Original

Effect of Methanol Extract of *Treculia Africana* Seeds on Reproductive Hormones, Thyroid Stimulating Hormone and Oxidative Stress Markers in Female Wistar Rats

[1]Barinua Kekii Gbaranor, [2]Anthony Uche Mbah, [1]Abiye Tamuno-Opubo,[1]Loghomemaziba Emmanuel Ogbanga, [2]Imeelda Nkoyo Nubila, [3]Blessing Zinab Ovili-Odili [4]Friday Sarone, [5]Sarah Kelechi Enebeli, [5]Ucheawaji Felicia Edward, [6]Nornu Stephen Agbeb, [7]Meka Okpokiri

[1]Department of Human Physiology, College of Medical Sciences, Rivers State University, Rivers State, South-South, Nigeria.
[2]Department of Pharmacology and Therapeutics, College of Medical Sciences, University of Nigeria, Enugu Campus, South-East, Nigeria.
[3]Department of Human Physiology, College of Medical Sciences, Delta State University, Delta State, South-South, Nigeria.
[4]Department of Human Physiology, PAMO University of Medical Sciences, Rivers State, South-South, Nigeria.
[5]Department of Pharmacology and Therapeutics, College of Medical Sciences, Rivers State University, Rivers State, South-South, Nigeria.
[6]Department of Electrical/Electronic Engineering, Kenule Beeson Saro-Wiwa Polytechnic, Bori, Rivers State, South-South, Nigeria.
[7]Department of Microbiology, Faculty of Science, Rivers State University, Rivers State, South-South, Nigeria.

Corresponding author: Shuaib Kayode Aremu, Department of Human Physiology, College of Medical Sciences, Rivers State University, Rivers State, South-South, Nigeria. barinua.gbaranor@ust.edu.ng:+23408037414186

Article history: Received 03 November 2025, Reviewed 15 November 2025, Accepted for publication 11 December 2025

ABSTRACT

Background: Women in search for fertility have turn their way from orthodox medicine to herbal medicine in order to achieve pregnancy. The increasing infertility problem in modern society, which results in an emotional, psychological, cultural, and social burden that depletes couples. The aim of this study is to evaluate the effects of methanol extract of *Treculia africana* seeds on the reproductive hormones and oxidative stress markers in female Wistar.

Method: Twenty (20) animals weighing between 160g to 180g were randomly selected in 4 groups of 5 animals per group. Administration of extract was done in 21 days and on the 22nd day, the animals were sacrificed and tissues and organs harvested. Statistically, the data obtained from the findings were analyzed using ANOVA and SPSS version 23. The results were expressed in mean and standard error deviation. $P<0.05$ was said to be significant.

Results: There is significant increase in serum follicle stimulating hormone concentration for the medium dose extract(150mg/kg). Luteinizing hormone, estrogen significantly increases in the medium and high doses (150mg/kg and 200mg/kg), and an increase in progesterone at all doses. TSH, prolactin, total protein and final weight of the animals increase significantly. Glutathione (GSH) serum level decrease significantly for the medium dose of extract. There was a dose dependent significant decrease when compared to control for SOD and MDA and may lack antioxidant properties.

Conclusion: The extract significantly increasing reproductive hormones and thyroid stimulating hormones and may enhance breast milk production in lactating mother.

Key words: Effect, Methanol Extract, *Treculia africana* Seeds, Reproductive Hormones, Oxidative Stress Markers

How to cite this article

Gbaranor KB., Mbah UA., Tamuno-Opubo A., Ogbanga LE., Nubila NI, Ovili-Odili BZ., Sarone F., Enebeli SK., Edward UF., Agbeb SN., Okpokiri M. Effect of Methanol Extract of *Treculia Africana* Seeds on Reproductive Hormones, Thyroid Stimulating Hormone and Oxidative Stress Markers in Female Wistar Rats. The Nigerian Health Journal 2025; 25(4), xxx-xxx.

INTRODUCTION

Several plants have been used across the globe by traditionalists for the treatment of various diseases without proper documentation especially in Africa. Phytomedicine involves the use of various plant's parts such as leaves, stems, seeds, fruits, barks and roots to treat certain disease at home[1].

