



**FERTILITY-ENHANCING POTENTIALS OF *IPOMOEA BATATAS*  
(SWEET POTATO) IN MALE ALBINO WISTAR RATS**

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**ABSTRACT**

This work is aimed at investigating the effects of *Ipomoea batatas* on fertility in male albino wistar rats. Fourteen adult male wistar rats weighing between 160g-200g were randomly assigned into two groups of 7 rats each. Group A (control) received 200g of animal feed per day, while Group B (Test group) received 120g animal feed thoroughly mixed with 80g dried ground *Ipomoea batatas* root tuber particles, daily for 60 days. The weights of the animals were taken weekly.

Fertility test was done by the natural mating method by cohabiting two mature fertile female rats with each male rat during the last ten days of treatment. The females were sacrificed after 7 days of separation from the males, and fertility parameters determined. On the 61<sup>st</sup> day, the male rats from each group were sacrificed and the testis and epididymis excised and weighed. Semen from the epididymis was analysed for sperm characteristics. The results in test group showed significant ( $P < 0.05$ ) increase in the following: weight of testis and epididymis, sperm motility, sperm count and sperm viability; with an insignificant ( $P > 0.05$ ) reduction in sperm abnormality. Also, there was a significant ( $P < 0.05$ ) increase in the number of pregnant female rats in test group, corresponding to 42.86% increase in fertility rate, compared to the control animals. It was concluded that prolong consumption of *Ipomoea batatas* enhances fertility in male wistar rats by improving the sperm quality.

**KEYWORDS:** Sweet Potato, *Ipomoea batatas*, Sperm Parameter, fertility.

## INTRODUCTION

Reproductive studies have undergone and continues to undergo some advancements. In the past, fertility alteration efforts in humans was focused mainly on the female with the male been an often neglected component. In recent times emphasis has been on evaluation of the male fertility as well. This has brought about the use of plants and plant preparations, with fertility-altering potentials, for fertility studies. The use of plant preparations and extracts as medicinal additives and food supplements have a long standing history dating back from the earliest days of man. Presently, its use has been accepted in both developed and developing countries, not just in Africa. Amongst these plants with potential medicinal and therapeutic effects is the *Ipomoea batatas* (sweet potato).

*Ipomoea batatas* L. (Lam.) from the family Convolvulaceae, is world's sixth largest food crop which is widely grown in tropical, subtropical and warm temperate regions.<sup>[1]</sup> It is widely cultivated and consumed throughout the world. The root (tuber) is edible while the leaves and shoots are eaten as vegetables. In traditional medicinal practice of South-West Nigeria, hot water infusions of the leaf and stem extracts of *Ipomoea batatas* is used to manage diabetes and control blood sugar.<sup>[2]</sup> Also, regular consumption of sweet potatoes have been reported to enhance the haematological and the immune systems.<sup>[3,4]</sup> However, similar reports on evaluation of its effects on male reproductive parameters is scanty, hence the purpose of this work.

## MATERIALS AND METHODS

**Extraction of Plant Material:** Purple *Ipomoea batatas* tubers were purchased at Choba Market in Port Harcourt and identified and authenticated by agronomist in the Department of crop and soil science, faculty of Agriculture, University of Port Harcourt. The purple sweet potatoes were washed clean, air dried, skin peeled off, and washed after peeling. They were sliced into chips and sun dried for 7 days. The dried chips were grounded into fine particles with an electric mill.

**Animal Models:** Fourteen male and twenty four female adult Wister albino rats weighing 160g-200g were bred in the Animal House unit of the Department of Human Physiology, Faculty of Basic Medical Sciences, University of Port Harcourt. The rats were maintained in a well ventilated animal house under optimum condition of humidity, temperature and a natural light-dark cycle. The animals were housed in clean wooden cages lined with wood

chip beddings. Standard pellet diet (Livestock feeds, Sapele, Nigeria) and water were given *ad libitum*. The males were kept in separate cages from the female.

**Experimental Design:** The male animals were divided into two groups of 7 animals each: Group A (control) and Group B (Test). They were allowed to acclimatize for seven days period during which they were fed with animal finisher feed and water *ad libitum*. After the acclimatization, Group A animals were daily fed with 200g of the animal feed, while Group B animals were daily fed with 120g of the animal feed thoroughly mixed with 80g of the sweet potato particles, for a period of 60 days.

**Body/ Organ Weights:** The initial body weight of all the animals was measured at the beginning of the experiment, continued weekly throughout the period of the study, and before sacrifice; while the weight of the testis and epididymis were measured after sacrificing the animals.

**Sperm Quality Analysis:** At the end of 60 days of treatment, the male rats were sacrificed with chloroform anaesthesia. Abdominal incision was made, the scrotum dissected to expose and excise the testis. The epididymis were trimmed off the testis. Semen was collected from the caudal epididymis by maceration through an incision made with a scalpel and spermatozoa characteristics such as motility, count, viability and morphology were analysed as earlier described.<sup>[5]</sup> Briefly, the sperm count was determined by routine procedure using an improved Neubauer haemocytometer, while viability was assessed by eosin-nigrosin dye exclusion test. Quantitative epididymal sperm motility was assessed by calculating motile spermatozoa per unit area and was expressed as percent motility. Sperm morphology was done using the wells and Awa stain and examined under the microscope.

