

Toxicity of *Hibiscus trionum* in Male Nubian Goat's Kids

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ملخص البحث

أجريت هذه التجارب لدراسة التأثيرات السمية لنبات معروف محلياً بويكة الخلاء (*trionum* *Hibiscus*) في سخلان ذكور ماعز نوبية. خلطت براعم ويكة الخلاء (خضراء وجافة) بالماء ثم جرعت للماعز في شكل جرعات يومية كما يلي 10جم و 5 جرام و 2.5جرام و 1 جرام و 0.5 وجرام لكل كيلو جرام من الوزن الحي للحيوان.

أهم العلامات المرضية لهذا التسمم هي فقدان الشهية، سيلان اللعاب، وألم في الجهاز الهضمي، أنين، إسهال، ضعف في الأرجل الخلفية ثم عدم الحركة والنفوق. الأوقات المرضية الواضحة هي نزف في القلب والرئة والكلبي مع التهاب في الغشاء المخاطي للمعدة، وتغيرات دهنيه ونخز في الكبد مع قصور كفاءة وظائف الكبد وتدنى في كل من البروتين والكالسيوم والمغنسيوم وزيادة في تركيز النشادر في مصل الدم وزيادة نشاط الانزيمات.

Summary

Twenty eight Nubian goat's kids were drenched with *Hibiscus trionum* green and dry shoots mixed in water at doses of 10, 5, 2.5, 1 and 0.5g per kg live bodyweight. Clinical signs induced were inappetence, salivation, abdominal pain, diarrhoea, weakness of the hind limbs and recumbency. Death occurred between six and 17 days after dosing. The prominent pathological changes included haemorrhages in the heart, kidney and lungs, catarrhal enteritis, hepatic fatty changes and necrosis, atrophy of the cardiac fat and oedema of the renal pelvis. Analysis of sera revealed increased ammonia concentration and the activity of the enzyme AST, while a decrease in total proteins, calcium and magnesium was recorded.

Introduction

Hibiscus trionum (Malvaceae) is known in the Sudan as "Waikat Alkhala". The plant is widely distributed in northern and central Sudan (Andrews, 1956). *Hibiscus trionum* is suspected of causing poisoning in animals (Adam *et al*, 1980). However, this observation has not been confirmed experimentally.

This study was planned to investigate the toxicity of *Hibiscus trionum* by the assessment of the clinico-pathological changes induced by drenching Nubian goat's kids with fresh or dry plant shoots.

Materials and Methods

Experimental Animals:

Twenty-eight male Nubian goat's kids, 6-8-month-old purchased from Khartoum North were used in the study. They were kept at the premises of Faculty of Veterinary Medicine, University of Khartoum and fed on Lucerne and watered *ad libitum*. *Hibiscus trionum* fresh shoot was collected from Shambat, Khartoum North, minced and mixed with water.

Experimental design:

The kids were divided into seven groups, each of four kids. Group 1 was left as untreated control. Fresh green shoots of *Hibiscus* was given to kids in repeated daily oral doses of 10 g/kg (group 2), 5 g/kg (groups 3), 2.5 g/kg (group 4), 1 g/kg (group 5), 0.5 g/kg (group 6) and the dried shoot of *Hibiscus* was given in repeated daily oral doses of 5g/kg to group 7 kids. All kids were bled from the jugular vein before dosing was commenced and every three days thereafter.

Haematology:

Blood samples were examined for haemoglobin concentration (Hb), total red blood cells (RBCs), white blood cells (WBCs) counts and differential leucocyte counts percent, packed cell volume (PCV), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) according to Schalm *et al* (1975).

Biochemical analysis:

Blood samples were taken in plain vacutainers and sera were separated and stored at -20°C until used. Sera were analyzed for the activities of aspartate aminotransferase (AST) and alanine-aminotransferase (ALT) according to Reitman and Frankel (1957) and the concentration of total protein by kits (Randax laboratories, UK). Serum ammonia was conducted according to Varely (1967), calcium and magnesium according to Frankel and Reitman, (1963) and serum creatinine by kits, Jaffe reaction (Fabing and Erthinghausen, 1971).

Pathological examinations:

All goat's kids were necropsied immediately after death or slaughter. Portions of liver, kidney, intestine, rumen, reticulum, omasum, abomasum, spleen, lung and heart were fixed in 10% formalin, embedded in paraffin wax, sectioned at 6 µm thick and stained with haematoxylin and eosin (H and E).

Statistical analysis:

Data analysed by ANOVA using the general linear models procedure of the SAS institute (1994).

Results

Details of the experimental kids, the dose of *H. trionum* and time of death are given in Table 1.