Phytomedicine is a crucial part or aspect of medicine globally that is providing needed alternative for treating ill-patients. Fertility and reproductive health are regulated and maintained by reproductive hormones in present in the serum. When these reproductive hormones are not in the right proportion, it affects several reproductive processes such as monthly menstrual cycle, libido, ovulation, development of female sexual characteristics and fertilization and this may result in conception been impossible. Hormones are the key to reproductive health in almost every aspect of a woman's sexual life. This is due to the fact that they control menstruation, fertility, menopause, and even libido[2].

Hormones are chemical substances that aid reproductive process and must be in normal proportion for fertility to take place. Hormones are important for both men and female reproductive process. Herbal medicine is been used across the globe to improve reproductive process. Both gonadotropic hormones (FSH, LH) and sex hormones (progesterone, oestrogen) are secreted by the anterior pituitary gland and ovary respectively. However, these hormones are control by the hypothalamus[3,4].

The main hormones that affect the menstrual cycle and fertility are produced by brain glands and the ovaries. The hypothalamus in the brain produces gonadotropin releasing hormone (GnRH), which causes the pituitary gland to release both follicle stimulating hormone (FSH) and luteinizing hormone (LH), which initiates the ovulation process in the ovaries. During this process, the ovaries also produce estrogen and progesterone, which aid in the preparation of the uterus for pregnancy[5]. When there is derangement in the endocrine balance, either due to hyper or hyposecretion of these hormones, it can interfere with ovulation, making pregnancy difficult to achieve, a condition known as infertility[6]. Hormonal disorders are a major cause of infertility in women. The inability of women at ovulation and regulation of hormone levels leads to too high or too low production of hormones and the following factors may cause hormonal disorders: gland problems such as thyroid gland, pituitary gland and hypothalamus gland problems[7].

Infertility is the inability of a couple to achieve pregnancy despite regular unprotected sexual intercourse for a period of 12 months[8]. Infertility is a prominent medical issue that takes its toll on social life in many parts of the world[9]. In most instances, the causal factors are multi-factorial or vague.

Thyroid dysfunction may cause disturbances in the ovarian cycle and also ovulation, but, the molecular link between these two disorders still largely unrevealed. Hypothyroidism causes decreased rates of metabolic clearance of androstenedione and estrone in women and unveils an increase in peripheral aromatization[10]. In humans, disorders of the thyroid gland are responsible for a dysregulation of the hypothalamus, pituitary, gonadal axis, and hypothyroidism is associated with oligomenorrhea[11]. Hypothyroidism has been associated with the altered ovarian function, menstrual irregularities, subfertility, and higher (recurrent) miscarriage rates, suggesting that thyroid hormone affects female reproductive axis[12]. Hypothyroidism causes an increase in the levels of thyroid releasing hormone (TRH) which in turn stimulates secretion of thyroid stimulating hormone (TSH) and prolactin (PRL) and PRL inhibits the synthesis and secretion of gonadotrophins. Several studies have also confirmed abnormal menstrual patterns in overt hypothyroidism[12]. In most cultures globally, being fertile and producing children is crucial aspect of life whereas infertility is perceived in Sub-Sahara-Africa as individual or personal calamity[13]. In some nation, where bearing of child is massively appreciated, sterile married people are faced with concern like overt shunning or divorce to smaller kind of social shame resulting to mental issues and isolation[14,15,16].

Changes on reproductive factors is usually perceived or implicated as reason for sterility and caused over 7.0% sterility in certain studied populace[17]. Changes on reproductive factors are connected with notably increased danger of impulsive abortion. Various procedures and processes are already presented to explain impulsive abortion arising from changes on reproductive factors and they comprise of turbulences blood flow in uterine changes in blood-supply to endo-

Print ISSN: 0189-9287 Online ISSN: 2992-345X

medium, uterine touchiness, troubles in enlarging uterine cavity to accept fetus and placenta growth and meddling in appropriate implantation and placental-growth by poor develop endometrium[18]. Common factors involve mostly are consuming common drugs, administering drugs from plant and several other factors[19].

Infertility arising from administration of drugs of plant origin is a major health concern[19]. In the management of chronic health issues, the adverse effects of these agents are often down-played in favour of the beneficial medicinal values[20]. This encourages repeated administration or consumption of part or whole plant products.

On record are the temporary and permanent anti-fertility effects of some plant extracts in laboratory animals. Such effects include step-wise decrease in weight of parts of the reproductive organs or in the volume of the products from the organs.

