

# Evaluation of Ethanolic Extract of Ginger On The Histology of The Testes And Sperm of Adult Wistar Rats

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**ABSTRACT:-** This research was carried out to evaluate the possible effects of ginger on the male reproductive system. Infertility is one of the major health problems in animals, approximately 30 % of infertilities are due to a male factor. Twenty animals were divided into four groups of five animals each and maintained under standard laboratory conditions of  $27 \pm 2^{\circ}\text{C}$ , relative humidity  $50 \pm 15\%$  and normal photo period (12h dark/12h light). The ginger extract was given orally once per day for 21 days. There were increases in sperm count and sperm motility. In normal sperm there was increase but not statistically different from the control. Treatment of the testes with 0.2ml/kg, showed tick cell membrane and the cells are fibrous in nature, while those treated with 0.4ml/kg and 0.8ml/kg showed fusion of cells, congestion and distortion of cell membrane of the seminiferous tubules. Ginger aids in the production of healthy sperm but should be take with care as it can also damage the cell membrane of the testes.

**Key Word:** Ginger, Sperm, infertility, Reproduction, Health.

## INTRODUCTION

Infertility is one of the major health problems in animals [1] approximately 30 % of infertilities are due to a male factor [2, 3]. Drug treatment, chemotherapy, toxins and environmental factors can have harmful effect on spermatogenesis and sperm normal production [1]. Medicinal plant for the treatment of diseases has a long a tradition. The Use of herbal medicines can be traced back as far as 2100 B.C. in ancient China and India. The first written reports was in 600 B.C. with the Caraka Samhita of India and the early notes of the Eastern Zhou dynasty of China that became systematized around 400 B.C.[4]. Some medicinal plants contain both useful and harmful substances which could either promote or retard the health of an individual. Base on this it is paramount to screen and rescreen medicinal plants for the purpose of identifying the active ingredients as well as harmful and non harmful. Ginger (*Zingiber officinal*) family: Zingiberaceae, is used worldwide as a spice [5], sweet, pungent, heating appetizer has been used in traditional oriental medicines for long time.

Its extract and major pungent principles have been shown to exhibit a variety of biological activities [6, 7]. Ginger is believed to help the common cold, flulike symptoms, headaches, painful menstrual periods [8,9]; arthritis [10], reduces symptoms in patients with nausea of pregnancy, motion sickness and postoperative nausea and vomiting [9,11]. In Nigeria the use of ginger as medicine is vast, it is also used for spicing almost all kinds of food including tea, and it is one of the major ingredients of “zobo” a local drink in Nigeria. The powdered form in combination with garlic is used for the treatment of dysentery, rheumatism, high blood pressure, body pains and eye related problems. Base on its broad usage it is therefore important to investigate on the possible effects of ginger on the male reproductive system.

## MATERIALS AND METHODS

### Plant Collection and Plant extraction

The plant was collected from Oyo State in Nigeria and was indentified at Ladoke Akintola University of Technology, Ogbomoso (LAUTCH). The ginger plant was dried and grinded to a powered form and extracted with ethanol.

### Animals

Twenty male wistar rats were used for the experiment. They were obtained from the animal house of Biochemistry Department of Obafemi Awolowo University, Ile-ife, Osun State, Nigeria. The rats weighing 105-180g were grouped into four, with five per group. The animals were allowed to acclimatize for two weeks prior to the start of the experiment. The animals were fed with pelletized feeds and water.

### Experimental design

The twenty animals were divided into four groups of five animals each and maintained under standard laboratory conditions of  $27 \pm 2^{\circ}\text{C}$ , relative humidity  $50 \pm 15\%$  and normal photo period (12h dark/12h light). The extract was given orally once a day for 21 days. They were administered as follows: Control Group I: Water, Group II: 0.2ml Group III: 0.4ml, Group IV: 0.8ml. At the end of the treatment; all the rats were sacrificed at the 22<sup>nd</sup> day. The caudal epididymis were placed in a plain tube containing

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0.1ml of normal saline and was immediately analyzed using haemocytometer for counting of the sperm cells. A drop of semen was placed on a clean slide, cover slipped and examined for motility. The semen was smeared, stained with Leishman's stain and examined under the microscope for morphology.

### Histopathology

The animals were sacrificed in accordance with ethical standards. Immediately after dissection, the sections of the testes were placed in a tissue cassette and fixed in 10%

formal saline for 24 h after which they were processed using standard histopathological methods. Sections of 5 $\mu$ m thickness were cut on a rotary microtome and stained with haematoxylin and eosin for microscopic assessment [12].

### Statistical Analysis

Values were represented as mean  $\pm$  SD. Data were analysed using one-way analysis of variance (ANOVA) and group means were compared using the Tukey-Kramer Multiple Comparisons Test using GraphPad InStat® software. P values < 0.05 were considered significant.

## RESULTS

Ginger did not show any significant increase in sperm count and sperm motility. In normal sperm there was increase but not statistically different from the control, table 1. Testes treated with 0.2ml/kg, Showed thick cell membrane and the cells are fibrous in nature, while those treated with 0.4ml/kg showed fusion of cells and congestion and the group treated with 0.8ml/kg showed distortion of cell membrane of the seminiferous tubules, which greatly affected the epithelial lining of the tissue, plate 2-4.



