

Effect of Breadfruit (*Treculia africana*) Leaf Extract on Some Hormones in Male Wistar Rats

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Received: March 14, 2024; **Published:** March 21, 2024

Abstract

This study aims to investigate how breadfruit leaf extract affects the hormone profile: (Testosterone, follicle stimulating hormone (FSH), luteinizing hormone (LH) and prolactin) of male albino rats. Twenty (20) male albino wistar rats (200 - 220g final body weight) were randomly assigned into 2 groups of 10 rats each. Group I served as control while group II was administered 400 mg/kg body weight of breadfruit leaf extract for 28 days. The results showed that the levels of testosterone, FSH and LH were significantly increased in the group that received 400 mg/dl extract of breadfruit leaves when compared to control at $p < 0.05$. While prolactin was significantly decreased when compared with the control at $p < 0.05$. This result implies that the consumption of breadfruit leaf extract could enhance reproductive functions in male albino Wistar rats and is likely to increase fertility.

Keywords: Breadfruit; Testosterone; Follicle Stimulating Hormone (FSH); Luteinizing Hormone (LH); Prolactin; Male Albino Rats

Introduction

Chemicals known as hormones serve as the body's principal messengers. Special glands known as the endocrine glands secrete these substances. Throughout the body, these endocrine glands are located [1]. Both physical and mental health are governed by these messages. To keep the body's homeostasis in check, they are also very crucial [2].

Depending on how they are released, hormones might have different impacts. Thus, the impacts of signaling are various. Different kinds of hormones are produced by the body to control a variety of processes. Following is how they are categorized: The two types of hormones are peptide and steroid the amino acids that make up peptide hormones are water soluble. Due to a phospholipid bilayer that prevents any fat-insoluble compounds from diffusing into the cell, peptide hormones cannot pass through the cell membrane. The pancreas produces insulin, which is a significant peptide hormone. Steroid hormones can cross a cell membrane because they are fat-soluble, in contrast to peptide hormones. A few examples of steroid hormones are the sex hormones testosterone, estrogen and progesterone [3].

Any chemical that affects cellular activity to start, stop, or regulate a cellular process is, in fact, a hormone. Depending on the target, the site of action may be close by or far away. The paracrine, autocrine and intracrine processes through which hormones work are all possible. An increase in testosterone, a key component of spermatogenesis, is caused by a normal insulin concentration because it increases the production of the hormones LH and FSH. This effect has been associated with some therapeutic herbs [4].

For the Ibo ethnic group in Southeast Nigeria, African breadfruit is a delicacy and an underutilized food security crop. In Africa's West and Central regions, it is frequently seen. Approximately 20 - 30 pods carrying edible seeds are produced each year by this huge, evergreen tree. The Ibo tribe in south-eastern Nigeria uses edible seeds as a specialized food. Meals made using breadfruit from Africa are highly nutritious. Traditional medicine employs the pods, leaves and roots. Phytochemicals such as flavonoids, phenols, cardiac glycosides and anthraquinones, as well as minerals, are particularly abundant in the leaves. These ingredients support its wound healing, antibacterial and antioxidant effects. An antibacterial substance found in the stem bark extract is utilized as a cough medicine. The root's water and ethanolic extracts have hypoglycemic-lowering qualities and can help prevent type 2 diabetes secondary problems from occurring. Scientific research hasn't been done on a lot of the alleged chemical and therapeutic capabilities. Even though *Treculia africana* has enormous promise as a food security and medicinal crop, other members of the mulberry family, particularly the *Artocarpus* species, have gained considerable study interest [5].

A breadfruit tree is one. Foods made from breadfruit seeds and fruit are consumed. Making medication involves using the roots, leaves and latex. A tropical, evergreen tree with a height of up to 30 meters, *Treculia africana* is also known as the African breadfruit. It features a smooth, dark, gray-barked trunk with flutes, a dense, spreading crown and a dense, spreading crown. The thick bark's white, rusty-red latex is produced when it is chopped. The enormous, simple, asymmetrical leaves are a deep green color. The elder wood down to the trunk may have yellow-brown flowers that grow on the axis of the leaves. Massive, round, dense and rigid describe the fruits. Up to 8.5 kilograms of fruit per fruit can be found. The spongy pulp of each fruit is filled with many orange seeds. As a laxative, anthelmintic and febrifuge, the plant is also used medicinally to cure leprosy, swellings, coughs and other ailments. Both roasting and boiling are methods of cooking seeds. There is a non-alcoholic beverage created from powdered seeds. Food oil is also produced from the seeds. Because the leaves of the breadfruit are a fantastic source of green manure, they are employed in soil conservation programs. The wood is good for manufacturing furniture, carvings, turnery, inlay wood, fuel, and charcoal, as well as pulp and paper. Both seeds and stem cuttings can be used to develop plants [6].

Although there isn't enough solid scientific data to back up these claims, breadfruit is used for a variety of ailments including ear infections, back discomfort, wound healing and earaches. By reducing heart rate and reducing the force with which the heart contracts, breadfruit may reduce blood pressure. It's thought that breadfruit leaves have a lot of antioxidants in them. So, flavonoids, saponin, and tannin, which are also known as anti-diabetic, anti-inflammatory, and antiviral compounds, are present in breadfruit leaves. To break the chain of free radicals, chemicals in breadfruit leaves can bind to them and create more stable molecules. According to research, the antioxidants in breadfruit leaves can reduce oxidative stress and consequently lower the risk of infertility [7].