Several individuals in Khana Local Government Area of Rivers State, South-South and South-Eastern part of Nigeria over depend have on *Treculia africana* seeds and its derivatives for meal and as medicinal and some women believed that its make breastfeeding's mother to produce milk, it has laxative effects and also boost sperm production in male. Again, *Treculia africana* were utilized by traditionalists in treating women that have changes in their reproductive parameters (hormones) in rural communities but little or no scientific documentation to actually ascertain the effects of this plant on reproductive parameters and thus the reason for this research.

MATERIALS AND METHOD

Plant collection, identification, and preparation

The *Treculia africana* seed (Akini ukwawas obtained from Khana Local Government Area of Rivers State, in October, 2021 and was taken to the Department of Plant Science and Bio-technology, Rivers State University, where it was identified by Dr. M.G. Ajuru. The seeds were dehulled, and air dried for three days at the room temperature of 40^0-45^0 and was grounded into uniform powder using Thomas Wiltey milling machine. The extract (filtrate) was then concentrated using rotary evaporator and weighed.

Extraction method

50g of grinded *Treculia africana* seed was measured with 500ml of methanol and poured into the extractor and extracted until the extract was gotten. The formed extract was obtained using rotatory evaporator and water bath for cooling. Extract was carried out according to the method described by[21].

Animals and Management

Female Wistar rats were sourced from animal house, Faculty of Basic Medical Sciences, University of Port Harcourt. The animals were kept in cages and maintained at their natural condition. These animals were given their conventional diets that was sourced from Flour Mill Port-Harcourt. The animal's weight was between 160g to 180g at commencement for this work. The animals were weighed before commencement and after administration of extract.

Study Design

Study Type: Experimental, laboratory-based in vivo animal study.

Experimental Animals: Adult female Wistar rats (usually 20–30 rats), acclimatized for 1–2 weeks under standard laboratory conditions.

Grouping: Twenty (20) female animals with weights between160-180g were randomly divided into 4 groups 5 rats per group. The extract, LD_{50} of 450mg/kg/ bwt as calculated and documented by[22], was used and doses of 100mg/kg(low dose), 150mg/kg (medium dose) and 200mg/kg (high dose) where determined. Extracts were administered orally using gavage tube. Administration-was done for 21 days. However, the exclusion criteria were pregnant animals.

Group 1: (Control) Received 5ml/kg of distilled water + feed was for 21days
Group 2: Received low-dose methanol extract (100mg/kg) of *Treculia africana* seeds extract + water + feed for 21days
Group 3: Received medium-dose methanol extract (150mg/kg) of *Treculia africana* seeds extract + water + feed for 21days
Group 4: Received high-dose methanol extract (200mg/kg) of *Treculia africana* seeds extract + water + feed for 21days

Print ISSN: 0189-9287 Online ISSN: 2992-345X

4. Treatment Administration
Methanol extract of *Treculia africana* seeds administered orally (via gavage) for 21 days

5. Sample Collection
At the end of treatment, animals were weighed, thereafter, sacrificed and blood samples collected for biochemical and hormonal assays.

6. Parameters Measured
Reproductive hormones: estrogen, progesterone, FSH, LH, Prolactin
Thyroid hormone: TSH
Oxidative stress markers: MDA, SOD, GSH

7. Data Analysis:
Results analyzed using ANOVA followed by post-hoc tests, with significance usually set at $p < 0.05$.

RESULTS

The results revealed that the serum levels of prolactin significantly increased in all the treated groups (low dose, medium dose and high dose) when compared with the control group (Table 4.1). Also, the serum levels of thyroid stimulating hormone (TSH) significantly increase in all the treated groups when compared with control group (Table1). The results revealed significant ($p<0.05$) increase in serum levels of follicle stimulating hormone concentration for the medium dose of bread fruit (BF) (150mg/kg), when compared to control group, while for low and high dose, there was slight increase but not significant when compared to control. Also, Serum levels of luteinizing hormone shows significant ($p<0.05$) increase in the medium and high doses (150mg/kg and 200mg/kg respectively) for the test group when compared to control group (Table 2). The serum levels of estrogen significantly increased at both the medium dose (150mg/kg) and high dose (200mg/kg) of *Treculia africana* seed extract when compared with control group. There was neither increase or decrease in the serum levels of estrogen when low dose of the extract was administered. Progesterone significantly increased in its serum levels in all the treated groups when compared with control group (Table 3). The result shows significant ($p<0.05$) decrease in the serum level glutathione (GSH) concentration for the medium dose of *Treculia africana* seeds extract(150mg/kg) when compared with the control group, while for low and high dose there was slight decrease but not significant (Table 4). Superoxide dismutase (SOD) shows significant ($p<0.05$) decrease in all the treated groups when compared with the control (Table 4). Serum levels of malondialdehyde (MDA) shows significant ($p<0.05$) increase in both the medium dose and high dose when compared with control (Table 4). The final weights of all the tested animals' increases when compared with the control (Table 5).

