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Effects of aqueous seed extracts of *Mucuna sloanei* (Fabaceae) on body weight and some biochemical parameters of *Rattus norvegicus*

Ugwu, Godwin C.^{1*}, Ejere, Vincent C.¹, Okanya, Chinagorom L.¹, Omeje, Joy N.², Egbuji, Jude V.¹, Onu, Martina C.³ and Chukwuka, Christian O.¹

¹Department of Zoology and Environmental Biology, University of Nigeria, Nsukka, Enugu State, Nigeria.

²Department of Pharmacognosy and Environmental Medicine, University of Nigeria, Nsukka, Enugu State, Nigeria.

³Department of Veterinary Physiology and Pharmacology, University of Nigeria, Nsukka, Enugu State, Nigeria.

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Mucuna sloanei is an annual leguminous plant widely used among the various ethnic groups in Nigeria. The effects of aqueous *M. sloanei* seed extract on the body weight and some biochemical parameters of 48 normal male *Rattus norvegicus* (albino rats) were investigated for 28 days. The rats were divided into control group (A) which received distilled water and treatment groups (B, C and D) that received oral administration of 100, 200 and 400 mg/kg body weight of the seed extract, respectively. Each group was further divided into three replicates of four rats each. Blood samples were collected before the experiment started (week 0) and at weekly interval from one rat per replicate. The biochemical profiles were determined using bioassay. The lethal dose (LD₅₀) of the aqueous seed extracts of *M. sloanei* may be above 5000 mg/kg, since no death occurred at that dose. The overall change in body weights of treated rats did not differ significantly ($P>0.05$) from those of the control and were not dependent on treatment duration. However, there was a significant decrease ($P<0.05$) in alanine aminotransferase (ALT) level at the lowest dose of 100 mg/kg when compared with the control. Also, there was no significant difference ($P>0.05$) in the mean values of AST from weeks 1 to 4 when compared with the control except at the dose level of 400 mg/kg which showed a significant decrease ($P<0.05$) at week 4. Similarly, a significant decrease ($P<0.05$) was observed in the mean serum urea at the dose levels of 100 and 200 mg/kg and BUN at 200 and 400 mg/kg at week 1, and creatinine at dose levels of 200 and 400 mg/kg in the third week of administration when compared with the control. This study indicates that the aqueous *M. sloanei* seed extract could have some hepato and nephro-protective properties.

Key word: *Mucuna sloanei*, aqueous seed extracts, liver markers, kidney markers, albino rats.

INTRODUCTION

Mucuna sloanei, commonly called the 'Horse-eye' or 'Hamburger' bean, is an annual leguminous plant widely used among the various ethnic groups in Nigeria (Obute, 2010). It is known in various places as, 'ukpo' by the Ibos; 'karasuu' by the Hausas; 'yerepe' by the Yorubas (Nwosu, 2011) and 'ibabat' by the Efiks of Nigeria

(Obochi et al., 2007). The seeds are used as source of vegetable oil, condiment or thickener of soup by Igbo communities in sub-Saharan Africa (Afolabi et al., 1985; Ukachukwu et al., 2002). Ukachukwu and Obioha (1997) stated that some rural populations of Nigeria consume seeds of *M. sloanei* during the period of scarcity of other

