

Toxicity of Crude *Balanites aegyptiaca* Seed Oil in Rats

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Abstract: *Balanites aegyptiaca* seed oil has been used in Nigeria as ingredient and substitute to groundnut oil in the preparation of local foods. A four week repeated dose toxicity study of crude *Balanites aegyptiaca* seed oil was performed on male Wister strain rats. The rats were divided into four groups consisting of five animals each and fed diet containing 0, 0.5, 1 and 5% crude *Balanites aegyptiaca* seed oil. Result showed no significant ($p > 0.05$) changes in AST and ALT, except in the 5% group where ALT activity was elevated. No significant ($p > 0.05$) changes in serum total protein, albumin, A/G ratio, serum urea, creatinine, mean final body weight, food consumption and relative liver and kidney weight were observed. The results showed that dietary exposure of crude *Balanites aegyptiaca* seed oil in rats did not result in marked changes in the toxicological parameters been assayed. Thus, consumption of the crude oil at the present level of exposure may be of no serious safety concern, especially on liver and kidney injury [The Journal of American Science 2009;5(6):13-16].(ISSN:1545-1003).

KEYWORDS: *Balanites aegyptiaca* ;seed oil; toxicity; rat

1.0 Introduction

Balanites aegyptiaca (L.)Del., is a perennial tropical plant used in food preparations and herbal medicine, especially in Africa and some developing countries. It is also called desert date (English), adua (Hausa, Nigeria), tanni (Fulfulde, Nigeria) and heglig (Arabic). *Balanites aegyptiaca* belongs to the family *Balaniteceae*. The plant attains a height of more than 6 meters. It has a multiplicity of uses and almost every part of the plant is useful including, leaves, thorns, back of root and fruit. *Balanites aegyptiaca* is used to treat so many illnesses including, laxative, diarrhoea, hemorrhoid, stomach aches, jaundice, yellow fever, syphilis and epilepsy (Ojo *et al.*, 2006). For instance, the fruit is used to treat liver disease and as a purgative and sucked by schools children as a confectionary in some countries (Barley, 1962 and Croach, 1962). The bark is used in the treatment of syphilis, round worm infections and as a fish poison. The aqueous extract and saponins isolated from its kernel cakes have a potent larvicidal activity (Zarroug *et al.*, 1988) and anti bacterial activity (Bashir *et al.*, 1984 and Doughari *et al.*, 2007).

Studies conducted elsewhere on some parts of the plant indicated the presence of many flavanoids, saponins and other important phytochemicals (Maksoud and Al-Hadidi, 1988).The alcoholic extract of the pulp and kernel contained sterols, terpenes and saponins as predominant compounds where as tannins, alkaloids and resins where found in slightly small amount (Abdel-Rahi *et al.*, 1986).

In Nigeria, the seed oil obtained from *Balanites aegyptiaca* has been used especially in the Northern part, as substitute to groundnut oil which is usually relatively expensive. The oil is used for frying food and adding flavor to the food. It is also used to add flavor to tea. This is in addition to medicinal uses such as treatment of skin disease and rheumatism. Despite such wide spread use, there is limited literature on the possible effects of long term consumption of the oil. This study attempts to evaluate the toxicity of the oil after dietary exposure in rats for four weeks.

2.0 Materials and Methods

2.1 Collection of *Balanites aegyptiaca* seeds and extraction of the oil

Balanites aegyptiaca seeds were collected from around Yola-Numan road, Adamawa state, Nigeria and were air dried in shade.

The crude *Balanites aegyptiaca* seed oil was extracted using the traditional method for extraction of vegetable oils (Balami *et al.*, 2004) with little modifications. Briefly, the dried seeds were shelled to obtain the kernel and grilled with intermittent stirring for five (5) minutes. The kernels were allowed to cool and pounded to paste using mortar and pestle. Some little amount of boiling water was added and stirred until oil separates from the cake. The crude oil was decanted and heated to reduce the moisture.

The percentage yield of the crude oil from the seeds was 29.6%. Refractive index was determined using Abbe refractometer and found to be 1.457. The specific gravity of the oil was determined (Oladele and Oshodi, 2008) using density bottle at 28°C and found to be 0.918. The oil was stored in glass bottles and refrigerated until use.

2.2 Animals

Male Wister strain rats weighing 150±10g were obtained from the animal house unit of the National Veterinary Research Institute (NVRI) Vom, Jos, Nigeria. They were allowed to acclimatize for one week prior to the experiment. The animals were housed in plastic cages, in a well ventilated room at room temperature and have free access to water throughout the period of the experimentation. A commercial pelleted diet (Grand cereals Ltd., Jos, Nigeria) was used in the entire study.

2.3 Experimental design

From a total of 34 rats, 20 animals were selected and divided into four groups of five animals

each, so that the weight distribution within each group was similar and initial mean body weights were approximately equal. The remaining animals were excluded from the study.

The rats were fed crude *Balanites aegyptiaca* seed oil mixed in the diet at concentrations of 0, 0.5, 1, or 5% daily for four weeks. The diet containing the oil was prepared daily. Food intake was recorded weekly and body weights of animals were measured once a week. Rats were fasted overnight at the completion of the treatment period and blood collected by heart puncture under diethyl ether anesthesia for serum chemistry. ALT and AST were determined by the method of Reitman and Frankel (1957). Serum creatinine, urea, total protein, albumin, and globulins and albumin/globulin ratio (A/G) were also determined (Chawla, 1999).

