



Review Article

Aphrodisiac Potential of Tiger Nut (*Cyperus esculentus* L.) Powder in Male Wistar Albino Rat

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ABSTRACT

This study aimed to assess the aphrodisiac potential of tiger nuts (*Cyperus esculentus* L.) powder in male Wistar albino rats. Twenty-five male and twenty-five female rats were used for the experiment. The male rats were selected into five groups of 5 rats/group. Two groups served as normal and positive controls. Three groups were fed with feed supplemented with varying concentrations of *Cyperus esculentus* powder (5%, 10%, and 20%) for fourteen (14) days. After the treatment, sexual behaviors, fasting blood glucose, lipid profile, nitric oxide, and some sex hormone levels were assayed. The results showed a significant variation in mount frequencies, while significant increases were observed in intromission frequency and intromission ratio as compared to the normal control. Significant increases in the body weight of both the normal control and treated groups were observed. However, the fasting blood glucose level was not altered significantly. Lipid profile levels were increased in rats fed a 20% tiger nut supplementary diet when compared with the control, whereas low-density lipoprotein was not changed significantly. Nitric oxide concentration significantly increased in the testes but decreased in the kidneys of the treated groups. The results of sex hormone levels showed a significant increase in follicle-stimulating hormone and testosterone with no variation in luteinizing hormone. These results showed that *Cyperus esculentus* powder can improve the sexual behavior of male rats, hence giving credence to the aphrodisiac potential of *Cyperus esculentus*.

Keywords: Aphrodisiac, Kidney, Testes, Testosterone, Wistar

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INTRODUCTION

Sexual dysfunctions are issues that cause an individual not to be satisfied during sexual intercourse (Ananya, 2019). They are as a result of many factors that include psychological problems, chronic diseases, life style and systemic disease. They are quite prevalent, affecting about 31% of males and 43% of females (Masoudi *et al.*, 2022). Although there are medications used for the treatment of sexual dysfunctions, but most at times they produce adverse effects such as drowsiness, nausea, headache, dizziness, visual disturbances, nasal congestions, etc., as a result, patients try to find other options of treating sexual dysfunctions (Erhabor & Idu, 2017). Some of the plants that are already in use to improve

sexual function, especially in Africa include among others, pumpkin seed, *Ekebergia capensis* and *Mondia whitei* (Kamtchouing *et al.*, 2002; Orisakwe *et al.*, 2004). These substances that can improve sexual functions also known as aphrodisiacs can be screened by physical and chemical means. In the physical method, sexual behavior is studied by observing the mating behavior of the animals such as, mount frequency and latency, intromission frequency and latency among other things after the administration of such substances. While the chemical method involves the measurement of hormonal concentration, organ weight and lipid profile of the animals among other things, after the administration

of the substances. In both the physical and chemical methods, laboratory animals (guinea pigs, mice and rats) are used (Singh *et al.*, 2013).

Tiger nut is known with other names among some tribes in Nigeria such as 'aya' in Hausa language, 'aki-Hausa' in Igbo language and 'ofio' in Yoruba language (Bamishaiye *et al.*, 2011). It is used for medication in the treatment of dysentery, upset of stomach, flatulence and ulcer of the mouth (Abiola & Mutiu, 2020). It has been reported to have a substantial amount of important mineral elements that include magnesium, calcium, sodium, potassium, and phosphorus as well as vitamins (A, C and E) and many amino acids that are needed for important metabolic processes in the body (Shaker *et al.*, 2009; Ekeanyanwu and Onogbugbu, 2010). Anti-nutrients (saponins, tannins, oxalates, phytate, and cyanogenic glycosides) are found to be minimal in tiger nuts (Okafor *et al.*, 2003; Ezeh *et al.*, 2014) with a good quantity of alkaloids, flavonoid, sterols, saponins, and tannins that are reported to be accountable for the many biochemical activities of the plant (Imam *et al.*, 2013). Tiger nut was found to be non-toxic to experimental rats at all levels (Chukwuma *et al.*, 2010). There are also claims about its aphrodisiac potential with reports covering little or no important biochemical indices. Therefore, this research examined the aphrodisiac (using standard screening methods) potential of *Cyperus esculentus* L. powder in male Wistar albino rats.

