PHYTOTHERAPY RESEARCH, VOL. **12**, 431–433 (1998)

SHORT COMMUNICATION

Effect of Aqueous Leaf Extract of *Cassia alata* (Linn.) on Some Haematological Indices in Albino Rats

O. A. Sodipo,[1]* K. D. Effraim[2] and E. Emmagun[2]

[1]Department of Biochemistry, College of Medical Sciences, University of Maiduguri, Maiduguri, Borno State, Nigeria
[2]Department of Pharmacology, College of Medical Sciences, University of Maiduguri, Maiduguri, Borno State, Nigeria

The effect of an aqueous leaf extract of *Cassia alata* (Linn.) on haematological indices in albino rats was studied. Increasing doses (10, 50, 100 and 150 mg/kg body weight) of the extract were administered orally to different groups of rats daily for a period of 14 days. Significant dose-dependent decreases in the levels of haemoglobin (Hb) and erythrocyte count ($p < 0.05$) were observed. In addition, increased packed cell volume (PCV) mean corpuscular volume (MCV), and mean corpuscular haemoglobin concentration (MCHC) were also observed. However, mean corpuscular haemoglobin (MCH) did not show any change. Clinical symptoms of loss of appetite, emaciation and loss of weight in the treated rats indicated toxicity. The observed symptoms of toxicity have been discussed in relation to the saponin content of the plant extract. © **1998 John Wiley & Sons, Ltd.**

Phytother. Res. **12**, 431–433, (1998)

Keywords: Cassia alata; Caesalpinaceae; haematological indices; medicinal; saponins

INTRODUCTION

The plant *Cassia alata* (Linn.) (family Caesalpinaceae) popularly known as 'ringworm cassia' is a medicinal plant used in many parts of the world. The shrub grows well in the forest areas of West Africa, flowering during November to January (Irvine, 1961), and being known by various names. For example, the Fantis of Southern Ghana call it 'Nsenpi', while in Sierra Leone, the Mendes call it 'Nje-pai' and the Yorubas of Western Nigeria call it 'Asunwon'. Its use in the treatment of skin diseases and in purgation is popular among some tribes in Southern Ghana. The leaves are well known for their laxative property and due to the high content of chysophanic acid, the leaf extract is also used for skin diseases. In addition, leaves are also used for various diseases of the liver (Irvine, 1961; Hutchinson and Dalziel, 1954). The stem bark and seeds can also be used in pest control (Grainage *et al.*, 1986).

Although much work has been done on the plant, there is no information on its effect on haematological indices. In view of the numerous uses of the leaves, especially as a popular purgative by traditional medicine practitioners, there is a need to conduct more studies. The primary objective of this investigation was to study the effect of the crude aqueous leaf extract on the haematological indices in albino rats.

* Correspondence to: O. A. Sodipo, Department of Biochemistry, College of Medical Sciences, University of Maiduguri, Maiduguri, Borno State, Nigeria.

MATERIALS AND METHODS

Plant material. *Cassia alata* leaves were collected from the main campus of the University of Cape Coast, Cape Coast, Ghana. The herbarium specimen was identified in the Botany Department of the Faculty of Science of the same University. The leaves were dried at 40°C for a period of 1 week, ground and sieved. The ground leaves were stored in cellophane bags and kept at 4°C until use.

Animals. Male albino rats of the Wistar strain weighing 120–150 g were obtained from the National Veterinary Research Institute, Vom, Plateau State, Nigeria. They were housed under a standard lighting regimen and fed *ad libitum* with standard diet (Nutrifeeds Nigeria Ltd., Kano) and water.

Preparation of extract. A 200 g portion of the ground leaves was mixed with 1 L of distilled water in a 2 L beaker, boiled for 1.5 h and allowed to cool to 40°C before filtering. The filterate was then evaporated until the volume was reduced to 400 mL (1 mL of extract was equivalent to 0.5 g of sample). The extract was then stored at 4°C until use.

Phytochemical analysis. The phytochemical analysis of the extract was performed by testing for tannins, alkaloids, saponins, phlobatannins, simple sugars and cardiac glycosides using standard procedures (Odebiyi and Sofowora, 1978).

