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Full Length Research Paper

Acute toxicity effects of the aqueous leaf extract of *Anogeissus leiocarpus* in rats

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A study was conducted to investigate the acute toxicity effects of the aqueous leaf extract of *Anogeissus leiocarpus* using conventional methods. The result of the oral acute toxicity study revealed no death with doses up to 3200 mg/kg body weight. However, the rats showed signs of depression and inappetence. Using the intraperitoneal route, the rats showed dose-dependent signs of toxicity ranging from inappetence, depression, unsteady gait, tremors, and respiratory distress to death. The I/P LD_{50} was 1400 mg/kg body weight. No gross changes were observed in the organs of rats that died following extract administration. Histopathological lesions were also not observed in all the organs except the lungs, which showed congestion, oedema and bronchitis. These results suggest that the aqueous leaf extract of *A. leiocarpus* could be used with some degree of safety especially by oral route.

Key words: Acute, toxicity, leaf, *Anogeissus leiocarpus*, rats.

INTRODUCTION

The ethnobotanical uses of plants are diverse in both traditional and Veterinary Medical practices (Agunu et al., 2003), and the use of plants for medicinal purposes dates back to antiquity (Ogunyemi, 1979). The World Health Organisation estimated that perhaps eighty percent of the inhabitants of the world rely chiefly on traditional medicines. It, therefore, approved the use of herbal products for national policies and drug regulatory measures in order to strengthen research and evaluation of the safety and efficacy of these products (Saxena, 2001). Farnsworth et al. (1985) reported that of the 119 plant derived drug listed by WHO study, 74% were discovered as a result of chemical studies to isolate the active compounds responsible for the use of original plant in traditional medicine.

Anogeissus leiocarpus is a graceful tree of the Sahel to forest zones, straight tapering boles branching from low down often gregarious and effectively killing out grasses (Dalziel, 1937). The leaves serve as a fodder to livestock Burkill, 1985). It is also used in traditional medicine as a remedy for many ailments of livestock and man, which include helminthosis, schistosomiasis, leprosy, diarrhoea and psoriasis (Burkill, 1985; Ibrahim et al., 1985; Onyeyili, 2000).

Although it is generally agreed that medicinal plants and their products are naturally safer than their synthetic counterparts drugs (Gamaniel, 2000), a general assumption of this safety should not always be made as a plant may prove efficacious but would have low therapeutic index or safety margin. It is in view of this that this study investigates the acute toxicity effects of the aqueous leaf extract of *A. leiocarpus*.

MATERIALS AND METHODS

Collection of plant materials

The leaves of the plant was collected from Gidan Massallaci village in Dange Shuni Local Government of Sokoto State and identified by Mal. Mohammed Aleiro, a taxonomist in the Department of Botany, Usmanu Danfodiyo University, Sokoto. The voucher specimen is kept at the herbarium of the Department of Veterinary Physiology and Pharmacology, Usmanu Danfodiyo University, Sokoto.

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Table 1. Toxicity signs observed in rats that received single dose (i.p.) of the leaf extract of *A. leiocarpus.*

Dose (mg/kg body weight)	Signs of toxicity					
	Inappetence	Depression	Unsteady gait	Tremor	Resp. distress	Death
800	+	+	+	-	-	-
1200	+	+	+	-	-	+
1600	+	+	+	+	+	+
2000	+	+	+	+	+	+
2400	+	+	+	-	+	+
2800	+	+	+	-	+	+

+ = Present, - = Absent.

Table 2. Percentage mortality in rats given *A. leiocarpus* plant extract (i.p) at different doses.

Group	No. of Animals	Dose (mg/kg)	No. of death	% Mortality
1	7	800	0	0
2	7	1200	4	57.1
3	7	1600	5	71.4
4	7	2000	6	85.7
5	7	2400	6	85.7
6	7	2800	7	100

Preparation of the extract

The collected leaves were air dried at room temperature until it attained a constant weight. The dried leaves were then powdered using pestle and mortar; 100 g of the powder was extracted in 2.0 l of distilled water for 1.5 h using a hot plate. The extract was filtered using a cheese cloth, then cotton wool and finally whatman filter paper No.1. The filtrate was concentrated over a water bath to achieve the desired concentration.

Animals

Albino rats of both sexes weighing between 135 – 235 g body weights obtained from Nigerian Trypanosomiasis Research Institute Vom, Nigeria were used for the experiment.

