SAJSET
ISSN: 2992-3581

Savannah Journal of Science and Engineering Technology
Volume: 03; Issue: 04; Pages: 286-290; 2025.
www.sajsetjournal.com.ng

DOI: xx.xxxx.x/sajset-03-2025-0037

SAJSET
ISSN: 2992-3581

Effect of roasted seed extract of *Senna occidentalis* on serum gonadal hormones in rats

[1]Ziamme, A., [1]Obidah, W., [2]Ja'afar, J. N. and [1]Zailani, H. A.
[1]*Department of Biochemistry, Faculty of Life Sciences, Modibbo Adama University Yola, Nigeria*
[2]*Department of Biotechnology, Faculty of Life Sciences, Modibbo Adama University Yola, Nigeria*
ziammeandrew@gmail.com; jnjaarfar@mau.edu.ng; hauwa.zailani@mau.edu.ng

Paper History
Received: 14th July, 2025
Accepted: 13th August, 2025
Published: August, 2025

Abstract:
The roasted seed of Senna occidentalis is consumed as a substitute for coffee and used in traditional medicine for the treatment of many diseases. However, there is a scarcity of information on the potential toxicity of the seed extract in the gonadal organs of rats, and hence, the safety of the seed cannot be guaranteed. The study investigated the effect of S. occidentalis roasted seed extract on the gonadal organs of albino rats. Eighty (80) male and female Wistar rats, each weighing between 100 and 120 g, were divided into four groups, with ten rats per group for each sex. In each sex, Groups 2, 3, and 4 were given S. occidentalis roasted seed extract at concentrations of 0.05%, 0.5%, and 1%, respectively, mixed with their drinking water for a duration of 90 days. Group 1 acted as the control group and received tap water without the seed extract. Animal body weights, food and water consumption, and serum gonadal hormone concentration were determined. The results indicated that the aqueous seed extract of S. occidentalis did not have a significant effect on the body weight of the rats. Food consumption showed a significant decrease only in females that were administered 1% S. occidentalis seed extract. In contrast, water consumption decreased significantly in both sexes of animals that received 0.5% and 1% S. occidentalis seed extract. In males, groups administered 0.5% and 1% showed elevated luteinizing hormone and testosterone levels, while Oestrogen levels decreased significantly in animals administered 0.5% and 1% S. occidentalis seed extract. Thus, administration of roasted seed extract of S. occidentalis has a positive impact on the gonadal function of male rats but has an adverse effect on the reproductive system of female rats. The seed may be used to enhance male reproductive health and fertility.

Corresponding author
Obidah, W.
wilson.obidah@mau.edu.ng

Keywords: *Gonads, Hormones, Rat, Roasting, Seed, Senna occidentalis*

1. Introduction

S. occidentalis is a perennial plant belonging to the family Fabaceae. The plant is found in West Africa and Asia. In Nigeria, as in many other countries, it grows along roadsides and in waste areas. *S. occidentalis* is consumed as a substitute for coffee and is employed as a therapeutic option in traditional medicine for the treatment of various diseases. In folklore medicine, seed powder (half a teaspoon) is used to cure fever, while two tablespoons of leaf juice mixed with honey are said to alleviate cough [1]. The seeds possess high antioxidant activity and are used in the treatment of blood pressure and ringworm [2]. The seeds exhibit strong antibacterial and antifungal activities [3].

Different parts of the plant have been reported to cause toxic effects in both animals and humans. However, the seeds are considered the most toxic part of the plant and may be included in animal feed. Subchronic oral administration of the raw seeds has been shown to induce hematotoxicity, cardiotoxicity, and hepatotoxicity in rabbits [4]. Additionally, *S. occidentalis* seeds have been linked to hepatotoxicity in mice [5]. Cardiotoxicity has also been observed in sheep following sub-chronic dietary exposure to *S. occidentalis* seeds [6]. Furthermore, laying hens that were fed various rations of raw *S. occidentalis* seeds experienced a significant reduction in egg production [4].