MATERIALS AND METHODS

Preparation of Sample Material

Tiger nut was bought from Dutsin-Ma Market, it was identified in the Department of Plant Science and Biotechnology, Federal University Dutsin-Ma with a voucher number FUDMA/PSB/0081. It was washed, dried, and ground to powder, after which the supplementations of 5% (5 g tiger nut+ 95 g animal feed), 10% (10 g tiger nut+ 90 g animal feed), 20% (20 g tiger nut + 80 g animal feed) were prepared from the powder (tiger nut) and were kept in airtight containers for further use.

Animals

Male and female Wistar strain albino rats numbering 25 each, weighing between 200 g and 260 g were used for the study. The rats were housed in separate cages (male and female) and maintained under conditions of natural temperature and light. They were allowed free access to rat feed and clean water

for 2 weeks to acclimatize, before the experiment was started. The Departmental Ethics and Animal Welfare Committee conveyed approval for this work in a letter with reference no: BCHEAWC-17/03/2022.

Experimental Design

Male rats were grouped into 5 groups of 5 rats each. The rats were treated as follows:

Group 1 (normal control): Rats were given normal feed.

Group 2 (positive control): Rats were given oral dose of 5 mg/kg sildenafil citrate.

Group 3 (experimental group): Rats were fed with 5% tiger nut-supplemented diet

Group 4 (experimental group): Rats were fed with 10% tiger nut-supplemented diet

Group 5 (experimental group): Rats were fed with 20% tiger nut-supplemented diet.

The treatment lasted for 14 days.

Fasting blood glucose and body weights were determined weekly after basal values had been taken with the aid of a glucometer and analytical weighing balance respectively.

Organ weight was taken after the rats were sacrificed.

Sexual Behavior Test

The sexual behavior test was carried out using the method described by Allouh *et al.* (2015), with modifications. The 5 male rats from each group were subjected to the sexual behavior tests; the test was performed 12 h after the last treatment and during the dark phase of the light/dark cycle. A single male rat was placed in a rectangular cage (45 × 40 × 30 cm) and allowed to acclimatize for 5 minutes. After the 5 minutes, a sexually receptive female rat was then introduced into the cage and the following parameters of sexual behavior were monitored with the aid of a video camera for 40 minutes. Mount latency (time from introduction of the female rat until the first mount by the male rat), intromission latency (time from introduction of the female until the first vaginal penetration by the male rats), mount frequency (number of mounts preceding ejaculation), and intromission frequency (number of intromissions from the time the female was introduced until ejaculation). Intromission ratio was calculated using the equation

$$\text{Intromission Ratio} = \frac{\text{Intromission frequency}}{\text{Mount frequency} + \text{Intromission frequency}}$$

Body and Reproductive Organ Weights

The body weights of the rats were taken weekly after the basal weight had been taken, while the internal reproductive organ (testis and kidney) weight was taken after the rats had been sacrificed, the organs were then removed, cleaned free of fat, and weighed using analytical balance.

Serum Biochemical Parameters

After the feeding period, the rats were euthanized with ethyl ether and blood was collected into plain sample containers through the abdominal aorta.

Serum was obtained by centrifugation of the collected blood at 3000 rpm for 15 min for the analysis of lipid profile, nitric oxide, and some sex hormones.

Lipid Profile

Total cholesterol, triglycerides, HDL-C, and LDL-C were assayed using Randox Diagnostic kits by following the manufacturer's described procedures.

