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Full Length Research Paper

Toxicity studies of ethanol extract of the leaves of *Datura stramonium* in rats

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The effect of administration of ethanol extract of the leaves of *Datura stramonium* on some serum biochemical parameters was studied in rats to establish its safety. 50 mg/kg and 200 mg/kg doses of the extract were administered to the rats for five weeks. Parameters studied were the indices of liver and kidney function and some biochemical and hematological parameters. Feed intake, final body weight, serum AST, ALT, bilirubin, total protein, urea and the electrolytes studied were all not affected by the extract administration. Serum creatinine levels were however significantly raised in the rats administered the 200 mg/kg body weight ethanol extract. The biochemical and hematological parameters studied were also not affected. Administration of the extract for the five weeks period did not therefore establish its complete safety.

Key word: *Datura stramonium*, liver/kidney function.

INTRODUCTION

The potentials of *Datura stramonium* (Solanacea) (Jimson weed) as a traditional herb are well documented. The widely reported medicinal uses include the use of the dried leaves of the plant as an anti-asthmatic agent (John, 1984; Sezik et al., 1992; De Foe and Senatore, 1993). Mixture of the leaves and seeds taken orally as a decoction or smoke is also used as a cure for the asthma (Hirschmann et al., 1990). Aqueous extract of the seeds are reported to be used in the treatment of gastric pains and indigestion (Bhattarai, 1993). Other reported medicinal uses of the plant are its anti-inflammatory property of all part of the plants (Spring, 1989), stimulation of central nervous system (CNS) (Guharov and Barajas, 1991; Manandhar, 1995), respiratory decongestion (Zagari, 1992), treatment of dental and skin infections (John, 1984; Darias et al., 1986; De Foe and Senatore, 1993) and also in the treatment of toothache (Abebe, 1986) and allopecia (John, 1984).

D. stramonium is a shrub of Asian origin that is naturalized in waste places in West Africa. Locally the plant is known as 'Haukata Yaro' in Hausa, 'Zakedi' in Kanuri and 'Apikan' in Yoruba. Phyotochemicals detected in the plant are the alkaloids atropine and scopolamine (Giral and Hidalgo, 1983), carotenes and coumarines (El-Tawil, 1983), saponins (Aynehchi et al., 1985) and steroidal saponins (Modawi et al., 1985).

The use of the leaves and seeds locally in the treatment of ailments like common cold, headache and asthma and the lack of information on the possible toxicological potentials of extracts from different parts of the plant on the animal system informed studies involving part of the plant. The possible hepato/nephrotoxicity of the aqueous extract of the seeds (Gidado et al., 2001) of the plant has been reported. The present study is aimed at investigating the toxicity of the ethanol extract of the leaves of *D. stramomium* on some indices of liver and kidney function and some serum biochemical parameters in rats.

MATERIALS AND METHODS

Plant

Part of the plant used for the study was the leaves. They were collected between the months of April and June in Maiduguri Metropolis and identified by a botanist in the Department of Biological Sciences, University of Maiduguri.

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Table 1. Effect of administration of ethanol extract of the leaves of *Datura stramonium* on final body weight change, feed intake and some indices of liver and kidney function in rats for five weeks.

Parameters	1 (0)*	II (50 mg/kg)*	III (200 mg/kg)*
Body weight change (g)	30.64±5.95	34.70±9.89	32.90±7.65
Feed intake (g/100g/day)	8.63±0.53	8.75±0.93	7.93±0.45
AST (i.u/L)	43.95±2.53	42.04±1.92	44.40±1.66
ALT (i.u/L)	40.60±3.24	50.90±9.28	43.50±0.67
Total billirubin (µmol/L)	1.24±0.22	0.93±0.02	1.55±0.44
Urea (mMol/L)	11.57±0.60	12.92±0.68	12.11±0.34
Creatinine (mMol/L)	36.00±2.80[a]	34.00±1.83[a]	46.50±1.50[b]
Na^+ (mMol/L)	141.00±14.60	142.00±10.07	156.00±3.65
K^+ (mMol/L)	5.95±0.49	6.15±0.50	5.00±0.40
Cl^- (mMol/L)	97.00±21.82	114.00±21.82	117.50±13.05
HCO_3^- (mMol/L)	26. 50 ± 2.22	27.00 ±5.00	28.50±2.96

Results are presented as Mean ± SEM (n=5).
[a,b]Results with different superscripts on the same horizontal row are significantly different (P<0.05).
*Values in parenthesis are dose (mg/kg) of extract administered to a group daily.

Animals

White wistar strain Albino rats of both sexes, weighing averagely 150 g were used for the study. The rats were purchased from the Animal House, Department of Biochemistry, University of Maiduguri. They were allowed free access to drinking water and standard diet (ECWA feeds, Jos, Nigeria).

Extract preparation

The fresh leaves of the plant collected were sun dried and processed into fine powder by many rounds of grinding and sieving. 250 g of the fine powder was extracted with 60% ethanol using a soxhlet extractor. The percentage recovery was calculated to be 13%w/w.

