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Original article

Effects of aqueous extract of ginger *(zingiber officinale)* on sperm count in wistar rats

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ABSTRACT

In this study, we evaluated the effect of aqueous ginger extract on sperm concentration in male wistar rats. A total of eighteen (18) apparently healthy male wistar rats were used. They were divided into three (3) groups of six (6) animals each as follows: Group 1: Served as the control and received distilled water, Group 2: Received 50 mg/kg b w of aqueous ginger extract and Group 3: received 100mg/kg of aqueous ginger extract respectively. The extract was administered to animals orally once daily for a period of twenty eight days. After the last day of treatment, animals from each group were euthanized and sperms cells collected from the caudal epididymis for sperm count evaluation. The results obtained revealed that the extract administered produced a significantly increased ($p<0.05$) mean sperm count from 3.150 ± 0.253 to 3.80 ± 0.146 in the group that received 50 mg/kg and from 3.150 ± 0.253 to 4.917±0.26 in animals that received 100 mg/kg b w of the extract when compared to control group respectively. In conclusion, the present study showed that the aqueous extract of ginger may possess an

androgenic activity; hence may have useful effects on spermatogenesis.

1. Introduction

One of the most important issues that influence the individual and social life of humans is sexual intentions. Sexual behavior is one of the major health issues in life (Khaki *et al.,* 2009). Infertility is one of the major health problems in life and approximately 30% of infertility is due to male factor. Several conditions can interfere with spermatogenesis and reduce sperm production and quality (Isidori *et al.,* 2006). A number of nutritional therapies have shown to increase sperm counts and motalility (Sigman *et al.,* 2006), folic acid and zinc (Wong *et al.,* 2002). *Zingiber officinale* commonly called ginger belongs to the family *Zingiberaceae.* The ginger plant has a long history of cultivation, and it is known to originate from China and then spread to India, Southeast Asia, West Africa, and the Caribbean (Lister, 2003). The local name in Yoruba is *Atale / Aje or Atale Fun-Fun* (Ogungbemi, 2006) in Hindi is *Aadrak* while in Gujarati is *Aadu* and *Cjitta* in Hausa (Memudu *et al.,* 2012). It is general known to be used as a culinary in making ginger tea, as well as a spice in food. The anti-oxidative and androgenic activities of *Z. officinale* have been reported in animal models (Kamtchouing *et al.,* 2002; Sekiwa *et al.,* 2000). Medicinal properties of ginger are numerous due to its active component (Chaiyakunaprak *et al.,* 2006). It is made up of phytocompounds such as zingerone, gingerdiol, zingibrene, shogoals and *gingerol* (Sekiwa *et al.,* 2000). It active component is *gingerol* which act as an anti- oxidant and is responsible for its taste (Witchl, 2004). However, ginger extract has recently been shown to have a variety of biological activities, including anti-inflammation, antimicrobial properties anti-platelet, antioxidant, anti-tumour, anti-rhinoviral, anti-hepatotoxic and anti-arthritic (Amin and Hamza, 2006). Although the beneficial effects of ginger has been exploited, however little research has been conducted on its activity on male reproductive functions. The study was designed to evaluate the effect of aqueous ginger extract on sperm count in wistar rats.

2. Materials and methods

2.1. Study location

The study was carried out in the Department of Human Physiology, Faculty of Medicine, Ahmadu Bello University, Zaria, Nigeria in the Month of September, 2009. The materials that were used include: HH-S Digital thermostatic water bath, syringes and needles, petridish, dissecting kit, slide and cover slips, Neubauer counting chamber, red blood pipette, beakers, funnels, measuring cylinder, dissecting boards, Electronic microscope.

2.2. Animals

A total of eighteen (18) male wistar rats that weighed approximately 150-200g were procured from the Animal House of the Department of Biological Science of Federal College of Education Zaria, Kaduna State, Nigeria. The animals were kept and maintained under laboratory condition of temperature, humidity and light, and were allowed to acclimatize for two weeks in the Department of Human Physiology Animal House before the commencement of the study. They were fed on standard commercial feeds (Vital feeds) with water *ad libitum.*

2.3. Collection and preparation of plant extract

Dry unpeeled ginger was purchased from Samaru market, Zaria Kaduna State, Nigeria. It was taken to the Herbarium unit of the Department of Biological Science, Ahmadu Bello University Zaria, where the plant was identified by Mal. M. Musa and a voucher specimen deposited. 40g of the ginger powder was put into 2.50ml conical flask and 200ml of distilled water was added into it. The mixture was shaken intermittently using mechanical shaker (SFI, Great Britain) at room temperature for 8 hours. The mixture was allowed to settle and then filtered using a filter paper (Whatmann size 1). The filtrate was transferred into a petri dish which was finally placed on (HH-S Digital thermostatic water bath) maintained at 30°C for a period of 8hrs to obtain 14g of dry

crude aqueous extract of ginger that was carefully stored until it was reconstituted in appropriate solvent for administration.