common legumes. The *M. sloanei* seeds have protein, carbohydrate, crude fat and fiber contents (Akpata and Miachi, 2001) as well as a very rich amino acid content (Ojiako et al., 2012). They also contain many important bioactive substances such as L-3, 4-dihydroxyphenylalanine (L-DOPA) (Rai and Saidu, 1977; Adebowale et al., 2005), which has been reported to be a potent precursor of the brain neurotransmitter, dopamine (Hornykiewicz, 2002; Kostrzewa et al., 2005; Nagatsua and Sawadab, 2009). They have also been reported to contain important phytochemicals such as alkaloids, phytic acid, tannins, flavonoids, haemoglutin and oligosaccharides (Obute and Adubor, 2007). Similarly, lectin from *M. sloanei* seeds has been reported to have an effective and suitable cell receptor signal inducer due to its ability to agglutinate blood cells of humans, goat, cow and chicken (Obochi et al., 2007). Whereas the Efiks in Nigeria claim that the consumption of seeds of *M. sloanei* lowers libido in men (Obochi et al., 2007), a recent study has shown that the methanolic extract of *M. sloanei* seeds has positive effects on sex hormones and sperm count in males (Egwurugwu et al., 2012). Nutritional and anti-nutritional characteristics and metabolisable energy of *M. sloanei* seeds has also been reported (Ekwe et al., 2016). Ejere et al. (2015) evaluated the effects of aqueous extracts of *M. sloanei* seed on haematological parameters of normal Wistar rats and discovered that the plant seed has no harmful effects on the haematological parameters investigated.

Despite the aforementioned medicinal values of this important food condiment, there is paucity of information regarding its effects on liver and renal function of experimental animals as well as the possible risks associated with its consumption by humans. The present study was therefore initiated to provide information on the effects associated with the oral consumption of aqueous extracts of shade dried de-hulled *M. sloanei* (Fabaceae) on body weight and some biochemical profile of albino rats (*Rattus norvegicus*).

MATERIALS AND METHODS

Collection and preparation of *M. sloanei* crude seed extract

Dried and mature nuts of *M. sloanei* were purchased from local markets around Nsukka metropolis. The seeds were identified at the herbarium of the Department of Pharmacognosy and Environmental Medicine, University of Nigeria, and a voucher specimen (UN/PCOG/12/1164) was deposited in the same department. They were de-hulled, dried at room temperature and pulverized into fine powder using a milling machine. The method of extraction followed that of Akintayo et al. (2000). A total of 100 g of the powdered sample was introduced into 2000 ml flat bottom flask and 1500 ml of distilled water was added. The content was mixed

thoroughly and left for about 24 h with an occasional shaking to increase the extraction capacity. Thereafter, the soaked substance was filtered with a muslin cloth (number 60 mesh size) and concentrated to dryness. The solid extract was weighed and redissolved in normal saline according to the body weights of the animals for oral administration.

Procurement and management of experimental animals

Forty-eight adult male albino rats weighing 167.3 to 189.0 g were obtained from Genetics and Animal Breeding Laboratory of the Department of Zoology and Environmental Biology, University of Nigeria, Nsukka. The rats had no history of drug consumption. They were kept in stainless wire-rat cages equipped with drinkers and fecal collecting trays, in a clean and fly proof experimental animal house. The rats were fed commercial growers chick mash (18% crude protein) made by Vital Feeds Nigeria Limited and clean drinking water, and acclimatized for 14 days before the start of the experiment. All the animals were maintained under the standard laboratory condition for temperature, humidity and light throughout the experiment and were allowed free access to food and water. The fecal droppings in the tray were removed daily. The experimental rats were handled in strict compliance with international guidelines as prescribed by the Canadian Council on the Care and Use of Laboratory Animals in Biomedical Research (1984).

Experimental design

The procured rats were assigned into four groups (A, B, C and D) of 12 rats per group. Each group was further replicated 3 times comprising of 4 rats each. The rats in group A (Control) were fed normal rat feed and 1 ml/kg body weight of normal saline *ad libitum*. On the basis of the toxicity result, the treatment groups B, C and D were administered in addition to the normal rat feed and water, 100, 200 and 400 mg/kg body weight of the aqueous seed extract, respectively. All the doses were administered once daily orally for 28 days (four weeks) for all the groups using 1 ml syringe without needles.

Collection of blood sample

About 5 ml of the blood samples was collected from each of the anaesthetized rats using the retro orbital plexus as described by Hoff (2000) and allowed to clot for about 30 min and centrifuged at 2000 rpm for 10 min. This was done at baseline (Week 0) and at weekly intervals during treatment (weeks 1 to 4).