As a result of the breadfruit's rich nutritional content, breadfruit leaf extract is thought to have several possible health benefits. However, its effects on hormone concentrations have received little specialized scientific attention. To ascertain how breadfruit leaf extract affects hormones, this study was conducted.

Materials and Methods

Plant material: The breadfruit leaves were collected from Ndibinama Duruewuru Amucha Njaba LGA Imo state and authenticated at the Department of Plant Science, Imo State University Owerri Nigeria. The plant material was sun-dried for seven days. The dried leaves of breadfruits were milled to get a fine powder. The appropriate concentrations of the extract were made in distilled water for the experiment. Hence, the concentrations of 400 mg were prepared.

Experimental animals: Male albino wistar rats weighing between 200 to 220g were used for the study. The Wistar rats were kept in a laboratory animal unit with a 12-hour light/dark cycle. Throughout the experiment, the room temperature was maintained. Also, the rats were maintained on a standard chow diet and water *ad libitum*. After acclimatization, the rats were randomly grouped into 2 groups of ten

rats each. The first group of animals which served as normal control was given distilled water. Group II was given 400 mg of breadfruit leaf extracts. The duration of the experimental period was 28 days. In both groups, the administration of breadfruit leaf extracts was through an oral route. This treatment was by oral compulsion. All animals were allowed free access to food and water throughout the experiment.

Ethics: All experiments were conducted following the National Institute of health guide for the care and use of laboratory animals.

Blood collection: Twenty-four hours after the last dose of breadfruit leaf extracts was administered, the animals were anesthetized with chloroform vapour, quickly brought out of the jar, and sacrificed. Whole blood was collected by cardiac puncture from each animal into clean dry test tubes. The blood was allowed to clot for about 15 minutes and then spun in a Wester fuge centrifuge (model 1384) at 10,000g for 5 minutes. The serum was separated from the clot with a Pasteur pipette into sterile sample tubes for the measurement of the hormonal concentrations.

Biochemical analysis: Serum level of FSH, testosterone, LH, and prolactin was estimated using enzyme immunosorbent assay through kits.

Statistical analysis: The values were expressed as mean ± standard deviation. The student t-test was used to calculate the significant differences at P < 0.05.

Results

Parameters	Testosterone (mg/dl)	FSH (mg/dl)	LH (mg/dl)	Prolactin (mg/dl)
Control	54.31 ± 6.33	15.81 ± 2.51	35.40 ± 2.44	23.79 ± 2.39
Bread fruit	63.65 ± 7.05	18.01 ± 1.12*	87.99±1.32*	15.28 ± 4.88*

Table 1: The level of some serum testosterone, follicle stimulating hormone (FSH), luteinizing hormone (LH), and prolactin among wistar rats that were administered with breadfruit leaf extract (400 mg/kg).

Discussion

The advancement of herbal medicine in Nigeria has been greatly aided by using some plant components in the pharmaceutical industry [8]. One cannot overstate the importance of encouraging both men and women to become fertile, particularly in Igbo communities where marriages without children are abhorred. Although there aren't many chemical techniques for boosting fertility, they could have some unwanted side effects. According to the study's findings, rats given breadfruit leaf extract had considerably higher levels of blood LH, FSH and testosterone when compared to the controls. According to practitioners of traditional medicine, the impact of this plant as a libido enhancer or reproductive agent may be caused by an increase in testosterone. For adult males to have adequate sex drives, testosterone levels must be at their highest. An increase in testosterone levels can also result in an increase in spermatozoa, which increases male fertility. In contrast, in the study by Nnodim., *et al.* [9], *Xylopia aethiopica* led to reproductive failure. This suggests that breadfruit extract plays a significant function in the regulation of hormone levels, which enhances reproductive health. The rise in FSH and LH levels may be caused by several powerful compounds found in breadfruit extract, which promote the production and subsequent release of these hormones in the ovary and anterior pituitary gland [10,11]. While LH increases the regulation of female reproductive function, FSH is a crucial hormone that promotes spermatogenesis. In females, FSH promotes the development and maturation of ovarian follicles as well as the generation of E2 by granulosa cells, whereas LH promotes the production of androgen by theca cells and the ovulation of the dominant follicle [12,13]. Primary or secondary amenorrhea and an accompanying stop in follicle development at the pre-antral stage are clinical

symptoms of females who have FSHR gene mutations that result in loss of function [14-16]. Therefore, taking breadfruit leaf extract could have huge advantages because it will improve thermal function. The level of prolactin was found to have dramatically dropped in this investigation. The levels of prolactin and testosterone typically have an inverse relationship. The amount of testosterone rises when prolactin levels fall. This is consistent with the research by Ofem., *et al.* [17].

Conclusion

Increased serum levels of testosterone, FHS and LH brought on by breadfruit leaf extracts may enhance albino Wistar rat reproduction.

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Volume 19 Issue 4 April 2024

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