CCC 0951–418X/98/060431–03 $17.50

Accepted 13 March 1998

Table 1. Effect of various doses of aqueous leaf extract of *Cassia alata* on body weights of albino rats

Group/dose	Body weight (g) Day 0	Day 7	Day 14
Control/untreated	149.33 ± 9.82	154.33 ± 10.18	160.10 ± 8.27
Extract (mg/kg)			
10	148.50 ± 8.09	145.50 ± 11.28	141.00 ± 12.14
50	148.90 ± 7.26	146.90 ± 8.15	139.50 ± 10.35
100	146.00 ± 11.15	138.40 ± 10.11	137.20 ± 13.09
150	148.60 ± 9.08	141.50 ± 8.06	136.20 ± 7.06

Values are mean ± SEM; $n = 6$ rats in each experimental group.

Table 2. Effect of various doses of aqueous leaf extract of *Cassia alata* on haematological indices in albino rats

Blood index	Dose of extract (mg/kg) Control	10	50	100	150
Haemoglobin (g/100 mL)	11.09 ± 0.83	11.86 ± 0.35	11.23 ± 0.06	10.03 ± 0.56	9.40 ± 0.36[a]
RBC (10^6/mm^3)	65.40 ± 14.90	66.98 ± 4.02	52.68 ± 1.69	45.05 ± 3.17	27.85 ± 8.17[a]
PCV (%)	47.17 ± 5.20	48.17 ± 0.60	44.83 ± 2.30	42.50 ± 4.12	40.00 ± 2.22
MCV (fL)	0.72 ± 0.00	0.71 ± 0.01	0.79 ± 0.00	0.04 ± 0.01	1.43 ± 0.05
MCH (pg)	0.17 ± 00	0.18 ± 0.00	0.21 ± 0.00	0.20 ± 0.00	0.51 ± 0.12
MCHC (g/dL)	0.24 ± 00	0.23 ± 0.00	0.28 ± 0.03	0.23 ± 0.03	0.23 ± 0.02

[a] $p < 0.05$ significantly different compared with the control; Values are mean ± SEM; $n = 26$ rats in each experimental group.

Administration of extract. The experimental animals were divided into four groups of six rats each. Before the extract was administered, baseline measurements of the various parameters, red blood cell count (RBC), white blood cell count (WBC), haemoglobin concentration (Hb) and packed cell volume (PCV) were taken. Thereafter each group of rats was administered one of various doses (10 mg/kg, 50 mg/kg, 100 mg/kg and 150 mg/kg of extract per body weight) orally. Estimations of the various haematological indices were carried out on days 8 and 15 of the period of treatments.

Collection of blood. Blood samples were collected from the tail of each rat, by making a cut right though, at a region, 2.0' cm from the tip.

Blood analysis. The haematological examinations were performed using standard methods. Haematocrit was determined by the microhaematocrit method described by McGowen *et al.* (1955). Erythrocytes were counted using the improved Neubauer haemocytometer. The packed cell volume of each sample was determined by using a Hawksley microhaematocrit centrifuge at 12 000 × **g** for 5 min. The mean corpuscular volume (MCV) was estimated from the RBC and PCV (Dacie and Lewis, 1984).

RESULTS

Phytochemical analysis

Phytochemical screening of the aqueous crude extract revealed the presence of tannins, saponins, cardiac glycosides and simple sugars.

Blood indices

The results of the various doses of aqueous leaf extract of *Cassia alata* on haematological indices are shown in Tables 1 and 2.

Haemoglobin (Hb)

At the end of the experimental period, there was a progressive decrease in the mean haemoglobin content of the animals as the dose increased. Animals administered with 150 mg/kg body weight of the extract had significantly lower Hb values ($p < 0.05$) compared with the control (untreated rats) (Table 2).

Erythrocyte count

The mean erythrocyte count decreased progressively as the dose of the extract increased from 10 mg/kg to 150 mg/kg body weight. The decrease was significant ($p < 0.05$) compared with the control values (Table 2).

Packed cell volume (PCV)

When compared with the control values, there was a decrease in the mean PCV values as the dose of the extract increased from 50 mg/kg to 150 mg/kg body weight (Table 2).

Absolute values (MCV, MCH MCHC)

Animals given 10 mg/kg body weight of extract had a lower mean corpuscular volume (MCV) (Table 2) compared with the values obtained for control at other doses. And generally, the results showed that MCV

increased with increasing dose (Table 2). There was no significant change in the mean corpuscular haemoglobin (MCH) at the various levels of dose (Table 2). However, there was a significant change in the mean corpuscular haemoglobin concentration (MCHC) when the dose was increased from 10 mg/kg to 50 mg/kg (Table 2). There was also a significant decrease in the MCHC between doses 50 mg/kg, 100 mg/kg and 150 mg/kg body weight (Table 2).