LDL-C: Low-density lipoprotein cholesterol was calculated using the equation;

$$\text{LDL (mg/dl)} = \frac{\text{Total cholesterol} - \text{HDL cholesterol}}{5}$$

Nitrite Oxide: Nitric oxide was assayed by the Griess method (Shamsaldeen *et al.*, 2016). Here, a 100 µl sample was added with 100 µl Griess reagents A and B (1:1 Griess reagents ratio- Sulfanilamide and N-1-naphthyl ethylenediamine). The reaction generates a pink azo dye, then the absorbance was taken using a spectrophotometer at 540 nm. A standard curve was used to estimate the nitrite concentration.

Serum reproductive hormone concentrations

The serum concentrations of LH and testosterone were assayed using the fully automated Fineware 3 PlusImmunoassay Analyzer (WondFo).

Data Analysis

The data was analyzed using one-way ANOVA on SPSS software version 20, and the results are expressed as means ± SEM (n=5). Duncan's post hoc test was used to compare the means. Significant difference was set at P<0.05.

RESULT

The results on Table 1 present the mating behavior test. All the groups fed tiger nuts supplemented diet showed significant reduction (P <0.05) in mount latency and intromission latency compared to the control group fed normal rat feed. No significant variations in mount frequencies were seen, while there was a significant increase in intromission frequency and intromission ratio as compared to the normal control group.

The effects of *Cyperus esculantus* powder on body and reproductive organs weight

The results of the effects of *Cyperus esculantus* powder on body and reproductive organ weights as presented in Tables 2 and 3 respectively, showed a significant increase in the body weight of both the control groups (normal and positive) and the experimental groups fed tiger nut supplemented diet across the weeks (Table 2), and a significant increase in testis weight was observed in all the tiger nut supplemented diet fed groups as well as positive control. No significant variation in kidney weight was observed when compared to the normal control group (Table 3).

Effects of *Cyperus esculantus* powder fasting blood glucose level

The result showed no significant difference in the level of fasting blood glucose level of the groups fed 5% and 20% tiger Nut supplemented diet and the positive control group, throughout the period of the experiment when compared to their basal values. But a significant increase in fasting blood glucose was seen in the negative control (fed normal rat feed) and 10% tiger nut-supplemented diet fed group on the 14th day when compared with the basal.

Table 1. The effects of *Cyperus esculentus* powder on the sexual behavior of adult male rats

Group	ML(s)	MF	IL(s)	IF	IR
NC	109.80 ± 3.43 ^d	4.80 ± 0.73 ^a	193.40 ± 3.93 ^d	8.00 ± 0.71 ^a	0.63 ± 0.05 ^a
PC (5 mg/kg)	37.00 ± 2.49 ^a	3.20 ± 0.58 ^a	53.60 ± 1.63 ^a	15.40 ± 1.12 ^d	0.83 ± 0.03 ^c
E1 (5%)	73.60 ± 2.86 ^c	4.00 ± 0.55 ^a	124.20 ± 3.65 ^c	11.00 ± 0.84 ^{bc}	0.74 ± 0.02 ^{bc}
E2 (10%)	51.40 ± 3.47 ^b	4.00 ± 0.45 ^a	93.00 ± 3.27 ^b	13.00 ± 0.63 ^c	0.77 ± 0.02 ^{bc}
E3 (20%)	41.20 ± 3.51 ^a	4.00 ± 0.45 ^a	89.40 ± 2.04 ^b	10.40 ± 0.51 ^b	0.72 ± 0.03 ^{ab}

Values are presented as means ± SEM (n = 5). Mean Values across columns with different superscripts are significantly different (P <0.05). ML=Mount latency, MF=Mount frequency IL=Intromission latency, IF=Intromission frequency and IR=Intromission Ratio. NC=Normal control, PC= Positive Control, (5 mg/kg sildenafil citrate) E1=Experimental group 1 (5% tiger nut supplemented diet), E2=Experimental group 2 (10% tiger nut supplemented diet), and E3=Experimental group 3 (20% tiger nut supplemented diet).