Table 1 Effect of Methanol Extract of Bread Fruit on Prolactin and Thyroid Stimulating Hormone in Female Wister Rat

Dose	Thyroid Stimulating Hormone (ng/ml) mean±SEM	Prolactine (ng/ml) mean±SEM
Control (5ml of distilled water)	0.58±0.01	1.4020±0.02
Low Dose (100mg/kg body weight)	0.99±0.02*	2.2040±0.01*
Medium Dose (150mg/kg body weight)	2.03±0.02*	1.8900±0.02*
High Dose (200mg/kg body weight)	2.38±0.02*	2.8220±0.02*

Values are presented in mean±SEM, n=5, * $p \leq 0.05$ statistically significant compare to control

Table 2: Effect of Methanol Extract of *Trecuila africana* Seeds on FSH and LH in Female *Wistar* Rats

Dose	FSH(m/u/ml) mean±SEM	LH (m/u/ml) mean±SEM
Control (5ml of distilled water)	0.25±0.01	0.42±0.01
Low Dose (100mg/kg body weight)	0.25±0.13	0.42±0.01
Medium Dose (150mg/kg body weight)	1.11±0.01 *	1.54±0.01 *
High dose (200mg/kg body weight)	0.39±0.09	0.71±0.01 *

Values are presented in mean±SEM, n=5, * $p \leq 0.05$ statistically significant compared to control.

Table 3 Effect of Methanolic Extract of Bread Fruit on the Sex Hormone in Female Wister Rats

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Dose	Estrogen(pg/ml) mean±SEM	Progesterone(ng/ml) mean±SEM
Control (5ml of distilled water)	53.20±0.58	8.90±0.07
Low Dose (100mg/kg body weight)	53.20±0.66	17.80±0.10*
Medium Dose (150mg/kg body weight)	56.00±0.70*	14.54±0.24*
High Dose (200mg/kg body weight)	59.60±0.50*	25.72±0.21*

Values are presented in mean±SEM, n=5, * p≤ 0.05 statistically significant compared to control

Table 4: Effect of Methanol Extract of *Treculia africana* Seeds on Some Biomarkers (Malondialdehyde, Glutathione, Superoxide Dismutase) in Female *Wistar* Rats

Dose	GSH mmol/L mean±SEM	SOD u/ml mean±SEM	MDA mmol/L mean±SEM
Control (5ml of distilled water)	1.30±0.17	0.22±0.01	0.53±0.01
Low Dose (100mg/kg body weight)	1.04±0.14	0.17±0.01*	0.56±0.01
Medium Dose (150mg/kg bodyweight)	0.69±0.05*	0.18±0.01*	0.60±0.01*
High Dose (200mg/kg body weight)	1.05±0.01	0.13±0.01*	0.64±0.01*

Values are presented in mean±SEM, n=5, * p≤ 0.05 statistically significant compared to control.

Table 5: Effect Of Ethanolic Extract Of Bread Fruit On Final Body Weight

Dose	FINAL WEIGHT(g)
Control (5ml of distilled water)	137.20±7.38
Low Dose (100mg/kg body weight)	162.00±1.92*
Medium Dose (150mg/kg bodyweight)	173.60±3.50*
High Dose (200mg/kg body weight)	190.00±0.84*

Values are presented in mean±SEM, n=5, * p≤ 0.05 statistically significant compare to control

