Effects of *Erythrina senegalensis* Aqueous Leaf Extract in Rats

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Abstract

The effect of treatment with leaf extract of *Erythrina senegalensis* was studied in male albino rats. Rats were investigated on the oral acute and subacute (4weeks) toxicity of the extract. The acute oral toxicity (LD_{50}) of the extract was determined to be > 4000mg/kg. Administration of the extract at 0, 50, 150 and 300mg/kg for 4weeks had no effect on rat serum transaminases, total bilirubin, total protein, total albumin, globuins, A/G ratio, blood urea nitrogen, creatinine, lipid profile, hematological parameters, and body and organ weights. This suggests that *Erythrina senegalensis* aqueous leaf extract has low toxicity in rats, especially when administered orally.

Keywords: *Erythrina senegalensis;Leaf extract;Toxicity;Rat*

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INTRODUCTION

Medicinal plants have been widely used as therapeutic options for the treatment of many human illnesses. Most of these plants are use routinely without consideration of their safety largely due perhaps to their long history of application and availability in local communities. However, literature on the safety of these medicinal plants is usually inadequate or unavailable.

Erythrina senegalensis DC (Fabaceae) is a thorny shrub or small tree with common names that include coral tree (English) and minjirya (Hausa, Nigeria). The stem and root bark are used by traditional healers to cure wide range of illnesses (Adamu *et al*., 2005;Togola *et al.*, 2008; Kone *et al.*, 2011). The leaves are used to treat malaria, gastrointestinal disorders, fever, dizziness, secondary sterility, diarrhea, jaundice, nose bleeding and pain (Togola *et al.*, 2008).

The stem bark extract has been shown to have antimicrobial activity against *Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Aspergillus flavus, Aspergillus fumigatus, Candida albicans, Penicillium notatum* (Doughari, 2010) and inhibitory activity against HIV-1 protease (Lee *et al.*, 2009). The root ethanol extract exhibited strong activity against *Plasmodium falciparum* (Atindehou *et al.*, 2004). The stem bark has been shown to have hepatoprotective properties (Donfack *et al.*, 2008). In contrast, intrapretorial administration of the stem bark demonstrated toxic effects on liver and heart, and hematoxicity in mice with an LD_{50} of 526mg/kg (Udem *et al.*, 2010).

Phytochemicals such as tannins, glycosides, alkaloids, cardiac glycosides, prenylated isoflavones and flavones have also been identified in the *E.senegalensis* stem bark (Wandji *et al.*, 1994; Oh *et al.*, 1999; Doughari, 2010). The leaf has also been shown to contain many phytochemicals (Bako and Madu, 2007). Although appreciable data has been reported on the stem and root bark, little is known about the leaf extract. In this study, we evaluated the effect of *Erythrina senegalensis* aqueous leaf extract orally administered in rats.

MATERIALS AND METHODS

Sample Collection and Preparation

Fresh mature leaf samples of *Erythrina senegalensis* collected from Dimkusum village, Jada local government area of Adamawa state, Nigeria. The plant was identified at the department of forestry, Modibbo Adamawa University of Technology Yola, Nigeria. The fresh leaf samples were dried at room temperature and pulverized to dry powder using pestle and mortar. About 100g of the powdered material was macerated in 500mls of distilled water over 12 hours and

filtered using Watman No.1filter paper. The filtrate was evaporated to dryness at 50°C on a water bath.

Animals

Male albino Wister rats weighing 140-160g were obtained from National Veterinary and Research Institute (NVRI) Vom, Jos, Plateau State, Nigeria.The rats were acclimatized for one week, kept in plastic cages at room temperature and fed pelleted diet (Grand Cereal Limited, Jos, Nigeria) and water *ad libitum* throughout the experimental period.

Experimental Design and animal treatment

Acute toxicity studies

The acute toxicity of the extract was determined using the method described by Lorke (1983). Briefly, four groups of male albino rats were dosed orally with *Erythrina senegalensis* aqueous leaf extract at dose levels of 500, 1000, 2000 and 4000mg/kg body weight. The animals were observed for mortality, body weight, clinical signs and gross pathological changes through day 14.

Subchronic toxicity studies

Twenty male albino rats were divided into 4groups (5rats/group) and administered aqueous leaf extract of *Erythrina senegalensis* at 0 (control), 50, 150 and 300mg/kg body weight daily for 4weeks. Clinical signs and general appearance were observed once a day, and body weights were measured once a week. After 4weeks of treatment, the rasts were fasted over night and sacrificed under diethyl-ether anesthesia. Blood samples were collected through cardiac puncture for the determination of biochemical and hematological parameters. Serum AST, ALT, ALP, AST, total bilirubin, total protein, albumin, globulins, urea, creatinine, triglycerides, total cholesterol, HDL and LDL were determined using kits purchased from Randox laboratories Co. Antrium, UK. Plasma samples were obtained for the determination of packed cell volume, white blood cell and red blood cells counts. In addition, body weight gain, absolute liver and kidney weights and albumin/globulin ratio (A/G) were also calculated.

Statistical analysis

All results were expressed as the mean ± standard error for five replicates. Statistical analysis of variance was carried out using one way ANOVA (SPSS 16.0). A value of $p< 0.05$ was used as the level of significance.

RESULTS

No mortality or clinical signs were observed in any of the animal groups administered the leaf extract at dose levels of up to 4000mg/kg body weight. Final necropsy revealed no apparent changes. *Table 1* shows the effect of *Erythrina senegalensis* aqueous leaf extract on body and organ weights of rats. There was no significant ($p> 0.05$) change in absolute liver and kidney weights between treated and control animals. However, treated animals had slight lower body weight gains when compared with the control.