The primary toxic component of *S. occidentalis* seeds is a dianthrone, an anthraquinone-derived compound that adversely affects mitochondrial function. However, it is known that roasting *S. occidentalis* seeds can degrade certain phytochemicals and may also inactivate plant tissue enzymes [7]. In a study conducted by Essa'a and Medoua [8], mice were orally administered either raw or roasted seed beverages of *S. occidentalis* for a duration of 21 days. The results indicated that the group consuming roasted seeds or the beverage exhibited no alterations in liver and kidney function markers, suggesting that the beverage is non-toxic when consumed in moderate amounts. Additionally, another subacute toxicity study demonstrated that the oral administration of roasted seed

extract of *S. occidentalis* in rats did not affect the liver, kidney, or haematological indices of Wistar rats [9]. However, there is currently no available information regarding the effects of *S. occidentalis* roasted seed extract on the gonadal function of Wistar rats. The aim of this study is to determine the effect of consumption of roasted seed extract on the gonadal organs of male and female Wistar rats.

2. Materials and methods

2.1 Materials

2.1.1 Equipment

Freeze dryer (DW-10ND), spectrophotometer (Jenway, 7315), centrifuge (Hettich, 78532), water bath (DK-420), thermostat oven (DHG-9030A), and precision balance (C78530).

2.1.2 Chemicals and reagents

All chemicals used were of analytical grade and were procured from BDH Chemicals Limited (Poole, Dorset, England) and Sigma-Aldrich Chemical Corporation (Missouri, USA). Additionally, test kits for hormonal assays were procured from Fortress Diagnostic Limited from UK.

2.1.3 Plant material

The seed of *S. occidentalis* was collected from a location opposite the Government Girls College in Yola, within the Yola North Local Government Area of Adamawa State, Nigeria. The specimen was identified and authenticated in the Plant Science Department of the Faculty of Life Sciences at Modibbo Adama University, Yola, Adamawa State.

2.1.4 Experimental animals

Male and female Wistar rats were sourced from the University of Nigeria, Nsukka, Enugu State. The rats were housed in polyethylene cages with stainless steel tops and maintained at a temperature of 24-25°C, following a 12-hour light-dark cycle. They were provided with a standard rodent pellet diet (Vital Feed, Grand Cereals Limited, Jos) and tap water *ad libitum*. Prior to the commencement of treatment, the animals were allowed to acclimatise for a period of seven days. Animal care adhered to the standard procedure described bythe National Research Council [10].

2.2 Methods

2.2.1 Preparation of plant sample

The *S. occidentalis* seeds were extracted from the pod and air-dried in an oven at 40°C within the laboratory of the Department of Food Science at Modibbo Adama University, Yola. Following this, the dried seeds were roasted at 200°C for duration of 10 minutes [8]. The seeds were allowed to cool and subsequently milled into a powder. The powdered sample was stored in lidded containers until required for use.

2.2.2 Extraction and lyophilization of the seed

The powdered seeds (500 g) were macerated in boiling water with occasional stirring. The mixture was allowed to stand for 30 min. The infusion was filtered with muslin cloth and subsequently through Whatman No. 1 filter paper. The filtrate was lyophilised to powder and stored in airtight containers until use.

2.2.3 Preparation of graded concentrations of the seed extract

The powdered seed extract was used to prepare different concentrations of the infusion. Appropriate amounts of *S. occidentalis* seed powder were added to distilled water to obtain 0.05%, 0.5%, and 1% (w/v) infusions.

2.2.4 Experimental design

Forty male and forty female Wistar rats were randomly assigned into four groups of ten (10) rats each. Groups 2, 3, and 4 were administered *S. occidentalis* seed extract through drinking water at 0.05%, 0.5%, and 1%, respectively, for 90 days (Table 1). The rats in the control group (Group 1) were given tap water. The animals were observed daily for signs of toxicity.

Table 1: Treatment protocol of *S. occidentalis* seed extract in rats

Animal group/sex	Treatment
Group I (Control)	Tap water only
Group II	Administered 0.05 % *S. occidentalis* roasted seed extract
Group III	Administered 0.5 % *S. occidentalis* roasted seed extract
Group IV	Administered 1 % *S. occidentalis* roasted seed extract

n= 10/sex

2.2.5 Determination of animal body weight

The body weight of the animals was determined weekly using a weighing balance.