Determination of body weights

The body weights of the individual rats were determined before the beginning of the experiment (day 0) and subsequently during treatment before collection of blood samples on days 7, 14, 21 and 28 using an electronic balance (Mettler, PC 2000).

Determination of LD₅₀

This was determined according to the method of Lorke (1983). Three groups (A, B and C) of 3 mice each were used for this

*Corresponding author. E-mail: godwin.ugwu@unn.edu.ng. Tel: +234 8064005944.

Table 1. Effects of different treatments of the aqueous seed extract of *M. sloanei* on body weight, BW (g) of albino rats.

Concentrations (mg/kg)	Duration (days)				
	0	7	14	21	28
Control	181.7±11.85 ^{a1}	197.7±19.34 ^{a1}	213.0±16.09 ^{a1}	213.3±20.67 ^{a1}	244.7±21.06 ^{a1}
100	167.3±6.70 ^{a1}	185.0±11.59 ^{a1,2}	203.0±9.64 ^{a,2}	207±19.43 ^{a,2}	236.0±18.88 ^{a,3}
200	189.0±15.10 ^{a1}	227.0±32.90 ^{a1}	220.0±23.76 ^{a1}	234.3±17.03 ^{a1}	210.7±19.41 ^{a1}
400	181.3±16.37 ^{a1}	205.7±20.54 ^{a1}	218.7±23.92 ^{a1}	220.0±12.34 ^{a1}	236.0±32.30 ^{a1}

Values with different alphabetic (lower case) superscripts differ significantly ($P<0.05$) between different concentrations within the same exposure duration. Similarly, values with different numeric superscripts differ significantly ($P<0.05$) between different exposure periods within the same concentration.

experiment. The plant seed extract dissolved in normal saline (0.85 g/mol) was orally administered to the mice in doses of 1000, 3000 and 5000 mg/kg in groups A, B and C, respectively. The number of animals dead within 24 h after oral administration was recorded for each group. The lethal dose was calculated as the arithmetic mean of the dose that killed the least number of animals and the one next to lower dose that did not kill any animal.

Determination of biochemical parameters

Alanine transaminase (ALT) and aspartate aminotransferase (AST) activities were determined using the standard method described by Reitman and Frankel (1957). The blood urea, blood urea nitrogen (BUN) and creatinine (CREAT) levels were determined according to the methods of Weatherburn (1967), Bartels and Bohmer (1972) and Kaplan (1965), respectively.

Ethical approval

The experimental animals were handled in strict compliance with international guidelines as prescribed by the Canadian Council on the Care and Use of Laboratory Animals in Biomedical Research (1984).

Statistical analysis

Data accumulated was analyzed using the GENSTAT (VSN International, Hemel Hempstead, Herts, UK). One-way ANOVA was used to test the effect of treatment and two-way ANOVA was used to determine the interactive effects of treatment and duration. Fisher's least significant difference (F-LSD) was used in the separation of means of the different treatment groups. All results were expressed as mean $\pm$ standard error of mean (SEM), while values were considered significant at $P<0.05$.

RESULTS

Acute toxicity test

The oral LD₅₀ of the aqueous seed extract in the rats showed no mortality at the different doses of 1000, 3000 and 5000 mg/kg. However, in the rats administered 5000 mg/kg dose, physiological side reactions such as shivering, bulging of eyes and dullness were observed.

Effects of aqueous extracts of *M. sloanei* on body weight of albino rat

Table 1 shows the weekly effects of the seed extracts of *M. sloanei* on the body weight (BW) of the albino rats. There was no overall significant difference ($P>0.05$) in the BW of the treated rats when compared with the control. It was also observed that this non-significant difference ($P>0.05$) was independent of the dosage and duration of treatment. However, the body weights of the treated animals increased minimally from the value at day 0 as the duration of treatment increased, while that of the rats administered 100 mg/kg increased significantly ($P<0.05$) from days 14 to 28 when compared with the control.