Clinical signs:

The prominent signs appeared in all male goat's kids of group, 2, 3, 4, 5 and 6 were diarrhoea, salivation, anorexia, dyspnoea, ataxia, and recumbancy. Control kids showed no clinical signs.

Haematological indices:

Goat's kids of all groups showed approximately similar hematological changes. There was a decrease in the values of Hb, RBCs, PCV and MCV, however, MCHC values did not show significant changes ($P > 0.5$). There were no significant changes in the total or differential leucocytes counts of all experimental animals.

Biochemical findings:

These data are presented in Table 2. None of the kids that had received fresh or dry *Hibiscus* shoots at any dose rate showed a significant change ($P > 0.5$) in serum ALT activity or creatinine concentration all through the experimental period. The activity of AST and concentration of ammonia were significantly higher ($P < 0.05$) in the kids of all treated groups than those of the control group. The concentration of total protein, calcium and magnesium decreased significantly in all treated groups ($P < 0.05$). There were no significant changes ($P > 0.05$) in the concentrations of serum constituents of the control animals.

Gross Pathology:

Necropsy findings included extensive haemorrhages in the liver, kidneys, heart and lungs, patches of severe catarrhal enteritis, intestinal ulcerations, pulmonary congestion, hepatic fatty changes and necrosis. Oedema of the renal pelvis and small amount of straw-coloured hydropericardium and hydrothorax were seen. No lesions were observed in control kids (group 1).

Histopathology:

There was catarrhal enteritis associated with infiltration of mononuclear cells and a few polymorphonuclear cells in the intestinal lamina propria (Fig. 1). Kidneys showed degeneration and necrosis of the renal tubules (Fig. 2). There was fatty changes and isolated cell necrosis. Congestion and haemorrhages were detected in the heart and lungs.

Discussion

The results of this study indicate that *H. trionum* (fresh or dry shoots) is toxic to male Nubian goat's kids. The kids that received 10, 5, 2.5, 1 and 0.5g / kg fresh shoots or 5g / kg b.wt / day dry shoots of the plant died within 6-17 days of dosing.

Table 1: Number and age of male Nubian goat's kids, daily dosed with *Hibiscus trionum* shoots, time between dosing, onset of

Group	No. of animals	Age (month)	Daily dose (g/kg b.wt)	Prepatent Period (day)	Course of Illness (day)	No. slaughtered
1	4	6-8	Nil	-	17	4
2	4	6-7	10(Fresh shoots)	12-20	4 -14	-
3	4	6-8	5(Fresh shoots)	20-24	12-14	-
4	4	6-8	2.5(Fresh hoots)	18-48	11-14	-
5	4	6-8	1(Fresh shoots)	24-48	7-16	-
6	4	6-8	0.5(Fresh shoots)	48-72	10-17	-
7	4	6-8	5 (dry shoots)	48	7-14	-

disease and death or slaughter.

Table 2: Serum constituent's concentrations in Nubian Male goats orally dosed with *Hibiscus trionum* shoots.

Parameters	Pre dosing values	Controls	10 g/kg fresh shoots/ day	5 g/kg fresh shoots/ day	2.5 g/kg fresh shoots/day	1 g/kg fresh shoots/day	0.5 g/kg fresh shoots/ day	5 g/kg dry shoot/day
AST(IU)	24±2.5 ^c	23.8±0.6 ^c	60.5±0.7 ^a	58±0.9 ^a	55.7±0.3 ^a	59±0.6 ^a	56±0.7 ^a	60.3±0.7 ^a
ALT (IU)	16.8±0.7 ^a	15.5±0.7 ^a	16.1±0.4 ^a	15.8±0.4 ^a	16.2±0.7 ^a	15.5±0.6 ^a	15.5±0.4 ^a	14.9±0.8 ^a
Total proteins g/dL	7.2±0.8 ^a	6.9±0.8 ^a	5.9±0.6 ^c	5.7±0.7 ^c	5.6±0.5 ^c	5.8±0.4 ^c	5.6±0.5 ^c	5.4±0.8 ^a
Creatinine (mg/dL)	0.4±0.7 ^a	0.46±0.5 ^a	0.38±0.6 ^a	0.35±0.7 ^a	0.4±0.5 ^a	0.38±0.2 ^a	0.36±0.7 ^a	0.4±0.2 ^a
Ammonia (mg/dL)	15±0.8 ^c	16.3±0.6 ^c	25.9±0.6 ^a	25.1±0.7 ^a	25.6±0.7 ^a	24.9±0.5 ^a	25.1±0.3 ^a	25.5±0.7
Calcium (mg/dL)	2.6±0.4 ^a	2.8±0.6 ^a	0.9±0.5 ^c	1.2±0.4 ^c	1.5±0.2 ^c	1.2±0.6 ^c	1.3±0.3 ^a	0.96±0.4 ^c
Magnesium (mg/dL)	1.6±0.8 ^a	1.9±0.5 ^a	0.86±0.7 ^c	0.59±0.2 ^c	0.48±0.7 ^a	0.38±0.7 ^c	0.25±0.6 ^c	0.26±0.7 ^c

*Values are expressed in mean ± S.E.; Means within rows with no common letters (a-c) differ significantly ($P < 0.05$).