2.2.6 Determination of food consumption

Food consumption was measured daily using a weighing balance. Food consumption was recorded as the difference between food provided in a cage (g) and left over (g) after 24 hours.

2.2.7 Determination of water intake

Water consumption was measured daily using a measuring cylinder. Water consumption was recorded as the difference between water provided in a cage (ml) and left over (ml) after 24 hours.

2.2.8 Blood sample collection

After 90 days of administration of *S. occidentalis* seed extract, the animals were fasted overnight and thereafter anaesthetised using chloroform. Blood samples were collected by cardiac puncture in sterile test tubes without anticoagulant. The blood samples were allowed to clot before being centrifuged at 3000 g for 10 minutes.

2.2.9 Hormonal assay

All hormonal assays were carried out using the enzyme-linked immunosorbent assay method using test

kits from Fortress Diagnostic Limited, United Kingdom, following the procedure described by the manufacturer.

2.2.10 Statistical analysis

Statistical analysis was carried out by the one-way analysis of variance (ANOVA) test using a statistical package program (SPSS 26.0), and the significance of the difference between means was determined by Dunnett's test at the ($P<0.05$) significant level.

3. Results and Discussion

3.1 Clinical signs

None of the animals exhibited any signs of toxicity during the study period.

3.2 Body weight, food, and water consumption

The body weight of animals administered *S. occidentalis* extract did not exhibit any significant difference compared to the control group (Table 2). Changes in body weight are typically linked to the toxic effects associated with exposure to harmful substances [11, 12]. The absence of significant alterations in weight gain suggests that the overall health status of the animals receiving *S. occidentalis* extract is comparable to that of the control group. The effects of *S. occidentalis* seed extract on food and water consumption in rats are presented in Table 3. Variations in food consumption can reflect the overall condition of the animals [13] and have implications for their nutrient intake [14]. In this study, a notable reduction in food consumption was observed in female rats administered 1% *S. occidentalis* seed extracts, indicating potential toxicity at higher concentrations. Additionally, a decrease in water consumption was recorded for the groups receiving 0.5% and 1% *S. occidentalis* seed extract. This reduction in water intake may be attributed to decreased palatability resulting from the high concentration of roasted seed in the drinking water. Values are mean± standard error for 10 replicates. From Table 3, the values are mean± standard error for 10 replicates and; *significantly different compared to control ($p < 0.05$).

Table 2: Effect of *S. occidentalis* seed extract on body weight gain in rats

Dose (%)	Initial body (g)	Final body weight (g)	Weight gain (%)
Male			
0 (control)	111.65±3.93	333.17±9.90	195.71
0.05	112.21±4.46	339.01±9.63	202.12
0.5	112.17±4.23	332.48±14.73	196.41
1	110.96±4.38	340.23±12.13	206.62
Female			
0 (control)	99.63±2.09	236.55±7.74	137.43
0.05	98.87±2.58	230.53±6.46	133.16
0.5	98.02±2.56	219.95±6.21	124.39
1	99.45±1.35	213,93±5.17	115.11

Table 3: Effect of *S. occidentalis* seed extract on food and water consumption of rats

Dose (%)	Food consumption (g/rat/day)	Water consumption (ml/rat/day)
Male		
0 (Control)	17.75±0.80	30.46±0.96
0.05	17.31±1.08	29.32±0.74
0.5	17.84±0.90	28.15±0.58*
1	16.50±0.92	26.09±0.60*
Female		
0 (Control)	16.58±0.40	29.73±0.61
0.05%	15.96±0.51	28.75±0.80
0.5%	15.25±0.66	27.61±0.81*
1%	14.19±0.50*	25.87±0.55*

3.3 Serum hormonal levels

Table 4 illustrates the effect of *S. occidentalis* seed extract on serum gonadal hormone levels in rats. The administration of 0.5% and 1% *S. occidentalis* seed extract resulted in increased serum testosterone levels and luteinizing hormone (LH) in male rats. Testosterone, a male sex hormone produced by Leydig cells in the testes, is essential for normal growth, development, maturation, and the maintenance of male secondary sexual characteristics [15]. The observed rise in testosterone levels may be induced by the increase in serum LH levels. In males, LH binds to receptors on the plasma membrane of Leydig cells, facilitating steroidogenesis and the secretion of testosterone [16-18].