Experimental procedure

Forty albino rats were divided into eight groups of five rats each and were given graded doses (800, 1200, 1600, 2000, 2400, 2800 and 3200 mg/kg body weight) of the extract by gastric tube. The rats were observed for signs of toxicity and death over a period of 72 h as described by Lorke (1983). The eighth group received single oral dose of 2 ml normal saline through the same route.

In another experiment, forty-nine rats were randomly divided into 7 groups of 7 rats each. The first 6 groups were given graded doses (800, 1200, 1600, 2000, 2400, and 2800 mg/kg body weight) of the extract by intraperitonal route while the last group received 2 ml of normal saline by the same route. The animals were then observed for 24 h for toxicity signs and death. The LD_{50} of the extract was calculated using the arithmetic method of Karber as modified by Aliu and Nwude (1982).

Histopathological study

All the rats that died during the study period were subjected to postmortem examination within six hour of death and tissue samples (liver, kidney, intestine and testicles) were obtained and fixed in 10% neutral buffered formalin and used for histopathological slide preparation as described by Drury and Wallington (1976). Slides of lesions were observed using X40 objective and results recorded.

RESULTS AND DISCUSSION

The results of the oral acute toxicity indicate that there was no mortality in any of the groups. However, the treated animals showed signs of depression and inappetance. In the intraperitoneal toxicity testing, the rats showed dose-dependent signs of toxicity (Table 1), with death occurring in groups that received 1200, 1600, 2000, and 2400 mg/kg within 14 h of extract administration while all the animals treated with 2800 mg/kg group died within 8 h. The mortality rates and calculated LD_{50} are presented in Tables 2 and 3, respectively.

Gross and histopathological lesions observed in some organs or rats that died from various groups as a result of extract administration are shown on Tables 4 and 5. There were no gross lesions in all organs examined except the lungs that were congested. Similarly, dose-dependent histopathologcal changes such as congestion, oedema and bronchitis were observed in the lungs.

Rats treated orally with the aqueous leaf extract of *A. leiocarpus* did not show any mortality and this could indicate wide safety margin following oral administration. According to the toxicity scale of Hodge and Sterner, any compound with an oral LD_{50} of between 500 – 500 mg/kg should be considered practically non toxic (CCHOS, 1999). This could be attributed to the fact that orally administered drugs and compounds do undergo some

Table 3. Determination of intraperitoneal LD_{50} of the leaf extract of *A. leiocarpus* in rats.

Group	Dose	Dose diff. (DD)	Dead	Mean dead (MD)	Dose diff x mean dead
1	800	400	0		
2	1200	400	4	2	800
3	1600	400	5	4.5	1800
4	2000	400	6	5.5	2200
5	2400	400	6	6	2400
6	2800	400	7	6.5	2600

LD_{50} = Least dose that killed all animals - (DD x MD)/(No. Animals/grp0
LD_{50} = 2800 – 9800/7
LD_{50} = 2800 – 1400
LD_{50} = 1400 mg/kg (i.p.)

Table 4. Gross changes observed in rats treated (i.p.) with varying doses of leaf extract of *A. leiocarpus.*

Dose (mg/kg)	Observed changes				
	Lungs	Liver	Kidney	Intestine	Testicles
800	-	-	-	-	-
1200	Mild congestion	Mild congestion	Mild congestion	Mild congestion	Mild congestion
1600	Mild congestion	Mild congestion	Mild congestion	Mild congestion	Mild congestion
2000	Severe	Congestion	Mild congestion	Mild congestion	Mild congestion
2400	Severe congestion	Mild congestion	Mild congestion	Mild congestion	Mild congestion
2800	Severe congestion	Mild congestion	Mild congestion	Mild congestion	Mild congestion

Table 5. Histopathological changes observed in various organs of dead rats treated with single dose (i.p.) of leaf extract of *A. leiocarpus.*

Dose (mg/kg)	Observed changes				
	Lungs	Liver	Kidney	Intestine	Testicles
800	-	-	-	-	-
1200	Congestion, Oedema, bronchitis	-	-	-	-
1600	As in 1200	-	-	-	-
2000	As in 1200	-	-	-	-
2400	As in 1200	-	-	-	-
2800	As in 1200	-	-	-	-

- = No lesion observed.

events that potentially decrease the amount reaching systemic circulation for pharmacological effects (Brander et al., 1991). The manifestation of depression and inappetance observed in the rats may however be link to some chemical constituents present in the extract such as tannins (Hotellier and Delaveau, 1975; Nwafor et al., 1995). Alldredge (1993) attributed reduce feed intake in animals fed tannin containing diets to strong astringent property of tannins and induction of internal malaise in mammals, which may contribute to reduce feed intake.