DISCUSSION

It is important to know that hormones play a vital role as far as reproduction is concern and when these hormones are inadequate it affects the reproductive processes or may lead to infertility. The study revealed that at low dose, medium dose and high dose, there is significance increase in the serum levels of thyroid stimulating hormone (TSH) when compare with control. The observed significant increase in serum thyroid-stimulating hormone (TSH**)** at low, medium, and high doses of the extract compared with the control suggests that the methanol extract of *Treculia africana* seeds may have had a stimulatory or disruptive effect on thyroid function. TSH is regulated by the hypothalamic-pituitary-thyroid (HPT) axis, and an elevation in its level typically indicates that the pituitary gland is responding to reduced circulating thyroid hormones (T3 and T4) or to a direct effect of the extract on thyroid regulatory mechanisms. Again, these increase in serum levels of TSH may be due to the presence of potent phytochemical substance found in *Treculia africana* seeds. An increase in TSH across all doses could therefore imply that the extract interfered with thyroid hormone synthesis or release, causing the pituitary to secrete more TSH in an attempt to maintain normal thyroid function or induced a mild hypothyroid-like effect, where the body compensates by increasing TSH production.

Also, these rise in serum levels of thyroid stimulating hormone may enhance reproductive processes. This is

Print ISSN: 0189-9287 Online ISSN: 2992-345X

because Thyroid stimulating hormone is secreted by the anterior pituitary gland which in turn act on the thyroid gland causing the secretion of thyroid hormones. When thyroid hormone is not in the right proportion, its lead to the development of hypothyroidism and this condition may lead to the development of oligomenorrhea which could affect fertility. In humans, disorders of the thyroid gland are responsible for a deregulation of the hypothalamus, pituitary, gonadal axis, and hypothyroidism is associated with oligomenorrhea[11]. Hypothyroidism has been associated with the altered ovarian function, menstrual irregularities, subfertility, and higher (recurrent) miscarriage rates, suggesting that thyroid hormone affects female reproductive axis[12]. Hypothyroidism causes an increase in the levels of thyroid releasing hormone (TRH) which in turn stimulates secretion of thyroid stimulating hormone (TSH) and prolactin (PRL) and PRL inhibits the synthesis and secretion of gonadotrophins. Several studies have also confirmed abnormal menstrual patterns in overt hypothyroidism[12]. This study shows that thyroid stimulating hormone is significantly increased and this increase may reduce the chances of developing hypothyroidism, thereby enhancing reproductive activities.

The study revealed that the serum levels of prolactin significantly increased in all the treated groups when compared with control. This increase in the serum levels of prolactin could be due to the phytoconstituents (bioactive substance) present in the *Treculia africana* seed extract. These bioactive substances may have influenced the hypothalamus particularly cells of the prolactin releasing hormones (PRH) which in turn acts on the anterior pituitary gland causing the secretion of prolactin. Prolactin deficiency may result in failure to lactate while excessive prolactin results in galactorrhea and infertility. This plant, *Treculia africana* seeds may enhanced lactation in nursing mother who found it difficult to lactate her baby following delivery. However, excess prolactin, induce infertility in both sexes due to GnRH inhibition by prolactin, as well as galactorrhea or the inappropriate flow of breast milk in men and women. Men may report a decrease in libido and erectile dysfunction as a result of hypogonadism caused by reduced secretion of LH and FSH. This study agreed with previous study were extract of *C. aralioides* causes rise in serum concentration of prolactin at a low dose of 150mg/kg when administered to the animals this may suggests interference with the hypothalamic-hypophysial portal system or may be due to obstruction of dopamine by a potent substance in the extract. Prolactin is a hormone produced by the anterior pituitary gland and regulated by the hypothalamus[3,4]. When prolactin is found in excess, it may delay fertility by suppressing gonadotropic hormones. Therefore, it may not be good for couples expecting children but may be good for nursing mothers who are unable to breastfeed their children due to inability of their breasts to produce milk despite presence of suckling reflex. The study shows that consuming *Treculia africana* seeds increase serum levels of prolactin to the level that it may enhance reproductive parameters in both male and female.