Effects of aqueous extracts of *M. sloanei* on ALT and AST of albino rats

The results of the weekly effects of the aqueous seed extracts of *M. sloanei* on some hepatic enzymes of the albino rats are presented in Table 2. There was no significant difference ($P>0.05$) in overall dose and duration in the serum ALT and AST levels of the rats administered the various doses when compared with the control. However, wavelike variations were noticed in the serum activities of both enzymes among the dose levels in some weeks. Whereas the ALT serum levels of the rats administered 200 and 400mg/kg significantly increased ($P<0.05$) in days 21 and 28, the serum AST levels of the rats that received 200 and 400 mg/kg significantly decreased ($P<0.05$) in day 28 from the value in day 21 when compared with the control.

Effects of aqueous extracts of *M. sloanei* on kidney markers of albino rats

The results of the analyses carried out on the blood samples obtained from adult albino rats for the determination of urea, blood urea nitrogen (BUN) and creatinine levels before and on weekly intervals during the seed extract administration are shown in Table 3.

Table 2. Effects of different treatments of the aqueous seed extract of *M. sloanei* on ALT and AST of Albino rats on weekly basis.

Parameter	Treatment (mg/kg)	Duration (days)				
		0	7	14	21	28
ALT (U/L)	Control	41.3±3.32 ^{a1}	58.0±8.02 ^{a1}	65.0±4.73 ^{a1}	72.7±5.78 ^{a1}	87.7±5.36 ^{b1}
	100	49.9±7.51 ^{a1}	45.7±9.13 ^{ab1}	65.7±7.36 ^{a1}	62.7±6.77 ^{a1}	61.3±8.57 ^{a1}
	200	40.6±0.67 ^{a1}	39.7±5.67 ^{a1}	49.3±4.41 ^{a1}	89.3±7.54 ^{a2}	90.0±1.53 ^{b2}
	400	46.4±1.16 ^{a1}	65.7±8.41 ^{b1}	51.7±5.61 ^{a1}	77.7±11.68 ^{a2}	81.3±7.84 ^{ab2}
AST (U/L)	Control	11.93±1.17 ^{a1}	20.17±3.44 ^{a1}	24.43±0.47 ^{a1}	32.00±3.04 ^{a1}	40.67±9.24 ^{b1}
	100	19.13±0.32 ^{b1}	15.33±2.49 ^{a1}	21.83±4.48 ^{a1}	25.00±2.57 ^{a1}	24.67±2.59 ^{ab1}
	200	12.60±1.55 ^{a1}	13.00±5.80 ^{a1}	18.33±4.28 ^{a1}	43.17±6.34 ^{b2}	32.17±4.92 ^{ab1}
	400	10.27±0.09 ^{a1}	18.17±3.61 ^{a1}	19.33±3.01 ^{a1}	30.33±4.21 ^{a2}	21.33±3.84 ^{a1}

Values with different alphabetic (lower case) superscripts differ significantly ($P<0.05$) between different concentrations within the same exposure duration. Similarly, values with different numeric superscripts differ significantly ($P<0.05$) between different exposure periods within the same concentration. Results are expressed as Mean $\pm$ SEM.

Table 3. Effects of the aqueous seed extract of *M. sloanei* on some nephrotic enzymes of Albino rats on weekly basis.