The result of the intraperitoneal acute toxicity study showed that LD_{50} of the extract is 1400 mg/kg, indicating that the extract is of low toxicity. Clarke and Clarke (1977) reported that any substance with an i/p LD50 of above 1000 mg/kg should be regarded as safe.

The dose dependent toxic manifestations observed following i/p administration may be due to the effect of one or more of the chemical constituents present in the extract, where the concentration increases with administration of higher doses. This might have affected morbidity and mortality observed in the study. The absence of gross and histopathological lesions in the liver, kidney, intestines and testicles further buttress the level of safety of the extract on these organs except the lungs where extensive lesions were observed as the dose increases.

It is therefore concluded that the high LD_{50} obtained following i/p administration of the extract and lack of mortality when orally administered may be an indication that the aqueous leaf extract of *A. leiocarpus* could be used with some degree of safety especially when consu-

med by oral route.

REFERENCES

Agunu A, Ibrahim NDG, Onyiloyi GA, Abdulrahman, EM (2003). Toxicity of stem-bark extract of *Steganotaenia araliacea* in rats. Nig. J. Natl. Prod. Med. 7: 65-67.

Aliu YO, Nwude N (1982). Vet. Pharmacol. Toxicol. Exp. 1st ed. pp. 104-110.

Alldredge J (1993). The effect of condensed tannins on browsers and grazers: Quantitative and Qualitative defense? Colorado State University, Fort Collins. Colorado p. 7.

Brander GC, Pugh DM, Bywater RJ, Jerkins WL (1991). Veterinary Applied Pharmacology. Ther. 5th ed. Bailliere Tindal, London pp. 513-547.

Burkill HM (1985). The useful plants of West Africa Vol. 1, Families A-D Royal Botanical Gardens, Kew. p. 417.

CCOHOS (1999). What makes chemicals poisonous? www. CCOHOS. Ca/OSHanswers. pp. 1-5.

Clarke EG, Clarke ML (1975). Vet. Toxicol. 3rd ed. Bailliere Tindal, New York.

Dalziel JM (1937). The useful plants of West tropical Africa Crown agents for overseas Governments. Milbank, London, UK. pp. 202-204

Drury RAB, Wallington EA (1976). Carteton Histological Techniques.4th ed. Oxford University Press, London. pp. 21-70.

Farnsworth NR (1984). How can a well be dry when it is filled with water? Econ. Bot. 38: 4-13

Gammaniel KS (2000). Toxicity from Medicinal plants and their products. Nig. J. Prod. Med. 4: 4-8.

Hotellier FP, Delaveau P. (1975). Nauclefine and Naucletine constituents of Nauclea latifolia. Phytochemistry. 14: 1407-1411.

Ibrahim MB, Owonubi, Onaolapo JA (1997). Antibacterial effect of the extracts of leaf, stem and root bark of *Anogeissus leiocarpus* on *S. aureus* NCTC 6571, *S. pyogenes* NCTC, 8198, *E. coli* NCTC 10418 and *P. vulgaris* NCTC 4638. J. Pharm. Res. Dev. 2(1): 20-26.

Lorke D (1983). A new approach to practical acute toxicity testing. Arch. Toxicol 54: 275-287.

Nwafor PA, Ephriam KD, Jacks TW (1996). The effect of *Khaya Senegalensis* on isolated guinea pig ileum and frog *rectus abdominus* muscle. Afr. J. Med. Pharm. Sci.

Ogunyemi A.O. (1979). The origin of the herbal cure and its spread. In: Proc. of a conference on African Medicinal Plants (Sofowora, A. Ed.) University of Ife Press, Ile-Ife. pp. 20-22.

Onyeyili, PA (2000). Anthelminthic efficacy of some plants used in ethnoveterinary practices in the Arid zone of North Eastern Nigeia. RGA No. 28 project Report.

Saxena MJ (2001). Relevance of herbs in improving health index of livestock animals. Proceedings of 38th congress of Nigeria. Vet. Med. Assoc. pp. 14-16.