Follicle stimulating hormone is the fundamental hormone of mammalian reproduction; it is produced by the anterior pituitary gonadotrophs. It plays a role in the maturation of gonads, gametogenesis, and steroidogenesis. The significant increase in the serum level of FSH by *Treculia africana* could enhanced follicular development, hence promote fertilization. This increase in the serum levels of FSH occur only the group treated with medium dose of *T. africana* seed extract. However, this increase in *T. africana* may not lead to a condition known as primary ovarian failure (Jiang *et al*., 2014) because the increase is not in excess. Luteinizing hormone is produced by the anterior pituitary gonadotrophs. This hormone enhances the secretion of sex steroid hormone from the gonads. In females, ovulation of mature follicles in the ovary is induced by a large surge of LH secretion during the pre-ovulatory periods. Several authors have demonstrated that LH release surges at the proestrous stage and are responsible for ovulation. The study revealed that the serum levels of luteinizing hormone (LH) significantly increase when both medium and high dose of *T. africana* was administered. This increase could be due to dose dependent and this could promote ovulation and thus promote fertilization. Hormones are determinants of fertility and when they are not in appropriate concentration, that is when there is underproduction or overproduction, it becomes a problem. These have led to several women to seek for herbal medicine as a solution to their infertility problem[3,4].

Treculia africana seeds is well known and consumed by the people of Eastern Nigeria. The plants eaten by both male and female and is prepared into various dishes. The

Print ISSN: 0189-9287 Online ISSN: 2992-345X

female gonads produce estrogen which enhances maturation of gonads, ovulation, and pregnancy maintenance. The results of the research show that the serum level of estrogen neither significantly increase nor decrease when *Treculia africana* seeds extract was administered at low dose. However, there were significance increase in the serum levels of estrogen when *Treculia africana* seeds extract was administered both at medium and high dose when compared with the control group. The increase may be due to increased dosage of the extract of *Treculia africana* seeds. Estrogen is secreted by the ovary, and this suggest that the extract may have interfered at the level of the ovary causing the increase of estrogen. It is believed that low serum estrogen affects reproductive process including fertility. This study revealed increased in the serum estrogen this may secure fertility for those women who may have low serum level of estrogen.

Also, the study revealed significance increase in the serum level of progesterone when *Treculia africana* seeds extract was administered when compare with the control (Table 3). There was increase serum levels of progesterone when extract at low, medium and high dose was administered to the animals. Progesterone is hormone commonly produced or secreted in gonads, placenta and adrenal glands and its duty is to prepare endometrium for fertilized ovum implantation and to maintain pregnancy. It is noted that low progesterone induces hormonal imbalance thereby having negative health effect on the people. Low progesterone can also cause abnormal uterine bleeding in women who have not gotten pregnant and may also hinder women from getting or sustaining pregnant. However, the study revealed increase in serum level of progesterone, and this could suggest that the plant *Treculia africana* seeds could enhance reproduction. However, both progesterone and oestrogen are secreted by the ovary and from the study, these two hormones (progesterone and oestrogen are significantly increased and this may have negative feed-back mechanism at the level of hypothalamus or pituitary leading to the significance decrease in both follicle stimulating hormone (FSH) and luteinizing hormone (LH) which enhances follicular growth and development leading to fertility.

Oxidative stress is the result of over production of reactive oxygen species (ROS) in relation to antioxidant defense levels. Excessive ROS production and resulting oxidative stress (OS) may contribute to aging and several diseased states affecting female reproduction.

Numerous antioxidants are related with the ROS detoxification, including superoxide dismutase (SOD), catalase, malondialdehyde (MDA), and glutathione. MDA levels changes is a pointer of lipid peroxidation. Glutathione a selenium-containing antioxidative enzyme scavenging system, act directly as an antioxidant and an inhibitor of lipid peroxidation. Glutathione also plays an important role in sperm oocyte maturation from the early events up to the onset of fertilizatiom. In this study, increase in the serum level of MDA and decrease in GSH and SOD is an indication that the extract may not have an antioxidant property.

The study shows that there is increase the final weights of the animals when compare with the control (Table 5). All the dosage caused increased in the final weights of the animals. This increase in the final weights could be due to the certain substance in the *Treculia africana* seeds when consumed by the animals. Therefore, these seeds may be consumed by people who lost weight and need to get back their lost weight.

Strengths of the Study

1. Use of an In Vivo Model

Using female Wistar rats allows assessment of the extract's effect on a whole biological system**,** making the findings more physiologically relevant than in vitro studies.

2. Controlled Experimental Conditions

The study likely used standardized housing, feeding, and dosing conditions, reducing environmental variability and improving the reliability of results.

3. Dose-Dependent Evaluation

Including low, medium, and high doses helps determine whether the extract's effects are dose-responsive, which strengthens interpretation of toxicological or therapeutic potential.