Parameter	Treatment (mg/kg)	Duration (days)				
		0	7	14	21	28
UREA (mg/dl)	Control	21.2±0.44 ^{b1}	26.5±2.01 ^{b1}	35.0±7.88 ^{a1}	42.1±5.63 ^{a1}	34.2±5.21 ^{a1}
	100	20.7±0.30 ^{ab3}	18.1±1.32 ^{a4}	36.5±9.50 ^{a2}	40.9±8.31 ^{a2}	32.9±1.66 ^{a23}
	200	19.2±0.19 ^{a1}	20.9±0.89 ^{a1}	30.0±3.79 ^{a1}	39.5±6.20 ^{a2}	26.8±3.11 ^{a1}
	400	20.1±0.29 ^{a1}	28.5±2.46 ^{b1}	35.2±6.42 ^{a2}	32.6±2.40 ^{a1}	29.3±3.50 ^{a1}
BUN (mg/dl)	Control	11.93±1.17 ^{a1}	20.17±3.44 ^{a1}	24.43±0.47 ^{a1}	32.00±3.04 ^{a1}	40.67±9.24 ^{b1}
	100	9.93±0.20 ^{ab1}	12.37±0.94 ^{a12}	16.33±3.69 ^{a2}	19.97±2.90 ^{a2}	16.00±2.43 ^{a2}
	200	10.20±0.66 ^{b1}	8.47±0.61 ^{b1}	17.00±4.41 ^{a2}	19.73±3.21 ^{a2}	15.37±0.77 ^{a2}
	400	8.97±0.07 ^{a1}	9.77±0.42 ^{b1}	14.00±1.77 ^{a1}	19.27±3.72 ^{a2}	12.57±1.45 ^{a1}
CREAT (mg/dl)	Control	2.30±0.40 ^{a1}	0.28±0.12 ^{ab1}	0.67±0.24 ^{a1}	2.46±0.96 ^{b1}	0.68±0.27 ^{a1}
	100	2.37±0.70 ^{a1}	0.24±0.11 ^{ab1}	0.50±0.30 ^{a1}	2.50±0.57 ^{b1}	0.90±0.85 ^{a1}
	200	2.60±0.21 ^{a1}	0.43±0.12 ^{a1}	0.42±0.29 ^{a1}	0.27±0.12 ^{a1}	6.30±4.14 ^{b2}
	400	2.90±0.79 ^{a12}	0.09±0.03 ^{b1}	1.03±0.49 ^{a12}	0.36±0.22 ^{a1}	4.07±2.52 ^{b2 3}

Values with different alphabetic (lower case) superscripts differ significantly ($P<0.05$) between different concentrations within the same exposure duration. Similarly, values with different numeric superscripts differ significantly ($P<0.05$) between different exposure periods within the same concentration. Results are expressed as Mean $\pm$ SEM.

There was no significant difference ($P>0.05$) in overall dose dependence observed in the serum urea, blood urea nitrogen and creatinine levels in all the weeks when compared with the control. However, some forms of minimal variations were observed at certain dose levels of the nephrotic enzymes on a weekly basis. Whereas a significant decrease ($P<0.05$) was obtained in the serum urea levels of the rats at dose levels of 100 and 200 mg/kg in week 1, the effects of duration of treatment of the varying doses on the mean urea values showed a marked decline in the fourth week of treatment. In the same vein, a significant decrease ($P<0.05$) in the BUN levels was observed in the rats given the dose level of 100 mg/kg in week 1 when compared with the control. The effects of duration of treatment of the varying doses

on the mean BUN values of those animals treated with aqueous *M. sloanei* seed extracts also showed a marked decline in the fourth week of treatment. Similarly, a significant decrease ($P<0.05$) was observed in the serum levels of creatinine at the dose levels of 100 and 400 mg/kg in week 3 when compared with the control. The effects of duration of treatment of the varying doses on the mean creatinine values of the animals treated with 200 and 400 mg/kg also exhibited some fluctuations from weeks 1 to 4.

