African Journal of Biochemistry Research Vol.3 (5), pp. 229-231, May, 2009
Available online at http://www.academicjournals.org/AJBR
ISSN 1996-0778 © 2007 Academic Journals

Short Communication

Toxic effects of aqueous stem bark extract of *Cassia sieberiana* on some biochemical parameters in rats

W. Obidah*, U. A. Sa'ad and A. U. Wurochekke

Biochemistry Department, Federal University of Technology Yola, Adamawa State, Nigeria.

Accepted 18 May, 2009

The aqueous extract of *Cassia sieberiana* stem bark was administered to groups of 4 albino rats (160 ± 10 g) at 0, 20, 60 or 180 mg/kg body weight daily by gavages for six weeks. A 7% decrease in mean body weight gain was observed in the group treated with the highest concentration of the extract (180 mg/kg). Groups treated with the extract showed significant ($p < 0.05$) increase in serum ALT and AST activity. Significant ($p < 0.05$) increase in serum urea and creatinine concentrations, together with decrease in serum total protein concentrations were observed in the group treated with 180mg/kg body weight of the extract. These results indicate that oral administration of aqueous extract of *Cassia sieberiana* stem bark to rats result in hepatotoxicity even at lower dose levels of 20 - 60 mg/kg and nephrotoxicity at higher doses of 180 mg/kg.

Key words: *Cassia sieberiana*, oral, rats, repeated dose toxicity.

INTRODUCTION

Herbal medicines are widely used for the treatment and prevention of various diseases in Africa and other developing countries of the world. These herbs are generally accessible, affordable and acceptable by most of the consumers (Sofowora, 1985). However, information on their safety is not usually adequate.

Cassia sieberiana is a savannah tree found in the dry areas of the forest and thickets (Gledhill, 1991). It belongs to the family called *Acacia*. It is commonly used for the treatment of many illnesses especially in the tropics. For instance, the aqueous extracts of the roots, stem bark and the fruit pulp have been used traditionally in North-eastern Nigeria for the treatment of inflammatory conditions, tiredness and joint pains (Madusolumuo et al., 1999). The extracts are used to treat fever, malaria, diuretics, diarrhoea, leprosy, bilhazia, stomach pains and as a dewormer (Dalziel, 1956; Gledhill, 1991; Tamboura et al., 2005). Other uses include improvement of lactation after child birth and treatment of rheumatic condition. Herds men in some countries including Nigeria use the stem bark in the treatment of jaundice (Madusolumuo et al., 1999).

The phytochemical studies of the plant indicated the presence of tannins, sterols and anthroquinones (Duquenois and Anton, 1968 and Madusolumuo et al., 1999). The LD_{50} of its aqueous leaf extract in mice was 24.4 mg/kg (Tamboura et al., 2005). Other researchers have also indicated that the plant is toxic (Dhar et al., 1968; Mugera, 1970; Neuwinger, 1996). The present study was undertaken to evaluate the possible toxic effects of *C. sieberana* stem bark extract on some serum biochemical parameters in rats.

MATERIALS AND METHODS

Plant

Fresh samples of stem bark of *Cassia sieberiana* were collected from around the Bagale-hills, Yola, Adamawa State, Nigeria. The specimens were identified at the Forestry Department, Federal University of Technology, Yola, Nigeria. The extract was prepared according to the method described by Madusolumuo et al. (1999). The collected samples were washed with tap water, cut into small pieces and dried to constant weight in an oven at 50°C.The dried samples were ground into fine powder using pestle and mortar.

Five grammes (5 g) of each portion of the powder was suspended in 50ml of distilled water, shaken thoroughly and then filtered using No. 1 Whatman filter paper. The 100mg/ml extract obtained was used for this study.

EXPERIMENTAL ANIMALS AND TREATMENT PROTOCOL

Sixteen (16) Wister rats weighing 160 ± 10 g body weight were obtained from the animal house unit of the Nigerian Institute of Trypa-

*Corresponding author. E-mail: domwam@yahoo.com

Table1. Mean body weights and % weight gain in rats treated with *C. sieberiana* stem bark extract.