4. Assessing reproductive hormones, TSH and oxidative stress markers provides a comprehensive understanding of how the extract affects endocrine and oxidative systems.

5. Potential Contribution to Ethnomedicinal Knowledge

Treculia africana is traditionally used in many cultures; studying its effects scientifically adds evidence-based value to indigenous practices.

Limitations of the Study

Print ISSN: 0189-9287 Online ISSN: 2992-345X

1. Limited Sample Size
Like many animal studies, the number of rats may be small, which reduces the statistical power and generalizability.
2. Species Differences
Results from Wistar rats cannot be directly extrapolated to humans due to physiological and metabolic differences**.**
3. Lack of Phytochemical Characterization because the active compounds in the methanol extract *T. africana* seeds were not identified, therefore, it was difficult to determine which specific components caused the observed hormonal and oxidative changes.
4. Absence of Histological Analysis: Without examining tissues (ovary, uterus, thyroid, liver), the study cannot confirm whether biochemical changes are associated with structural or cellular changes.
5. Only Female Rats Used: Using only female rats limits understanding of potential sex-specific differences, which may be important in endocrine studies.
6. No Behavioral or Fertility Assessment: Changes in reproductive hormones may not always reflect actual changes in fertility, estrous cycle and mating behavior. These functional outcomes were not assessed.

Implications of the findings of the Study
1. Potential Endocrine-Disrupting Effects
The significant increase in TSH and alterations in reproductive hormones suggest that the extract may interfere with normal endocrine function. This implies that *Treculia africana* seed extract may have the potential to disrupt the hypothalamic–pituitary–thyroid and hypothalamic–pituitary–gonadal axes.
2. Possible Impact on Female Fertility
Changes in hormones such as estrogen, progesterone, FSH, and LH can influence ovulation, menstrual/estrous cycle regularity and fertility outcomes. Thus, the extract could affect reproductive capacity if consumed over long periods.
3. Insight into Safety of Traditional Use
Since *Treculia africana* is widely used in traditional medicine and as a food source, the findings provide important information about its safety profile, especially regarding long-term hormonal and thyroid effects.
4. Indication of Thyroid Dysfunction Risk
The elevated TSH levels may indicate a risk of hypothyroid-like changes, which could affect metabolism, growth, and overall physiological balance if similar effects occur in humans.
5. Need for Human Studies
Because the results come from animal experiments, there is need for well-designed human studies to determine whether similar effects occur in people, especially among populations that consume *Treculia africana* regularly.
6. Guidance for Regulatory and Public Health Decisions
The findings contribute to the body of knowledge needed by regulators, food scientists, and herbal practitioners to evaluate dosage limits, safety margins, and possible contraindications for the plant.

CONCLUSION
Treculia africana, though traditionally consumed and used medicinally, was found in this study to significantly elevate prolactin and thyroid-stimulating hormone levels, along with FSH, LH, progesterone, and (at higher doses) estrogen—changes that could disrupt normal reproductive processes and potentially contribute to infertility. Oxidative-stress analysis showed reduced SOD and increased MDA, indicating that the extract lacks antioxidant activity and may negatively affect reproductive organs. Overall, despite increasing body weight in treated animals, the extract demonstrated no fertility-enhancing properties and may instead pose risks to reproductive health, suggesting it should not be used as a fertility remedy.

DECLARATIONS
Acknowledgments: We acknowledge Nazor Barinua-Gbaranor, Nuazor Victory Barinua, Kedumle Success Barinua, Tuamene Excellent Barinua and Excellent Support Global Foundation for their moral support, prayers, understanding, and encouragement during the period of this research.
Funding: No funding
Conflict of Interest: None declared

REFERENCES
1.Gbaranor KB, Tee PG, Agara HN, Victor PD, Alasia OM, David-Sarogoro N, Opusunju BH, George BO, Nonju II, Ovili-Odili BZ, Nonju TI, Nwauzoma AP, Nwosu GN. Phytochemical analysis of leaf extract of *Englerina drummomdii* Balle ex Polhill & Wiens. *World Journal of Pharmaceutical Research*. 2021;10(11):128-134.
2.Lowik AJ. The Palgrave Handbook of Critical Menstruation Studies. *Sex Reprod Health Matters*. 2020;28(1):1854928.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