DISCUSSION

The possible effect of aqueous extracts of *M. sloanei*

seed on body weights and some biochemical parameters of normal albino rats were investigated for a total of 28 days. LD₅₀ of aqueous *M. sloanei* seed extract showed that although at a dosage of 5000 mg/kg no death occurred, though cage side behaviors such as shivering, bulging of eyes as well as dullness were observed in the rats. This present report suggests that the extract was tolerated and is therefore relatively safe for consumption. This observation corroborated that of Ejere et al. (2015) who observed no lethal effects of *M. sloanei* aqueous extract on albino rats after 24 h at a high dose of 5000 mg/kg. Contrarily, it disagreed with Egwurugwu et al. (2012) who recorded lethal effects of the methanolic *M. sloanei* seed extract at a dose level of 3,872.98 mg/kg in experimental rats. This discrepancy aptly calls for more studies to fully unravel the true identity of the *Mucuna* species involved.

Data obtained in the present work showed that the aqueous *M. sloanei* seed extracts exhibited a dose and duration independent non-significant difference in the body weights of the treated animals in all the weeks (Table 1). In addition, there was a progressive minimal non-significant increase in the body weight of the rats administered the various doses of the extract as the duration of treatment progressed. The absence of a significant effect on body weights of the animals is an indication that the extract did not adversely affect the body size of the animals and as such may not be considered a good anti-obesity agent (Ashafa et al., 2011). On the other hand, the ability of the seed extract to minimally increase the body weights of the treated animals must be taken seriously. This is indicative of the seed extract's tendency to cause increases in weight with increasing dosage and duration of administration. Therefore, there is need to further investigate the safe concentration levels of this important food condiment in Nigeria as several studies have indicated the possibility that high doses of plant extracts could lead to life threatening public health diseases (Ene-Ojo et al., 2013; Ijeh and Agbo, 2006; Ijeh and Ukwani, 2007; Mehrdad et al., 2011).

The importance of blood chemistry profiles in relation to nutrient intake has been reported (Church et al., 1984). Serum levels of ALT and AST which are the two diagnostically important transaminases have not only been used as good bio-indicators of the functionality and cellular integrity of the liver but as well, to assess the functional health status and the internal environment of the organism (Rehman et al., 2006; Sood, 2006; Lavanaya et al., 2011). Normally, an elevation in their serum levels may be indicative of an inflammation or damage to the hepatocytes or liver dysfunction (Edwards et al., 1995; Sood, 2006) especially whenever the liver undergoes such pathological conditions as cirrhosis or subjected to abnormal onslaught that accompany the presence of toxins or usage of some drugs (Nyblom et al., 2004; Crook, 2006). The fact that the extract had no

significant effect on the serum levels of these liver marker enzymes (Table 2) is an indication that it had no negative interaction on the hepatocytes and as such did not increase the activities of the lysosomes. In addition, the extract interaction with the animal appeared to have not caused any damage to the mitochondria nor did it affect the membrane permeability of the liver cells, thus not inducing any form of damage to the morphology of the liver (Crook, 2006). This view corroborates an earlier one on another *Mucuna* species at Nsukka. Odoh and Osadebe (2010) reported that aqueous extracts of *Mucuna flagellipes* seeds did not have any significant effect on the serum chemistry of albino rats. Nevertheless, the extract's ability to cause minimal non-significant increases in the serum levels of both enzymes is very instructional. This may also be an indication of the extract's potentiality to gradually manifest its harmful tendencies in a dose and duration dependent fashion. This is believable because the difference in value between the observed least ALT (39.7 ± 5.67 U/L) and the highest (90.0 ± 1.53 U/L) level in the treated rats was greater than the normal ALT range (10 to 40 U/L) in man (Chernecky and Berger, 2008). Similarly, the observed difference in value between the least (13.00 ± 5.80 U/L) and highest serum AST (43.17 ± 6.34 U/L) level was greater than the AST range (14 to 20 U/L) obtained for human males (Chernecky and Berger, 2008).

The minimal non-significant reduction in AST activity at week 4 in all the treatment groups is nonetheless very important. This may be an evidence of the extract's ability to improve hepatic functions following prolonged administration or, it could be an indication that the effect of the extract may be self-limiting. On the other hand, it may be that the extract is metabolizable into less toxic substances by the liver or as a result of the extracts high content of bioactive constituents like flavonoids which have been reported to have anti-oxidative effects (Middleton, 1996).