Table 2. The effects of *Cyperus esculentus* powder on body weights (g)

Group	Basal (g)	7 days (g)	14 days (g)	%Weight gain(g)
NC	210.60 ± 0.40 ^a	216.20 ± 0.58 ^b	223.40 ± 1.63 ^c	6.08
PC (5mg/kg)	254.00 ± 0.45 ^a	260.00 ± 0.71 ^b	262.40 ± 0.75 ^c	3.31
E1 (5%)	228.60 ± 0.87 ^a	231.40 ± 0.93 ^a	239.80 ± 1.11 ^b	4.90
E2 (10%)	219.60 ± 0.51 ^a	222.80 ± 0.80 ^b	229.60 ± 1.03 ^c	4.55
E3 (20%)	211.20 ± 0.49 ^a	222.60 ± 0.60 ^b	223.00 ± 1.10 ^c	5.59

Values are presented as .eans ± SEM (n = 5), Mean values across the rows with different superscripts are significantly different (P <0.05). NC=Normal control, PC= Positive Control, (5 mg/kg sildenafil citrate) E1=Experimental group 1 (5% tiger nut supplemented diet), E2=Experimental group 2 (10% tiger nut supplemented diet), and E3=Experimental group 3 (20% tiger nut supplemented diet).

Table 3. The effects of *Cyperus esculentus* powder on adult male rats' reproductive organs weight

Group	Testes (g)	Kidney (g)
NC	2.30 ± 0.08 ^a	1.02 ± 0.06 ^a
PC (5 mg/kg)	2.84 ± 0.19 ^b	1.20 ± 0.07 ^a
E1 (5%)	2.82 ± 0.20 ^b	1.20 ± 0.05 ^a
E2 (10%)	2.78 ± 0.16 ^b	1.20 ± 0.09 ^a

Values are presented as means ± SEM (n = 5). Mean values across columns with different superscripts are significantly different (P <0.05). NC=Normal control, PC= Positive Control, (5 mg/kg sildenafil citrate) E1=Experimental group 1 (5% tiger nut supplemented diet), E2=Experimental group 2 (10% tiger nut supplemented diet), and E3=Experimental group 3 (20% tiger nut supplemented diet).

Table 4. The effects of *Cyperus esculentus* powder on fasting blood glucose Level

Group	Basal (mmol/L)	7days (mmol/L)	14 days (mmol/L)
NC	5.64 ± 0.16 ^a	5.52 ± 0.50 ^a	6.80 ± 0.20 ^b
PC (5mg/kg)	5.56 ± 0.16 ^a	5.94 ± 0.21 ^a	6.10 ± 0.15 ^a
E1 (5%)	5.22 ± 0.27 ^a	5.34 ± 0.46 ^a	5.94 ± 0.30 ^a
E2 (10%)	6.00 ± 0.26 ^a	5.18 ± 0.28 ^a	7.28 ± 0.50 ^b
E3 (20%)	6.40 ± 0.21 ^a	6.10 ± 0.38 ^a	6.00 ± 0.13 ^a

Values are presented as means ± SEM (n = 5). Mean values across the rows with different superscripts are significantly different (P <0.05). NC=Normal control, PC= Positive Control, (5 mg/kg sildenafil citrate) E1=Experimental group 1 (5% tiger nut supplemented diet), E2=Experimental group 2 (10% tiger nut supplemented diet), and E3=Experimental group 3 (20% tiger nut supplemented diet)

The Effects of *Cyperus esculentus* Powder on Lipid Profile

The lipid profile results showed that total cholesterol was increased in 5% and 10% of treated groups

compared to both controls. Triglyceride was increased in all treated groups compared to both controls. High-density lipoprotein cholesterol significantly increased in the 10% and 20% of treated

groups whereas low-density lipoprotein cholesterol had a reduction in the 10% treated group (Table 5).