Dose level (mg/kg)	Final body weight (mg)	Mean weight gain (%)
0 (normal)	240.6 ± 8.2	26.4
20	211.1± 10.5	25.3
60	232.9 ± 8.7	23.6
180	223.4 ± 7.8	19.4

Values are mean ± S.E, n = 4
*Significantly different from control group ($p < 0.05$)

Table 2. Serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities in rats treated with *Cassia sieberiana* stem bark extract.

Dose level (mg/kg)	ALT (U/L)	AST (U/L)
0 (control)	71 ± 10.2	51 ± 7.0
20	99 ± 11.1*	43 ± 9.3
60	116 ± 14.6**	72 ± 8.1*
180	185 ± 12.8**	91 ± 7.1**

Values are mean ± S.E, n = 4
*Significantly different from control group ($p < 0.05$)
**Significantly different from control group ($p < 0.01$)

nosomiases Research (NITR) Vom, Jos, Plateau State, Nigeria. They were housed in steel cages at room temperature and fed with pelleted standard laboratory feed (Grand Cereals Ltd., Jos, Nigeria).

The animals were allocated to four groups of four rats each. Group 1(control) animals were maintained without any treatment. Animals of group 2, 3 and 4 were orally administered with *C. sieberiana* stem bark extract at 20, 60 and 180 mg/kg body weight per day respectively for 6 weeks.

At the end of the experimental period, rats were fasted overnight. Blood was collected from the rats by direct heart puncture under diethylether anaesthesia. Serum chemistry measurements were performed on some biochemical parameters. Alanine aminotransferase (AST) and aspartate amino transferase (AST) were determined by the method of Reitman and Franklin (1957). Total protein was determined by the method of Reinhold (1953). Serum urea and creatinine were also assayed (Chawla, 1999).

STATISTICAL ANALYSIS

The data was presented as mean ± S.E, n = 4. One way ANOVA was used to evaluate the difference between multiple groups. The level of significance was set at $p < 0.05$ and $p < 0.01$

RESULTS

The weight gains of experimental animals treated with *C. sieberiana* stem bark aqueous extract are shown in Table 1. Oral administration of rats with 180 mg/kg of the extract resulted in 7% decreased in mean body weight gain.

The Serum ALT activity was significantly ($p < 0.05$) higher at all treatment levels when compared with control group. Significant ($P < 0.01$) values were also observed in the groups treated with the extract at 60 and 180 mg/kg. Serum AST activity in groups treated with 60 and 180 mg/kg of the extract were significantly ($p < 0.05$) higher than control (Table 2). Table 3 shows the result of serum total protein, urea and creatinine. Serum total protein concentration decrease significantly ($p < 0.05$) in the group treated with 180 mg/kg of the extract as compared to the control animals. Likewise, serum urea and createnine concentration increased significantly ($p < 0.05$) as compared to the control animals.

DISCUSSION

Liver and kidney are important organs of the body which play a vital role in metabolic processes. Liver detoxifies substances that are harmful to the body. The kidney helps in maintaining homeostasis of the body by reabsorbing vital substances and excretion of waste products (Chawla, 1999).

Oral administration of rats with *C. sieberana* stem bark aqueous extract resulted in marginal reduction in mean body weight gain (7%) which may be due to toxic response of the alkaloids in the extract. The serum ALT and AST assayed in this study are sensitive indicators of hepatocellular damage (Chapatwala et al., 1982). High levels are present within hepatocytes and plasma levels rise as hepatocytes membrane integrity is disturbed during hepatocellular injury (Kew, 2000; Galati et al., 2005). In the present work, oral administration of the extract to rats resulted in significant increase in serum levels of ALT and AST suggestive of a hepatotoxic effect induced by the extract.

Contrary to the present observations, Madusolumuo et al. (1999) have demonstrated the hepatoprotective properties of this extract and the possible explanation for this variation at this time could be assigned to the excessive doses and prolonged treatment schedules used in the present study.

