins		+
Tannins		+++
Anthraquinones		++
Emodols		+
Polyuronide		-
Sterols and triterpenes		++
Glycosides		
	Salkowskis test	++
	Lieberman's test	+++
	Keller-killian's test	+++
Alkaloids		
	Drangendoff's test	+++
	Wagner's test	+++
	Pieric acid test	++
	Tannic acid test	++

Key

-	Chemical not detected	
+	"	Present in low concentration
++	"	Present in moderate concentration
+++	"	Present in high concentration.

Phytochemical Analysis

Tannins, alkaloids and glycosides are present in high concentrations. Anthraquinones, sterols and triterpenes are present in moderate concentrations while saponins and emodols are present in low concentrations. Polyuronides are probably absent in the plant extract. The results obtained are shown in Table 3.

Discussion

Acute toxicity study of *Cassia occidentalis* aqueous leaf extract showed that it caused mortality of experimental rats at a high dose with an intraperitoneal LD_{50} of 1680mg/kg body weight. This through the oral route where the absorption might not be complete due to inherent factors limiting absorption in the gastrointestinal tract (Dennis, 1984).

The toxicity observed could result from any of the various organic chemicals like saponins, tannins, alkaloids, phenolic compounds and glycosides as indicated by the result of phytochemical tests done in this study. The findings are in agreement with those of other workers like O'Hara (1969; 1974) and Herbert (1983). These organic chemicals may cause haemolysis, cardiomyopathy, toxic myopathy, myodegeneration and death of animals that ingest high doses of *Cassia occidentalis* leaf or seeds (Simpson, 1971; Rogers,

1979; Flory, 1992).

Phytochemical tests result indicated high concentrations of tannins, alkaloids and glycosides and moderate concentration of anthraquinones in the plant extract which are in agreement with those of other workers like Lemli *et al* (1981), Sofowora (1984), Elujoba (1989) and Hussain (1991). Although it is known that variation may sometimes occur in bioactive compounds of the same plant found in different environments (Elujoba, 1989), this was however not the case in this study.

The apparent lack of signs of toxicity when the extract of this medicinal plant is given to humans for febrile illnesses may be a reflection of the oral route of administration, low dose administration as well as the short duration of exposure. The extract is administered orally two to three times daily for a period of four to five days. However, further work is still needed in this area.

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