Table 4: Effect of *S. occidentalis* seed extract on serum level of gonadal hormones in rats

Dose	**FSH (IU/mL)**	**LH (IU/mL)**	**Testosterone (ng/dl)**	**Oestrogen (pg/ml)**
Male				
0 (control)	0.59±0.08	2.13±0.37	5.06±0.97	-
0.05%	0.61±0.09	3.18±.0.60	4.62±0.78	-
0.5%	0.64±0.08	5.12±0.58*	9.85±0.83*	-
1%	0.54±0.06	5.16±0.76*	9.96±0.82*	-
Female				
0 (control)	0.86±0.03	8.66±0.55	-	425.48±33.12
0.05	0.76±0.04	6.75±0.83	-	334.14±25.50
0.5	0.83±0.02	11.70±0.93*	-	284.26±17.21*
1	0.83±0.03	6.24±0.70	-	240.94±31.65*

From Table 4, the values are mean ± standard error for 10 replicates, *significantly different compared to control ($p < 0.05$), FSH is the follicle stimulating hormones and LH is the luteinizing hormone.

On the other hand, in female rats, *S. occidentalis* seed extract decreases the serum concentration of oestrogen without altering serum follicle-stimulating hormone and luteinizing hormone levels. In females, Oestrogen promotes the development of breast and uterine tissues and influences the distribution of adipose tissue [19]. The observed decrease in serum oestrogen levels may be due to a direct adverse effect of the seed extract

on the ovaries, thereby decreasing the synthesis and/or release of oestrogen into the bloodstream. The reduction in oestrogen levels may indicate potential adverse effects on the reproductive system of female rats.

4. Conclusion

The oral administration of a roasted seed extract from *S. occidentalis* enhances serum luteinizing hormone and testosterone levels in male rats while decreasing oestrogen levels in female rats. Consequently, the seeds of *S. occidentalis* may have beneficial effects in males but could pose serious risks to the reproductive system of female rats. Roasted *S. occidentalis* seed may be used to enhance male fertility in humans and animals.

Recommendation

There is a need for comprehensive studies on the effects of roasted seed extracts from *S. occidentalis* on the reproductive systems of both male and female rats. Further research on how the seed extract affects sperm parameters and histopathological changes in gonadal organs would enhance our understanding of its mechanisms of toxicity.

References

[1]. Manikandaselvi, S., Vadivel, V. and Brindha P., (2016). Review of nutraceutical potential of Cassia occidentialis L: An Indian traditional medicinal and food plant,*International Journal of Pharmaceutical Sciences Review and Research*, 37(2), 141-146

[2]. Ngombe, N.K.,Ngolo, C.N., Kialengila, D.M., Wamba, A.L., Mungisthi, P.M., Tshibangu, P.T., Dibungi, P.K.T., Kantola, P.T. and Kapepula, P.M., (2019). Cellular antioxidant activity and peroxidase inhibition of infusions from different aerial parts of *Cassia occidentalis*,*Journal of Biosciences and Medicines*, 7, 83-94. https://doi.org/10.4236/jbm.2019.74009.

[3]. Yadav, J.P., Arya, V., Yadav, S., Panghal, M., Kumar, S., Dhankhar, S., (2010). *Cassia occidentalis* L. A review on its ethnobotany, phytochemical and pharmacological profile,*Fitoterapia*, 81, 223–230

[4]. Gotardo, A.T., Haraguchi, M., Raspantini, P.C.F., Dagli, M. L. Z. and Górniak S. L. (2017). Toxicity of *Senna occidentalis* seeds in laying hens and its effects on egg production, *Avian Pathology*, 46(3), 332-337. https://doi.org/10.1080/03079457.2016.1278199

[5]. Gebrezgi, E. M., Hiben, M. G., Kidanu, K. G. and Tsegay A. T., (2020). Subacute hepatotoxicity of extracts of *Senna occidentalis* seeds in Swiss Albino Mice. *Journal of Toxicology*, 2020, 8843044. https://doi.org/10.1155/2020/8843044.