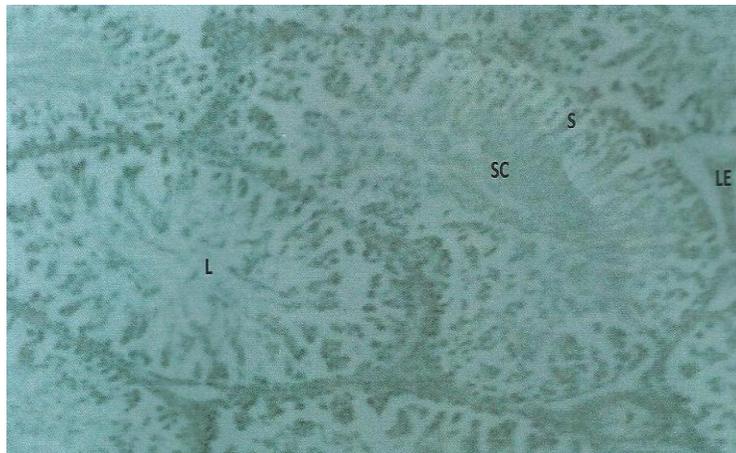
**Plate 1:** Control testes, stained with H and E

Showing normal Lumen (L), Spermatids (S), Leydig cells (LE), Sertoli cells (Sc). The cells are all normal



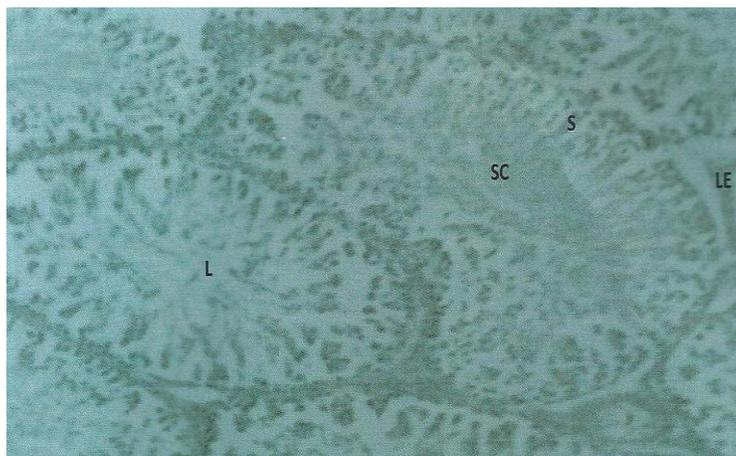
**Plate 2:** Testes treated with 0.2ml/kg, stained with H and E

Showing Lumen (L), Spermatids (S), and cells of Spermatogenic lineage. The cell membrane is thick and the cells are fibrous in nature.



**Plate 3:** Testes treated with 0.4ml/kg, stained with H and E

Showing Lumen (L), Spermatids (S), Leydig cells (LE) Sertoli cells (Sc). There is fusion of cells and congestion, although the cells seems normal



**Plate 4:** Testes treated with 0.8ml/kg

Showing Lumen (L), Spermatids (S), Leydig cells (LE) Sertoli cells (Sc). There is distortion of cell membrane of the seminiferous tubules, which greatly affected the epithelial lining of the tissue

**Table: Sperm parameters**

Parameters	Control: Group O	Group I	Group II	Group III
Sperm count (x 10 <sup>6</sup> )	15.10±1.59	16.40±0.70	14.50±3.45	14.93±1.46
Motility (%)	65.00±13.23	65.00±6.08	68.33±7.64	61.67±4.36
Normal Sperm (%)	70±11.40	71±7.68	75±14.14	75±15.81

Each value represents the mean ± standard deviation (n = 5), values are statistically different from control at p< 0.05\* one-way analysis of variance (ANOVA) + Tukey –Kramer Multiple comparisons Test.

## DISCUSSION

Ginger is a strong anti-oxidant substance and may either mitigate or prevent generation of free radicals. It is considered a safe herbal medicine with only few and insignificant adverse/side effects [13]. Ginger extracts have been extensively studied for a broad range of biological activities, especially antioxidant activities [14] found that ginger significantly lowered lipid per oxidation by maintaining the activities of the antioxidant enzymes –super oxide dismutase, catalase and glutathione peroxides in rats [15]. Previous study carried out by Arash et al., [16] on the administration of 100mg/kg ginger reveals that there is a significant increase in sperm motility and viability; this is similar to our result where there were increases in normal sperm and level of normal sperm, though not statistically significant. In motility also there were no significant differences when compared with the control, but Sharma and Agarwal [17] on a research on the “role of reactive oxygen species in male fertility” revealed loss of motility and impairment of spermatogenesis. Treatment of the testes with 0.2ml/kg, showed tick cell membrane and the cells are fibrous in nature, while those treated with 0.4ml/kg and 0.8ml/kg showed fusion of cells, congestion and distortion of cell membrane of the seminiferous tubules, which greatly affected the epithelial lining of the tissue, plate 2-4. The histopathology of our study agreed with the work done Nashwa et al., [18], where testis showed marked necrosis of spermatogoneal cells lining seminiferous tubules, degeneration and desquamation of germ cells lining seminiferous tubules following the administration of Ciprofloxacin, but when combined with ginger showed apparent normal seminiferous tubules. Our histopathology result did not agree with the work of Arash et al., [16] where the testes treated ginger showed regular seminiferous tubule with normal germinal epithelium morphology, and Musa et al [19], where *Crassocephalum crepidioides* did not cause any distortion on the testes of rats.

## CONCLUSION

Our result indicates that ginger has some useful substances that aid the nourishment of sperm. On the other hand the gradual distort of cell membrane may be dose dependent. It is therefore recommended that dosage of any edible substance should be placed on high priority before consumption.

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