Serum total protein represents a complex mixture containing a number of components which differ in properties and function. Liver is the organ mainly responsible for formation of plasma albumin and at least 30% serum globulins. Decrease in serum total protein concentration is associated with terminal liver disease and renal failure (Chawla, 1999). Increased serum urea and creatinine have been linked to kidney disease (Chawla, 1999). Urea

Table 3. Serum concentrations of total protein, urea and creatinine in rats treated with *Cassia sieberiana* stem bark extract.

Dose level (mg/kg)	Total Protein (g/l)	Urea (mg/dl)	Creatinine (mm/l)
0 (control)	78.01 ± 8.1	7.77 ± 1.4	2.54 ± 0.6
20	74.54 ± 8.4	8.47 ± 1.2	3.11 ± 05
60	68.29 ± 9.2	9.44 ± 1.6	3.48 ± 0.5
180	59.71 ± 11.3*	10.21 ± 1.5*	4.01 ± 0.4*

Values are mean ± S.E, n = 4

*Significantly different from control ($p < 0.05$)

is the main end product of protein catabolism. It represents 90% of the total urinary nitrogen excretion. In this study, the group treated with the highest concentration (180 mg/kg) of the extract exhibited significant increase in serum urea and creatinine that might suggest the inability of the kidney to excrete these products. Renal diseases which diminish the glomerular filtration rate lead to urea and creatinine retention (Chawla, 1999). Since urea and creatinine are used as indices for the evaluation of the effects of chemicals on the kidney (Kaplan et al., 1988), this result may suggest that the extract may be toxic to the kidney, especially at higher concentrations (≥ 180 mg/kg body weight).

Thus, it is concluded that oral administration of *Cassia sieberiana* stem bark extract resulted in significant heaptotoxicity and nephrotoxicity.

REFERENCES

Chapatwala KD, Boykin MA, Rajanna B (1982). Effects of intraperitoneally injected cadmium on renal and hepatic glycogenic enzymes in rats. Drug Chem. Toxicol. 5:305-317.

Chawla R (1999).Serum total protein and albumin-globulin ratio. In: (Methods and Interpretations) (eds Chawla R): Jaypee Brothers Medical Publishers, New Delhi, India. Pract. Clin. Biochem. pp.106 - 118.

Galati EM, Mondello MR, Lauriano ER, Taviano MF, Galluzo M, Miceli N (2005). *Opuntia ficus indica (L)* Mill fruit juice protects liver against carbon tetrachloride induced liver injury. Phytother. Rev. 19: 796-800.

Kaplan LA, Szabo LL, Opherin EK (1988). Clin. Chem.: Interpretations and techniques. 3rd Ed. Lea and Feblinger, Philadelphia.

Kew ML (2000).Serum aminotransferase concentration as evidence of hepatocellular damage. Lancet. 335: 951-952.

Madusolumuo AM, Nadro SM, Wurochekke, UA (1999). Antihepatotoxic properties of Cassia sieberiana in acetaminophen treated rats. Nig. J. Biochem. Mol. Biol. 14: 21-25.

Reitman S, Frankel S (1957). A colorimetric method for the determination of serum glutamic oxaloacetic and glutamic pyruvic transaminase. Am. J. Clin. Pathol. 28: 56- 62.

Sofowora EA (1985). Medicinal plants and traditional remedies in Africa. University of Ife Press, Nigeria.

Tamboura HH, Bayala B, Lompo M, Guissou IP, Sawadogo (2005). Ecological distribution, morphological characteristics and acute toxicity of aqueous extracts of *Holarrhena floribunda* (G.don) Duran and Schinz, Leptadenia hastate (Pers.) decne and Cassia sieberiana(Dc) used by veterinary healers in Burkinafaso. Afr. J. Trad. C AM. 2 (1):13-24.

Dhar ML, Dhar MM, Mehrothra BN, Dhawanan BN, Ray C, (1968). Screening of Indian plants for biological activity. Ind. J. Exp. Biol. 6: 232-247.

Mugera GM (1970).Toxic and medicinal plants of eastern Africa Part II. Bull. Epizootic. Dis. Afr. 18:389-403.

Neuwinger HD (1996). African ethno botany: poisons and drugs .Chapman and Hall.