[6]. Lopes, D.I.S., Sousa, M.G., Ramos, A.T. and Maruo, V.M., (2016). Cardiotoxicity of *Senna occidentalis* in sheep (Ovaries aries),*Open Veterinary Journal*, 6(1), 30-35

[7]. Olapadea, A. A. and Ajayia, O. A., (2016). Effect of Roasting Regime on Phytochemical Properties of *Senna occidentalis* Seeds,*International Journal of Food Studies*, 5, 203-211

[8]. Essa'a, V. J. and Medoua G.N., (2013). Subchronic toxicity of the beverage made from *Cassia occidentalis* seed in mice,*International Journal of Nutrition and Food Sciences*, 2(5), 237-242. https://doi.org/10.11648/j.ijnfs.20130205.14

[9]. Obidah, W., Sahabo, Y.J., Onoja, R.I., Umaru, H. A. andOdenigbo, G.I., (2024). Effects of Roasted *Senna occidentalis* seeds on the haematology, hepatorenal functions and hispathology of albino rats,*Animal Research International*, 21(3), 5710-5717.

[10]. National Research Council (2011). Guide for the care and use of laboratory animals,*(8th ed).* Washington, DC; National Academies Press.

[11]. Ghasemi, A., Jeddi, S. and Kashfi, K., (2021). The laboratory rat: Age and body weight matter, *Experimental and Clinical Sciences Journal*, 20, 1431-1445. https://doi.org/10.17179/excli2021-4072

[12]. Lai, M. N., Hsu, H. C. and Ng, L.T., (2021). Safety assessment of the standardized aqueous extract from solid-state cultured Xylaria nigripes (WulingShen) in rats, *Clininical Phytoscience*, 7, (2021) 44, 1-10. https://doi.org/10.1186/s40816-021-00281-5.

[13]. Ugwah-Oguejiofor, C.J., Okoli, C.O., Ugwah-Oguejiofor, M., Umar, M.L., Ogbulie, C.S., Mshelia, H.E., Umar, M., and Njan, A.A., (2019). Acute and sub-acute toxicity of aqueous extract of aerial parts of *Carralluma dalzielli* N.E Brown in mice and rats,*Heliyon*, 5(1), e01179. https://doi.org/10.1016/j.heliyon.2019e01179

[14]. Kiani, A.K., Dhuli, K., Donato, K., Aquilanti, B., Velluti, V., Matera, G., Iaconelli A., Connelly, S.T., Bellinato F., Gisondi P., Bertelli, M. (2022). Main nutritional deficiencies,*Journal of Preventive Medicine and Hygiene*, 63(3) E93-E101

[15]. Monocha, A., Kankra, M., Singla, P., Sharma, A., Ahirwar, A.K. and Bhagava, S., (2018). Clinical significance of reproductive hormones,*Current Medicine Research and Practice*, 8 (3), 100-108. https://doi.org/10.16/j.cmrp.2018.05.006

[16]. Dutta, S., Sengupta P. andMuhamad, S., (2019).Male reproductive hormones and semen quality, *Asian Pacific Journal of Reproduction*, 8(5), 189-194

[17]. Ezirim, C. Y., Abarikwu, S. O. and Uwakwe, A. A., (2019). Effects of *Anthocleista djalonensis* root extracts on reproductive hormones and testicular marker enzymes in adult male Wistar rats,*Andrologia*, 51(11), e13442. https://doi.org/10.1111/and.13442

[18]. Osonuga, I.O., Faponle, A.S., Ezima, E.N., Adenowo, T.K., Adelegan, A.A., (2020). Effect of aqueous extract of *Allium sativum*(Garlic) on fertility in male Wistar rats,*Annals of Health Research*, 6(1), 100-107. https://doi.org/10.30442/ahr.0601-11-71

[19]. Howard, S. R., (2021). Interpretation of reproductive hormones before, during and after the pubertal transition-identifying health and disordered puberty, *Clinical Endocrinology*, 295, 702-715.