3. Gbaranor KB, Adienbo OM, Tee PG, Alasia OM, Tamuno-Opubo A, William AM, Agara HN, Amadi H, Nonju TI, Daka IR, Nonju II, Oriji EI, Nwosu GN, Emeghara GI. Effect of *Englerina drummondii* Balle ex Polhill & Wiens on follicle-stimulating hormone, luteinizing hormone, oestrogen, and progesterone in MSG-induced alterations in reproductive parameters in female rats. *Int J Recent Innov Med Clin Res*. 2021;3(4):19–25
4.Gbaranor KB, Ovili-Odili BZ, Okpara EP, Tamuno-Opubo A, Victor PD, Orupabo CD, Tee PG, Alasia OM, Sapira-Ordu L, Nonju II, Nwosu GN. Effect of hydroalcohol extract of *Englerina drummondii* Balle ex Polhill & Wiens (mistletoe) leaves on prolactin and thyroid stimulating hormone in female Wistar rats. *Green J Med Sci*. 2021;11(2):109–12.
5. Strahler J. Food cue-elicited brain potentials change throughout menstrual cycle: modulation by eating styles, negative affect, and premenstrual complaints. *Horm Behav*. 2020; 124:104811.
6. Wang J. Risk of multiple pregnancy when infertility is treated with ovulation induction by gonadotropins. *Fertil Steril*. 2003;80(3):664–5.
7. Meneses K, Holland A. Current evidence supporting fertility and pregnancy among young survivors of breast cancer. *Contemp Nurse Educ*. 2014;43(3):374–81
8. Ikpeze OC. *Fundamentals of Obstetrics and Gynaecology*. Afri Fst Publ; 2009. p. 271.
9. Akinola O, Fabanwo K, Rabiu K, Akinoso OA. Semen quality in male partners of infertile couples in Lagos, Nigeria. *Int J Trop Med*. 2010;5(2):37–9.
10. Redmond GP. Thyroid dysfunction and women's reproductive health. *Thyroid*. 2004;14(Suppl 1):S5–15
11.Krassas G, Poppe K, Glinoer D. Thyroid function and human reproductive health. *Endocr Rev*. 2010;31:702–55.
12. Krassas GE, Papadopoulou F, Tziomalos K, Zeginiadou T, Pontikides N. Hypothyroidism has an adverse effect on human spermatogenesis: a prospective, controlled study. *Thyroid*. 2008;18:1255–9.
13. Ombelet W, Cooke I, Dyer S, Serour G, Devroey P. Infertility and the provision of medical services in developing countries. *Hum Reprod*. 2008;14(6):605–21.
14. Tabong PT, Adongo PB. Infertility and childlessness: a qualitative study of the experiences of infertile couples in Northern Ghana. *BMC Pregnancy Childbirth*. 2013;13:72.
15.Dyer S. Infertility-related reproductive health knowledge and help-seeking behavior in African countries. *Hum Fertil (Camb)*. 2008;11(1):29–33.
16. Wischmann T, Stammer H, Scherg H, Gerhard I, Verres R. Psychosocial characteristics of infertile couples: a study by the Heidelberg fertility consultation service. *Hum Reprod*. 2010;25(6):1753–61.
17. Ekwere P, Archibong E, Bassey E, Ekabua J, Ekanem E, Feyi W. Infertility among Nigerian couples as seen in Calabar, Port Harcourt. *Afr J Reprod Health*. 2007;11(2):35–40.
18. Kaur H, Rao K. Fibroids and infertility. *Int J Infert Fetal Med*. 2014;5(1):1–7.
19. Olayemi FO. A review on some causes of male infertility. *Afr J Biotechnol*. 2010;9(20):2834–42.
20. Erhirhie E, Ilodigwe E, Ajaghaku D, Mbagwu I, Moke E. Toxicity evaluation of a commercial herbal preparation commonly used in Nigeria. *Eur J Med Plants*. 2015;5(2):176–90.
21. Handa SS, Khanuja SPS, Longo G, Rakesh DD. *Extraction technologies for medicinal and aromatic plants*. Trieste: ICS UNIDO; 2008.
22. Aderibigbe AO, Adeyemi IO, Agboola OI. Central nervous system depressant properties of *Treculia africana* Decne. *Ethnobot Leaflets*. 2010; 14:108.

Print ISSN: 0189-9287 Online ISSN: 2992-345X