Table 2 show the effect of *Erythrina senegalensis* aqueous leaf extract on some biochemical parameters in rats. There was no significant ($p> 0.05$) changes in serum AST, ALT, ALP, total bilirubin, total protein, total albumin, globulins, A/G ratio, total cholesterol, triglycerides, high density lipoprotein (HDL), low density lipoproteins (LDL), white blood cell (WBC), red blood cells (RBC) and packed cell volume (PCV) between treated and control animals.

Table 1: Effect of *Erythrina senegalensis* aqueous leaf extract on rat body and organ weights

Dose (mg/kg)	Final body weight (g)	Body weight gain (%)	Absolute Organ Weight (g)	
			Liver	Kidney
Control	208.13 ± 4.51	60.40	5.56 ± 0.38	0.90 ± 0.04
50	214.41 ± 6.11	58.14	4.58 ± 0.27	0.76 ± 0.02
150	207.23 ± 3.32	56.50	4.88 ± 0.53	0.72 ± 0.05
300	204.61 ± 5.71	55.10	4.26 ± 0.19	0.86 ± 0.03

Values are expressed as mean ±S.E.M, n=5

Table 2: Effects of Oral Administration of *Erythrina senegalensis* on some biochemical and hematological parameters

Parameters	Dose (mg/kg body weight)			
	Control	50	150	300
AST (U/l)	44.4 ± 6.23	48.1 ± 5.90	52.4 ± 7.33	56.1 ± 4.90
ALT (U/l)	18.4 ± 1.43	17.5 ± 1.38	19.4 ± 1.12	22.8 ± 1.66
ALP (U/l)	23.7 ± 6.02	22.9 ± 2.84	21.1 ± 2.84	23.9 ± 1.52
Total Bilirubin (µmol/l)	26.9 ± 2.82	35.1 ± 2.33	35.7 ± 2.22	35.9 ± 2.49
Total Protein (g/l)	56.8 ± 1.73	58.7 ± 3.95	58.4 ± 2.16	57.4 ± 1.85
Total albumin (g/l)	18.6 ± 0.64	19.5 ± 0.93	18.2 ± 0.47	18.2 ± 0.69
Globulins (g/l)	38.1 ± 1.84	39.2 ± 3.61	40.2 ± 2.30	39.2 ± 1.54
A/G	0.49 ± 0.03	0.49 ± 0.03	0.46 ± 0.03	0.46 ± 0.02
Urea (mmo/l)	6.25 ± 0.28	7.60 ± 0.77	8.54 ± 0.21	6.52 ± 0.34
Creatinine (mmo/l)	4.21 ± 1.01	4.08 ± 1.45	3.68 ± 1.40	4.85 ± 2.09
Triglycerides (mg/dl)	67.3 ± 4.51	62.6 ± 5.85	74.8 ± 4.03	65.7 ± 4.47
Total Cholesterol (mg/dl)	66.2 ± 4.65	73.1 ± 3.50	75.8 ± 4.86	71.7 ± 5.58
HDL (mg/dl)	36.2 ± 4.48	36.2 ± 2.71	31.9 ± 3.03	39.2 ± 2.27
LDL (mg/dl)	39.2 ± 2.27	23.5 ± 4.35	27.1 ± 5.79	41.8 ± 4.39
WBC (10^9/L)	1.25 ± 4.17	1.16 ± 3.79	1.26 ± 4.69	1.12 ± 4.04
RBC (10^9/L)	4.19 ± 4.14	5.20 ± 4.81	6.54 ± 2.98	5.66 ± 2.15
PCV (%)	43.1 ± 3.44	37.6 ± 3.90	38.4 ± 3.89	41.8 ± 4.39

Values are expressed as mean S.E. M, n=5;

AST, Aspartate aminotransferase; ALT, Alanine aminotransferase; ALP, Alkaline phosphatase; A/G, Albumin/globulin ratio; HDL, High density lipoproteins; LDL, Low density lipoproteins; WBC, White blood cell counts; Red blood cell counts; PCV, Packed cell volume.

DISCUSSION

The oral administration of 4000mg/kg of the extract did not produce any sign of acute toxicity or instant death in any of the rats treated with acute dose during the observation period. This suggests that the median lethal dose (LD_{50}) of the extract is greater than 4000mg/kg. The fact that the LD_{50} of the extract is above 4000mg/kg is an indication that the extract could be considered safe, especially when given orally (ECETOC, 1985).

However, administration of *Erythrina senegalensis* leaf extract in rats resulted in non-significant decreases in body weight gain. This however, was considered as having no toxicological relevance since the magnitude of decrease was minimal.

Biochemical and hematological parameters were also comparable in all the groups. The lack of significant changes in these parameters shows that administration of the extract has no effect on liver, kidney and lipid profile of rats especially at the present dose levels. This claim is strengthened by the observation that the absolute liver and kidney weights were not also seriously affected.

Previous reports on other parts of *Erythrina senegalensis* indicated similar results. For instance, literature data confirms the hepatoprotective potentials and oral low toxicity of the root and stem bark extract of the plant which was largely associated with the presence of flovonoids and allied substances (Donfack *et al.,* 2008), Wandji *et al.,* 1994; Oh *et al.,* 1999; Doughari, 2010). These findings tend to suggest that the therapeutic use of *E.senegalensis* leaf may be of no safety concern especially when administered orally in moderate doses. We concluded that there were no toxic changes related to the administration of *Erythrina senegalensis* aqueous leaf extract in rats.

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