DISCUSSION

This study has shown that the crude aqueous extract of the leaf of *Cassia alata* at the doses administered and for the duration of the experiment, was toxic to albino rats. There was a dose-dependent reduction in the haemoglobin concentration, erythrocyte count and packed cell volume compared with the controls (Table 2). The reduction in the haemoglobin, erythrocyte count and packed cell volume can be attributed to lysis of blood cells and loss of fluid.

Saponins have been known to cause lysis of red blood cells (Harborne, 1984). The results of phytochemical screening revealed the presence of saponins as one of the constituents of the extract. And as the loss of fluid usually occurs in diarrhoea and increased urination, conditions which the administered doses did not elicit, the observed effects were probably due to the presence of saponins. Furthermore, the toxic effect of the extract was also manifested in the physical appearance by reduction in weight and general emaciation (Table 1). Other clinical signs observed included loss of appetite, as deduced by reduction in feed intake. These effects were also observed to be dose-dependent. Again, such effects may be due to the toxic effects of saponins in the plant extract. Indeed, saponins are known to produce such clinical symptoms in rats (Watt and Breyer-Brandwijk, 1962). Thus, rats fed saponins from some sources at levels of 2–6 mg/day for 14 days have been reported to show a loss of weight and develop a form of osteomalacia (Brune and Gunther, 1960). The systemic effect of an ingested saponin has been reported to depend on the degree of absorption (George, 1965), and since most saponins dialyse with difficulty, in a normal animal, only a very small percentage of ingested saponins can be absorbed through the intestine (George, 1965). Conditions such as inflammation of the intestines and the use of drastic purgatives can lead to increased absorption of saponins (Ewart, 1931). Patients with inflamed intestine or cirrhotic livers, or those using drastic purgatives, have been advised to avoid foods containing saponins of natural or artificial origin. In view of this, and based on the results of this study, the continued use of the extract should be with caution. There is therefore a need to establish a safe level of dosage for the use of this extract as a purgative and future research should be encouraged in this direction.

Acknowledgements

The authors gratefully acknowledge the technical assistance of Justus Jibrin and Ushadrag Medugu.

REFERENCES

Brune, von H., and Gunther, K. (1960). Zur Frage der Wirksamkeit der Saponineals Antivitamin D. *E. Ernahrungs.* **2**, 45.

Dacie, J. V., and Lewis, S. M. (1984). *Practical Haematology*, 6th edn, pp. 24–36. Churchill Livingstone, Edinburgh.

Ewart, A. J. (1931). The poisonous action of ingested saponins. *Council Sci. Industr. Res. (Australia) Bull.* No. **50**.

George, A. G. (1965). Legal status and toxicity of saponins. *J. Food. Cosmet. Toxicol.* **3**, 85–91.

Grainage, M., Saleem, A., Mitchell, W. C., and Hylim, J. W. (1986). Plant species reportedly possessing pest control properties. *An EWC/UH Data Base*, East West Resource System Institute, Honolulu, Hawaii, pp. 32–34.

Harborne, J. B. (1984). *Phytochemical Methods—A Guide to Modern Techniques of Plant Analysis*, 2nd edn, p. 126. Chapman and Hall, New York.

Hutchinson, I., and Dalziel, J. M. (1954). *Floral of West Tropical Africa*, 2nd edn, pp. 450–455. Revised by R. W. J. Keay, Crown Agents, London.

Irvine, F. R. (1961). *Woody Plants of Ghana with Special Reference to their Uses*, pp. 178–183. Oxford University Press, London.

McGowen, J. J., Jones, A. A. R., and Steinberg, A. O. (1955). The haematocrit of capillary blood. *N. Engl. J. Med.* **253**, 303.

Odebiyi, O. O., and Sofowora, E. A. (1978). Phytochemical screening of Nigerian medicinal plants. *Lloydia.* **41**, 234–235.

Watt, J. M., and Breyer-Brandwijk, M. J. (1962). *The Medicinal and Poisonous Plants of Southern and Eastern Africa*, 2nd edn, p. 1425. E. and S. Livingstone, Edinburgh.