Furthermore, many dietary supplements may not be harmful; some have been associated with nephrotoxicity while others have the potential to do so (Thomson et al., 2002). Usually, an elevation in serum urea and BUN levels presupposes renal dysfunction as a result of kidney damage. The observed lack of overall dose dependent significant difference in the serum urea and blood urea nitrogen (BUN) levels (Table 3) when compared with the control, suggested that the *M. sloanei* seed extract was not harmful to the kidney function, but may in some degree confer positive effect on waste excretion in the rats. It seems plausible that the seed extract on reaching the end tract of the collecting tubules minimally decreased urea re-absorption. Similarly, it is possible that there was no increased tissue protein catabolism or excess breakdown of blood protein resulting in increased urea excretion by the kidney (Nduka, 1999; Adepoju and Odubena, 2009). Since urea is the major nitrogen-containing metabolic product of

protein catabolism, the significant reduction in the mean serum urea at the dose levels of 100 and 200 mg/kg and BUN at 200 and 400 mg/kg of *M. sloanei* at week 1 may be attributed to an impairment in the urea cycle leading to reduced production of the metabolic product (Yakubu et al., 2003). This is indicative of an abnormality in the physiological excretion of urea caused by a non-renal factor which is the seed extract in this study. This observation corroborates the findings of past reports using other *Mucuna* species. Adepoju and Odubena (2009) working on *Mucuna pruriens* reported a significant decrease in the serum urea levels of rats fed different doses of the plant extract. Odoh and Osadebe (2010) also observed that the aqueous seed extracts of *M. flagellipes* had no significant effect on the serum chemistry of albino rats when compared with the control.

Creatinine is a major catabolic product of protein metabolism in the muscle tissue usually excreted by the kidneys. Serum urea is also used as an indicator of the renal functional ability (Aliyu et al., 2006). The lack of an overall dose dependent significant difference coupled with a dose independent significant decrease in the serum creatinine levels at 200 and 400 mg/kg in the third week of administration when compared with the control suggests that the aqueous extract may have therapeutic effects on the renal system. That is, the *M. sloanei* seed extract did not impair the functioning renal tubular mass vis-à-vis its regulatory functions. Nevertheless, the observed sudden sharp increases in the fourth week of the rats administered 200 (6.30 ± 4.14 mg/dl) and 400 mg/kg (4.07 ± 2.52 mg/dl) far above the serum creatinine value (0.5 to 1.3 mg/dl) for humans (Mehrdad et al., 2011) is very worrisome. Although, an experimental default in the analysis is strongly suspected, it may nonetheless tend to suggest the possibility of some kinds of renal toxicity which may be exacerbated with increase in the dosage and duration of administration. However, since several studies (Ene-ojo et al., 2013; Ijeh and Agbo, 2006; Ijeh and Ukwani, 2007; Mehrdad et al., 2011) have indicated the possibility that the usage of high doses of plant extracts could lead to acute renal failure, there is need to further investigate safe concentration levels of this important food condiment in Nigeria.

Conclusion

Conclusively, in as much as the domestication and utilization of underutilized legumes as inexpensive and elegant source of protein is commendable in developing countries, care must be taken in their consumption. Data collated and reported in the present study tend to show that moderate consumption of *M. sloanei* seeds could be beneficial to human health. Although, the seed extract could have hepato-protective ability in the long run, it is doubtful if it can be a good anti-obesity agent. It is also noteworthy that its nephro-protective ability may be fully realized when moderately consumed. This calls for

further studies to fully harness the beneficial properties of this food condiment which is a delicacy in most homes in developing countries. Nevertheless, further work should be done to ascertain the safe concentration of this important food condiment for consumption in Nigeria following prolonged administration. This will go a long way to assess its stability and suitability in clinical trials.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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