2.4. Experiment procedures

The animals were assigned into three (3) groups of six (6) animals each as follows: Group 1: Served as the control and received distilled water, Group 2: Received 50 mg/kg b w of aqueous ginger extract and Group 3: received 100mg/kg of aqueous ginger extract. The extract was administered once daily for a period of twenty eight (28) days.

2.5. Sperm count evaluation

This was determined by method described by Yokoi and Mayi, (2003). Briefly, rats were anaesthetized and dissected and the testes were carefully removed and transferred into petri dish. The adipose tissues, connective tissues and blood vessels were removed from the testes before they were washed with normal saline maintained at 37ºC to remove excess blood. A small incision was made on the caudal epididymis to get the sperm from it into a petri dish. One mL of diluted sperm suspension was made by adding normal saline and mixed thoroughly using a syringe to draw and release the mixture continuously. The sperm mixture was then sucked into a red blood cell pipette to the 0.5 mark, then normal saline was sucked up to the 101 mark. The normal saline in the stem of the pipette was discarded and the contents of the bulb of the pipette were mixed thoroughly. A drop of the mixture was placed on the Neubaeur counting chamber which then spreads under the cover slip by capillary action. The counting chamber was then mounted on the slide stage of a binocular light microscope using an adjustable light source and then viewed under ×10 magnification. The ruled part of the chamber was focused and the number of spermatozoa counted in five 16-celled squares. The sperm concentration will be calculated multiplied by 5 and expressed as [X] x 106 /ml, where [X] will be the number of spermatozoa in a 16-celled square.

2.6. Statistical analysis

The values obtained were represented as mean ± SEM. Data were analyzed using one-way analysis of variance (ANOVA) and group means were compared using the Tukey-Kramer Multiple Comparisons Test using GraphPad Instat® software. $P<0.05$ was considered statistically significant.

3. Results

Table 1 shows the mean values of sperm concentration of the control and experimental animals. The results obtained from the present study showed that at 50mg/kg b w of the extract treatment, the mean sperm count was significantly increased ($p<0.05$) from 3.150 ± 0.253 to 3.80 ± 0.146 when compared to the control group. There was also a significantly elevated ($p<0.05$) sperm concentration from 3.150 ±0.253 to 4.917±0.26 in the animals that received 100 mg/kg b w of the extract when compared to control group. This implies that the effects of the extract as observed in this study was in a dose dependent manner.

Table 1
Effect of aqueous ginger extract on mean (± SEM) Sperm concentration in male wistar rats

Treatment given	Sperm concentration (No of sperm/rat ×10^6)
Group1:Control and received water and feed	3.150 ± 0.253
Group 2: 50mg/kg b w of ginger	3.800 ± 0.146[a]
Group 3: 100mg/kg b w of ginger	4.917 ± 0.260[a]

Values are statistically significant when compared to control group at [a] $p < 0.05$ while ns =not significant.

4. Discussion

The use of ginger, and specifically its medicinally active rhizome, has gained popularity among modern physicians in recent years (Mascolo *et al.,* 1989). Ginger extracts have been extensively studied for a broad range

of biological activities, for example it has been reported to have a potent androgenic activity in male rats (Kamtchouing *et al.,* 2002). In our current work, the effect of graded doses of aqueous extract of ginger on sperm count was investigated. Our findings from the present study, showed that all doses of aqueous extract of ginger administerd to animals, resulted in significantly increased mean sperm count in the experimental animals when compared to the control group. However, this effect of the extract in boosting sperm count appeared to be in dose dependent fashion. This observed increase in sperm concentration is in agreement with the work of Zahedi *et al.,* (2010) who showed that ginger may increase sperm count through its antioxidant effects which is reflected by the increased levels of antioxidant enzymes, as well as through its androgenic activity which is also indicated by an elevated level of testosterone. However, the antioxidant activity of the extract and the serum testosterone levels in the studied animals were not determined in our current study. The result of our findings also agreed with the study of Nassiri *et al.,* (2009), who showed that administration of 50mg/kg b w and 100mg/kg b w ginger for twenty consecutive days significantly increased sperm count and motility. However, in other report by Khaki *et al.,* (2008) and Khaki *et al.,* (2009) showed that ginger treatment produced no significant increase on sperm count.

5. Conclusion

In conclusion, the present study has demonstrated that aqueous extract of ginger may possess an androgenic activity, thus, may have useful effects on spermatogenesis as shown by increased sperm count in animals studied.

6. Disclosure

The authors of this research work affirm that there is no conflict of interests in the publication of this article.

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