Experimental Design

A total of 15 rats were used. They were divided into 3 groups. Group I served as control while groups II and III served as experimental groups. The controls were administered normal saline while the experimental groups were daily administered 50 mg/kg and 200 mg/kg body weight of the extract respectively for five weeks. The extract was administered to the rats intragastrically using a BMI feeding tube.

Sampling

Body weight changes and daily feed intake were monitored in the rats until termination of the experiment. Haematological parameters-PCV and Hb, and blood glucose were assayed 24 h before the last treatment.

The rats were sacrificed 24 h after the last treatment, blood collected in clean and dry centrifuge tubes. The blood was allowed to clot and serum harvested. The serum was used to assay the following parameters: aspartate transaminase (AST), alanine transaminase (ALT), bilirubin, total protein, urea, creatinine, serum electrolytes and cholesterol.

Analysis

Serum alanine (ALT) and aspartate (AST) transaminases were assayed colorimentrically by the method of Reitman and Frankel, (1957). The sulphanilic reaction, diacetylmonoxime reaction and Jaffe's reaction as described by Kaplan et al. (1988) were used in assaying total bilirubin, urea and creatinine respectively. Serum total protein was estimated by the biuret reaction (Henry et al., 1974), while chloride and bicarbonate by titrimeric method as described by Harold (1988). Sodium and potassium levels were estimated by flame photometric method. The Drabskin method as described by Schalm et al. (1975) was used for the estimation of haemoglobin. For PCV, microhaematocrit method of Coles (1974) was used.

Statistical analysis

Data collected were summarized as Mean ± SEM. Differences between individual groups were assessed by the students' t-test. A p-value less or equal to 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

The effect of administration of ethanol extract of the leaves of *D. stramonium* on body weight changes, feed intake and indices of liver and kidney function is presented in Table 1. The body weight change and feed intake were not significantly affected by the extract administration. The body weight changes in the experimental groups were however slightly higher than the changes observed in the control group. Indices of liver function (AST, ALT and total bilirubin) were also not increase by the extract following five weeks of administration. The group administered 200 mg/kg extracts however produced the highest value of AST (44.40 ± 1.66) and bilirubin (1.55 ± 0.44) compared to the other two groups. For ALT, the group administered 50 mg/kg

Table 2. Effect of administration of ethanol extract of the leaves of *Datura stramonium* on some biochemical and haematological parameters in rats.

Parameters	1 (0)*	II (50 mg/kg)*	III (200 mg/kg)*
Glucose (mMol/L)	5.64±0.70	6.44±0.42	5.84±0.38
Cholesterol (mMol/L)	8.32±1.09	5.56±0.38	7.17±0.78
Total protein (g/L)	76.72±4.22	78.24±3.22	81.50±5.28
Haemoglobin (mMol/L)	10.88±0.62	11.00±0.60	11.20±0.30
PCV (%)	45.80±1.90	44.60±1.21	44.00±2.02

Results are presented as Mean ± SEM.
*Values in parenthesis are dose (mg/kg) of extract administered to a group daily. (N=5).

extract showed the highest increase.

Administration of 200 mg/kg ethanol extract of the leaves of *D stramonium* to the rats for five weeks resulted in a significant ($P<0.05$) increase in the creatinine levels when compared to the control and the group administered 50 mg/kg extract. The other indices of kidney function – urea, Na^+, K^+, Cl^- and HCO_3^- were not statistical affected by the extract. Table 2 showed the effect of administration of ethanol extract of the leaves of *D-stramonium* on some biochemical and haematological parameters is rats for five weeks. Glucose and protein levels were slightly increased in the experimental groups. The increases were however not significant. Cholesterol levels on the other hand were slightly decreased by the extract administration. The decrease was also not significant. Haematological parameters – Hb and PCV were also not significantly affected.

In our previous communication, we reported that administration of aqueous seed extracts of the plant at a higher dose produced significant increase in body weight change (Gidado et al., 2001). The present study showed no significant differences in both body weight changes and feed intake, suggesting that ethanol extract of the leaves of *D. stramonium* had no possible effect on body weight and nutrient utilization of the rats. AST, ALT and bilirubin (indicators of liver function) were not significantly raised in the rats at the doses administered. This suggests that ethanol extract at the doses used is not likely hepatotoxic.

Urea, Na^+, Cl^- and HCO^-_3 were all slightly increased in the experimental groups, however the increase in creatinine levels at the highest dose was significant ($P<0.05$). Since creatinine is one most important indicator of kidney function (Kaplan et al., 1988), the results suggests possible renal damage. The previous study had also suggested possible nephrotoxicity following the administration of the aqueous seed extract (Gidado et al., 2001). Glucose, cholesterol and total protein concentrations were not affected by the extract. Statistical analysis of the haematological parameters also indicates that the extracts had no significant effect.

In conclusion, the study did not establish the complete safety of the ethanol extract as administration of the extract for five weeks to rats may likely be nephrotoxic at higher doses.

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