Effects of *Cyperus esculentus* Powder on Nitric Oxide Concentration

Table 6 is the result of the effects of crude powder of *C. esculentus* on nitric oxide levels of *Wistar* rats. The results showed significant increase in testes nitric oxide concentration in all the tiger nuts supplemented diet fed groups compared to the normal control group. While significant decrease in kidney nitric oxide concentration was observed in all the tiger nuts supplemented diet fed and positive control groups compared to the normal control.

Effects of *Cyperus esculentus* Powder on Sex Hormones Concentrations

The results as presented in Table 7 below showed significant increase in follicle stimulating hormone in all the tiger nut powder supplemented diet fed groups. Significant increase in testosterone level of rats fed 10% tiger nuts supplemented feed was also observed. However, no significant variation in luteinizing hormone concentrations in all the groups fed tiger nuts supplemented diet was observed when compared to the normal control group.

Table 5. The effects of *Cyperus esculentus* powder on Lipid Profile

Group	TCHOL(mg/dl)	TG (mg/dl)	HDL-C (mg/dl)	LDL-C (mg/dl)
NC	107.40 ± 0.93 ^a	84.80 ± 1.85 ^a	22.80 ± 1.39 ^{ab}	67.40 ± 0.93 ^b
PC (5 mg/kg)	108.40 ± 0.60 ^a	86.20 ± 0.86 ^a	21.20 ± 0.80 ^a	70.00 ± 0.77 ^b
E1 (5%)	116.60 ± 1.54 ^b	94.80 ± 2.31 ^b	22.60 ± 1.17 ^{ab}	72.80 ± 0.86 ^b
E2 (10%)	110.00 ± 1.38 ^a	112.40 ± 2.73 ^c	25.20 ± 0.97 ^b	62.20 ± 1.53 ^a
E3 (20%)	115.80 ± 2.91 ^b	99.80 ± 4.03 ^b	28.40 ± 0.68 ^c	67.60 ± 2.29 ^b

Values are presented as means ± SEM (n = 5). Mean values with different superscripts across a column are significantly different (P <0.05). TCHOL= Total cholesterol, TG= Triglyceride, HDL = High-density lipoprotein cholesterol, LDL= Low-density lipoprotein Cholesterol, NC = Normal control, PC= Positive Control, (5 mg/kg sildenafil citrate) E1=Experimental group 1 (5% tiger nut supplemented diet), E2=Experimental group 2 (10% tiger nut supplemented diet), and E3=Experimental group 3 (20% tiger nut supplemented diet)

Table 6. The effects of *Cyperus esculentus* powder on nitric oxide Concentration

Group	Testes (nmol/ml)	Kidney (nmol/ml)
NC	49.9980 ± 1.72 ^a	220.07 ± 2.94 ^d
PC. (5mg/kg)	65.1140 ± 1.02 ^c	57.64 ± 1.43 ^a
E1 (5%)	58.8500 ± 0.71 ^{bc}	136.36 ± 3.99 ^c
E2 (10%)	59.2720 ± 4.69 ^{bc}	64.91 ± 5.49 ^{ab}
E3 (20%)	57.1240 ± 1.07 ^b	73.45 ± 4.66 ^b

Values are presented as means ± SEM (n = 5). Mean values with different superscripts across a column are significantly different (P <0.05). NC=Normal control, PC= Positive Control, (5 mg/kg sildenafil citrate) E1=Experimental group 1 (5% tiger nut supplemented diet), E2=Experimental group 2 (10% tiger nut supplemented diet), and E3=Experimental group 3 (20% tiger nut supplemented diet).