**Fertility Testing:** Evaluation of male fertility was done naturally by cohabiting individual male rats in each group with untreated mature female rats in a male: female ratio of 1:2 for a period of 10 days, a period corresponding to two estrous cycles. Cohabiting commenced on the first day of the last ten days of treatment. The animals were left together to mate freely. Seven days after the cohabitation period, the females were sacrificed under light chloroform anesthesia and abdominal hysterectomy done. The number of litters in the uterus of each female were counted and fertility indices were then calculated. A male rat was considered fertile if he impregnated the female rat with which he cohabited.

**Statistical Analysis:** The results were statistically analyzed using the statistical package for Social Sciences Software (SPSS; version 17.0 USA). Differences between groups were examined by t-test test. The significant differences were determined at  $P \leq 0.05$ .

## RESULTS

**Organ Weight:** Results of the effect of *Ipomoea batatas* on the weight of reproductive organs of the rats (table 1) shows that there were significant increases in the weights of the testes ( $p < 0.05$ ) and epididymes ( $p = 0.01$ ) in animals in the test group when compared to the control group.

**Sperm Quality Analysis:** The results revealed a significant increase in sperm motility ( $P < 0.01$ ), sperm count ( $P < 0.01$ ), and sperm viability ( $P < 0.01$ ), as well as an insignificant ( $P > 0.05$ ) decrease in morphologically abnormal spermatozoa in rats in the treated group, compared to the control group (table 2).

**Table 1: Effect of *ipomea batatas* on the weights (Mean  $\pm$  SEM) of testis and epididymis in male wistar rats**

Group	Weight of testis (g)	Weight of epididymis (g)
Control	2.47 $\pm$ 0.78	0.35 $\pm$ 0.78
Test	2.70 $\pm$ 0.069	0.74 $\pm$ 0.104
P-value	0.04	0.01

**Table 2: Effect of *ipomea batatas* on Sperm Parameters (Mean  $\pm$  SEM) of Male Wistar Rats.**

Sperm parameter	Control	Test	P-value
Motility (%)	60.00 $\pm$ 2.58	83.00 $\pm$ 1.41	0.01
Count ( $10^6$ )	65.33 $\pm$ 5.93	89.50 $\pm$ 3.12	0.01
Abnormal morphology (%)	10.00 $\pm$ 1.83	<b>7.50<math>\pm</math>1.12</b>	0.20
Viability (%)	65.67 $\pm$ 1.48	86.17 $\pm$ 1.68	0.01

**Fertility Test:** Results of the fertility parameters for 60 days consumption of *Ipomoea batatas* (table 3) shows an increase in the number of pregnant female rats ( $P < 0.05$ ) as well as in the number of litters ( $P > 0.05$ ) in the test group, when compared to the control group animals. This corresponds to fertility rates of 58.33% and 83.33% for animals in the control and test groups respectively, showing a relative increase in fertility rate by 42.86% in the test animals, compared with the control animals.

**Table 3: Effect of *ipomea batatas* on fertility parameters in male wistar rats.**

Parameters	Control group (n=7)	Test group (n=7)	P-value
Total number of males mated	6	6	-
Total number of females mated	12	12	-
Number of pregnant females	7	10	0.03
Number of litters	7.60 ± 1.70	8.4 ± 1.10	0.20
*Fertility rate (%)	58.33%	83.33%	-

\*Fertility rate =number of pregnant females in a group/ number of mated females in the group

## DISCUSSION

In this study, consumption of *Ipomoea batatas* significantly increased the weight of the testis and epididymis as well as sperm quality in male rats. These effects may be due to its phyto-constituents. Studies show that sweet potatoes are rich in vitamins (B1, B2, C and E), minerals (calcium, magnesium, potassium and zinc), dietary fiber, and non-fibrous carbohydrates.<sup>[6]</sup> The roots and skin have been reported to contain high levels of polyphenols such as anthocyanins and phenolic acids such as caffeic acid'.<sup>[7]</sup> Phenols have been reported to stimulate the secretion of FSH and Testosterone;<sup>[8]</sup> while testis, epididymis and other reproductive organs are structurally and physiologically dependent upon testosterone, which stimulates growth and secretory activities of these reproductive organs.<sup>[9]</sup> This results in increase in testicular and epididymal weight, as observed in this study.

Also, testosterone and follicle stimulating hormone are known to stimulate and maintain the process of spermatogenesis and sperm maturation leading to increase in sperm count and the acquisition of motility and viability of the spermatozoa.<sup>[10]</sup> The resultant enhancement in sperm quality parameters, as observed in this study, has been associated with increased fertility.<sup>[11-13]</sup> This suggests that the observed increase in the number of pregnant rats, and in the fertility rate, in rats in the test group, was due to improvement in the sperm quality.

## CONCLUSION

This study has revealed that prolong intake of *Ipomoea batatas* enhances fertility in male rats by improving the sperm quality. This points to its potential as a fertility-enhancing food crop in humans, if properly explored.

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