2.4 Statistical analysis

Results were presented as Mean and Standard error (Mean ± S.E), n=5. The significance between the control and each of the oil treated group was determined by Dunnett's test (Dunnett, 1955) after one-way ANOVA. The level of significance was set at p<0.05.

Table 1: Final body weight and food consumption of rats treated with crude *B.aegyptiaca* seed oil for four weeks

Dose group(%)	Final body weight(g)	Food consumption(g/rat/day)
0 (control)	275.31 ± 8.34	24.16± 2.93
0.5	275.75 ± 7.92	23.85± 3.35
1	277.25 ± 10.14	23.41± 2.58
5	276.75 ± 8.94	23.61± 3.13

Values are mean ± S.E., n=5

Table 2: Serum biochemical parameters in rats treated with crude *B.aegyptiaca* seed oil for four weeks

Dose group (%)	ALT (U/L)	AST (U/L)	UREA (mg/dl)	CREATININE (mg/dl)	TOTAL PROTEIN (g/dl)	ALBUMIN (g/dl)	ALBUMIN/GLOBULIN (A/G)
0 (control)	75.01±8.49	55.51±5.80	38.49±5.17	0.26±0.016	8.95± 0.7	5.76±0.5	1.8±0.2
0.5	78.75±9.29	56.12±6.37	37.09±6.78	0.27±0.018	9.12± 0.3	5.87±0.4	1.8±0.1
1	82.11±8.53	58.52±7.19	39.31±6.77	0.28±0.020	9.03± 0.3	5.85±0.6	1.7±0.1
5	91.12±9.61*	61.07±6.05	44.53±5.64	0.29±0.017	8.81±0.4	5.55±0.4	1.6±0.2

Values are Mean ± S.E., n=5

*Significantly different from control (p<0.05)

Table 3: Relative organ weights of rats treated with crude *B.aegyptiaca* seed oil for four weeks.

Dose group (%)	Relative organ weight (g/100g body weight)	
	Liver	Kidney
0 (control)	3.92 ± 0.19	0.76 ± 0.04
0.5	3.92 ± 0.14	0.75 ± 0.05
1	3.94 ± 0.16	0.74 ± 0.06
5	3.95 ± 0.21	0.78 ± 0.05

Values are Mean ± S.E., n=5

3.0 RESULTS AND DISCUSSION

3.1 Final body weight and food consumption

The results of changes in final body weight and food consumption of rats treated with crude *Balanites aegyptiaca* seed oil are presented in **Table 1**. There were no significant ($p > 0.05$) changes in final body weight and food consumption between control and treated groups. The effect of food consumption on body weight gain have already been studied (Coleman *et al.*, 1997, Hubert *et al.*, 2000 and Moriyama *et al.*, 2006). In the present study, no treatment related changes were observed in food consumption and final body weight of the animals, which may imply that consumption of the diet mixed with the oil, had no effect on rat appetite and cell injury.

3.2 Serum biochemical parameters

Table 2, shows the result of serum biochemical parameters in rats treated with crude *Balanites aegyptiaca* seed oil for four weeks. The result showed a dose dependent increase in serum ALT activity. Compared to rats fed with normal diet, serum ALT increased significantly ($p < 0.05$) in 5% treated group. No significant ($p > 0.05$) changes in serum total protein, albumin and A/G ratio were observed between the control and treated groups. Although, the elevated levels of ALT activity in the 5% treated group may indicate hepatotoxicity in rats, the absence of significant changes in other related indicators such as AST, total protein, albumin and A/G ratio may suggest that the hepatotoxic effect of the oil was mild. High levels of AST and ALT are usually present within hepatocytes and plasma levels rise as hepatocytes membrane integrity is disturbed

during hepatocellular cell injury (Kew, 2000 and Dobbs, 2003). Rise in the level of ALT is generally accompanied by significant elevation in the levels of AST which is not observed in the present work. This could partly explain the fact that the liver is not seriously affected by the crude oil. Both enzymes play important role in the conversion of amino acids to ketoacids and they are major markers of liver damage caused by exposure to toxic substances (Chawla, 1999). The changes in serum urea and creatinine were statistically insignificant ($p > 0.05$). These parameters are indicators of kidney injury and are elevated in renal toxicity (Chawla, 1999). Renal disease which deminishes glomerular filtration leads to urea and creatinine retention. The insignificant rise in serum urea and creatinine is suggestive of normal functional kidney.

3.3 Relative liver and kidney weights

The effect of administration of crude *Balanites aegyptiaca* seed oil on relative liver and kidney weights of rats are presented in **Table 3**. No statistical difference ($P > 0.05$) was observed in relative liver weights of the groups treated with the crude seed oil when compared with control animals. Also, treatments had no effect on relative kidney weights of the experimental rats. These further substantiate lack of serious toxic effect of the crude oil.

Conclusion

In conclusion, dietary exposure of crude *Balanites aegyptiaca* seed oil to rats did not show any toxicological concern but should be used with caution having indicated subtle hepatotoxic effects in the 5% treated group.

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