Table 7. The effects of *Cyperus esculentus* powder on Sex Hormones Concentrations

Group	FSH (mIU/ml)	LH (mIU/ml)	TEST (mIU/ml)
NC	2.86 ± 0.07 ^a	1.16 ± 0.02 ^a	0.78 ± 0.06 ^a
PC (5mg/kg)	2.86 ± 0.32 ^a	1.76 ± 0.15 ^b	3.96 ± 0.11 ^c
E1 (5%)	5.28 ± 0.13 ^d	1.02 ± 0.02 ^a	0.64 ± 0.12 ^a
E2 (10%)	4.26 ± 0.14 ^c	1.22 ± 0.04 ^a	1.50 ± 0.05 ^b
E3 (20%)	3.46 ± 0.07 ^b	1.24 ± 0.02 ^a	0.54 ± 0.05 ^a

Values are presented as means ± SEM (n = 5). Mean values across columns with different superscripts are significantly different (P <0.05). NC=Normal control, PC= Positive Control, (5 mg/kg sildenafil citrate) E1=Experimental group 1 (5% tiger nut supplemented diet) E2=Experimental group 2 (10% tiger nut supplemented diet), and E3=Experimental group 3 (20% tiger nut supplemented diet)

DISCUSSION

The effect of *Cyperus esculentus* (tiger nut) powder on sexual behavior, body and reproductive organs weight, serum lipid profile and some sex hormones (FSH, LH and Testosterone) in adult male Wistar albino rats were studied. In this work, the significant reduction in mount latency and intromission latency observed in rats fed with the powder of *C. esculentus* (Table 1) indicated that the rats desire to participate in the sexual activity has been increased, since these parameters (Mount latency and intromission latency) are indicators or markers that shows the level of willingness the rats had in engaging in sexual activity (Yukubu and Afolayan 2009; Cicero *et al.*, 2001). Also the frequency of intromission has been found to increase, indicating that the rats acquired enough energy to be able to engage in sexual activity many times (Dasofunjo *et al.*, 2013). This work shows similar results in the mating behavior of rats with the report of Boublata *et al.* (2021) that also reported enhancement in the sexual performance of male rats that were administered ethanolic extracts of *Cleome arabica*. The increase in weight in the rats fed tiger nut supplemented diet and the control group that was fed normal rat feed as shown on Table 2, could be in addition to being physiologic, a result of higher feed and water intake and without any long body movement as they were confined during the entire study time. We believe the increased body weight may be more of physiological since almost all the groups had progressive increase from day 7-14th. This outcome conforms to the result of Chukwu *et al.* (2022) who reported that the mean weights of rats rose after they were administered aqueous extract of *Cyperus esculentus*. Gonadal hormones have been noted to be able to influence the development, structure and function of the sexual organs (Arteaga, *et al.*, 2013). The observed increase in testis weight in the test groups and positive control group (Table 3) may be associated with the increased FSH level (Table 7). Allan *et al.* (2004) has reported that, independent of luteinizing hormone (LH), FSH alone promotes proliferation of sertoli cells and (indirectly) spermatogonia. Literature has established close correlation between increased sertoli cell number with both testicular size and sperm output (Petersen and Söder, 2006). Morakinyo *et al.* (2008) have reported significant increase in testicular weight of rats upon administration of *Zingiber officinale* (Ginger). The maintenance of a stable glucose level seen in the tiger nut supplemented diet groups (5%