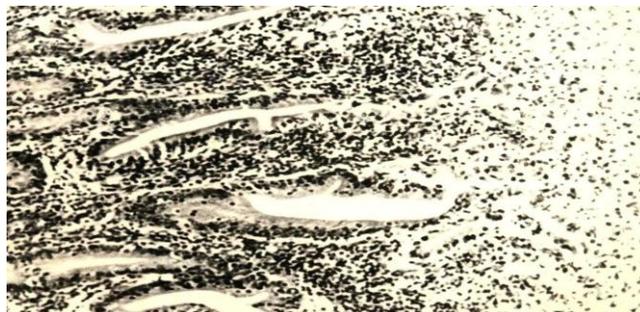


Fig. 1: Nubian Goat's kid orally dosed with 5 mg/kg/b.wt/day of fresh *Hibiscus trionum* shoots for 12 successive days. Note Catarrhal enteritis (H& E X 100).

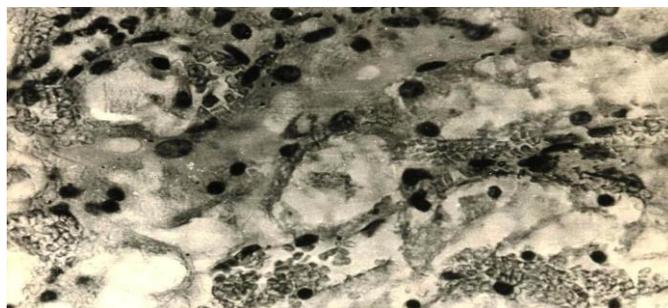


Fig. 2: Kidney: Degeneration and necrosis of the renal tubules cells of a goat orally dosed with 5mg/kg/day of fresh *Hibiscus trionum* shoots for 12 days (H& E X 400).

The main signs of *H. trionum* toxicity in goats were diarrhoea, dyspnoea, inappetence, depression and loss of condition. Diarrhoea may be a consequence of enteritis and intestinal ulcerations. This was also detected in goats fed with *Jatropha curcas* seeds (Ahmed and Adam, 1979a, b; Onsa *et al*, 2001). The development of dyspnoea may be due to pulmonary congestion and haemorrhages. The damages to the liver, intestine and kidneys may explain the loss of condition in *Hibiscus* intoxicated kids and this is in agreement with Ibrahim *et al* (1992).

The hematological changes were dominated by decrease in Hb%, PCV and RBCs counts in *Hibiscus trionum*-drenched goats which may be attributed to liver and kidneys damage (Raja, 2001).

The damage to the liver and kidneys probably had contributed to the rise in serum ammonia. It is also possible that the subsequent increase in blood urea nitrogen content had resulted in entering of an increased amount of urea in the intestinal lumen where it was converted into

ammonia by enteric bacterial urease. Ammonia is absorbed into the portal circulation and is transported to the liver (Nelson and Seligson, 1953; Cornelius and Kaneko, 1963). However, feeding of *H. trionum* to goats did not cause an increase in the urinary output, which is similar to the findings of other investigators (Barri et al, 1983; Onsa et al., 2001; Abdelgadir et al, (2003).

The increased activity of serum AST and the reduction in serum total proteins concentration may indicate hepatic insufficiency in *H. trionum* fed goats (Raja, 2001). Lack of increase in ALT activity may suggest a minimal damage to muscle tissues (Ahmed and Adam, 1980; Haroun et al, 1995; Abdel Gadir et al, 2003). Moreover, the decrease in serum calcium concentration is probably brought about by a lowered absorption of calcium from the alimentary tract (Barri et al, 1983).

It seems reasonable to conclude that fresh or sun-dried *H. trionum* is toxic to male Nubian goat's kids by producing structural and functional changes in a number of organs of the body. Further studies, however, are needed to make extractions from the different parts of this plant to analyze, identify and characterize its active ingredients. By then it could be possible to clarify the mechanisms responsible for the induction of such clinical manifestation and histopathological changes.

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