and 20%) throughout the period of the experiment (Table 4), may be due to the fiber content of tiger nut and the fact that its carbohydrate content is basically made up of sucrose and starch (Gambo and Da'u, 2014). This result correspond to the work of marcelo *et al.* (2016) who reported no significant effect on blood glucose level of treated rats, but disagree with the report of Shiekuma *et al.* (2019) at the given doses, who reported significant reduction in fasting blood glucose levels in rats upon administration of sorghum- tiger-nut lbyer. The increase in cholesterol concentration seen in 20% tiger nut supplemented diet fed rats (Table 5), could be the supporting basis for the increase testosterone concentrations observed. Cholesterol is required by the testes to be able to perform their activities, and is one of the precursors for the synthesis of steroids (bile acids, steroid hormones and vitamin D) (Joseph and MacDonald, 2017; Watcho *et al.*, 2004). Any increase in the level of cholesterol that is observed in either the testes and serum of animals such as rats administered a medicinal plant extract, is an indication of a corresponding increase in the aphrodisiac activity of the plant because the increase in the cholesterol also caused increase in the production of testosterone which is an essential hormone that increase sexual urge (Yakubu *et al.*, 2007; Yakubu *et al* 2005). The result disagree with the work of El-Naggar (2017) that reported treatment with 5% and 15% tiger nut oil meal-based diet to decrease the lipid profile of rats, but correlates with the work of Ihedioha *et al.* (2013) who reported significant increase in total cholesterol, HDL-C and LDL-C levels in rats from four (4) weeks of age to the peak recorded at week six(6) before progressive decrease across the ages and stabilized from week 20 to 50 of age. The nitric oxide assay result on Table 6 showed increase in nitric oxide concentration in the tiger nut supplemented diet fed rats, and can be attributed to the presence of the amino acid arginine that is found in tiger nut, which is a precursor in the synthesis of nitric oxide (NO) via a pathway known as nitric oxide synthase pathway (Gambo and Da'u, 2014; Dennis, 2004). Nitric oxide has been found to play vital role in penile erection, because it is a vasoactive nonadrenergic, noncholinergic neurotransmitter and chemical mediator of penile erection. When nitric oxide is being released from the corpora cavernosa of the penis, it causes the activation of guanylyl cyclase, an enzyme that converts GTP to 3',5'-cyclic guanosine monophosphate (cGMP) causing the level of cGMP to substantially increase. cGMP would then act as a

second messenger molecule to control the activity of calcium channels and intracellular contractile proteins that affect the relaxation of corpus cavernosum smooth muscle and allow the flow of blood into the penis (Burnett, 2006). This result corresponds to the work of Subramoniam *et al.* (2013) that reported significant increase in nitric oxide level when rats were treated with alcoholic extract of *Vanda tessellate* flower. The increase in testosterone on the administration of 10% tiger nuts supplemented diet observed and increased FSH level in all the treated groups (Table 7), could be due to the presence of phytochemicals that are found in Tiger nuts that have been found to play crucial role in the production of sex hormones. One of such phytochemical is squercetin that was found to be associated with the production of testosterone (Ma *et al.* 2004). Other important chemicals in tiger nut are, vitamins E and C and the mineral Zinc which can all help in the production of testosterone and improvement of erectile function. According to Hu *et al.* (2013), antioxidant protection of sertoli and leydig cells is known to produce a concomitant increases in the level of sex hormones such as testosterone, FSH and LH. The increase in FSH and testosterone could also account for what was seen in the sexual behavior of the male rats, because sexual urge is being control by the level of testosterone available (Joseph and MacDonald, 2017; Aversa and Fabbri, 2001) ditto FSH which is known to promotes proliferation of sertoli cells and (indirectly) spermatogonia (Allan *et al.*, 2004). Bando *et al.* (2020) have reported the presence of pharmacologically important phytochemicals in tiger nuts. These findings correspond with those of Allouh *et al.* (2015). Testosterone is produced by the interstitial Leydig cells of the testis and is the principal sex hormone in the male gonads (Cao *et al.*, 2012), that has been reported to be an important modulator of male sexual activities that include erection and libido (Joseph and MacDonald, 2017). Research has also shown that the administration of testosterone enhances sexual function and improves the amount of libido, orgasm and ejaculations (Aversa and Fabbri, 2001).

CONCLUSION

The findings from this study indicated that the concentrations of tiger nut powder used were able to positively influence most of the examined physical and chemical prognostics indices. This further

supports the claims and reports of inherent aphrodisiac potential in tiger nut.

Conflict of interest:

The manuscript has no conflict of interest.

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