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HISTOMORPHOLOGICAL STUDY ON THE SEMINAL VESICLES OF WISTAR RATS TREATED WITH AQUEOUS EXTRACT *Abelmoschus esculentus*

OBETEN K. E[1], ABUA E. N[1], ETUKUDO E. M[1], BWANGA B[2], KAFUMUKACHE E. B[3]

[1]Department of Anatomy, Faculty of Basic Medical Sciences, University of Cross River State, Nigeria

[2]Department of Anatomy, Faculty of Biomedical Sciences, Kampala International University, Uganda

[3]Department of Anatomy, Faculty of Medicine, Lusaka Apex Medical University, Zambia

Email: kobe@unicross.edu.ng, fredobeten@yahoo.com

Abstract

This research studied the seminal vesicle of Wistar rats treated with extract of *Abelmoschus esculentus*. 21 adult rats, divided into three groups were used. Control, low-dose, and high-dose groups were administered 1.0 mg/kg BW and 3.0 mg/kg BW of *Abelmoschus esculentus* extracts respectively. All experimental animals were sacrificed under cervical dislocation, 24 hours after the last administration. The seminal vesicles were harvested and processed histologically. Results showed a significant increase in the final body weights of all the animals compared with their initial body weights. Histological observation in control animals showed the epithelial folds in the mucosa and the smooth muscle layer appearing normal. Seminal vesicles of rats treated with low dose *Abelmoschus esculentus* showed foliation of epithelial folds of the mucosa with mild smooth muscle loss. The seminal vesicles of rats treated with high dose *Abelmoschus esculentus* showed mild epithelial dysplasia in the mucosa with a normal smooth muscle.

Keywords: *Abelmoschus esculentus,* Seminal vesicles, Wistar Rat.

1.0 Introduction

Recently, male reproductive health has become an increasingly focal point globally due to the growing incidence of reproductive disorders and the consequent impact on total fertility (De Jonge & Barratt, 2019). Seminal vesicles act as indispensable appendages of sex glands in the structure of the male reproductive system and represent the organ responsible for sperm production and storage (Shah *et al*., 2023). Histomorphology is the key study of these organs since it allows the

evaluation of the structural changes in such organs under various physiological and pathological conditions to determine possible implications for reproductive health (Machado-Neves, 222). However, despite the active study of male reproductive structure and the influence of natural plants on the seminal vesicle histology, some gaps remain. Okra, *Abelmoschus esculentus*, also known as ladies` finger, is used as a nutritional and medicinal fruit. Earlier studies have indicated possible pharmacological therapeutic effects of okra on various systems, including the morphological structure of the reproductive system (Sasikumar *et al.*, 2022, Sun *et al.*, 2022, Elkhalifa *et al.*, 2021).

Despite the regular use of *Abelmoschus esculentus*, there is a dearth of literature that provides a histomorphology evaluation of the seminal vesicles. The present study addresses this gap by examining the histological and gross morphological changes in the seminal vesicle of Wistar rats administered with an aqueous extract of *Abelmoschus esculentus*. Wistar rats were chosen based on their popularity as experimental models due to their reproductive physiology similarity to that of humans. Therefore, the present study utilized histological investigation and gross anatomical techniques to understand the effects of *Abelmoschus esculentus* on the cytoarchitecture of the seminal vesicles. This viewpoint is not only scientifically relevant but is also signified for the rational development of target-based therapeutics against male reproductive pathology.

2.0 Materials and methods

2.1 Extract preparation

The okra powder was dispensed in 15,000mls of distilled water in a plastic container; the mixture was vigorously stirred intermittently with a stick and then allowed to stand for 24 hours before it was filtered with a cloth sieve. The filtrate was evaporated at 45°C with a water bath to obtain the crude solid extract and the extract obtained was stored in the refrigerator until the commencement of the administration.

2.2 Experimental animals

Twenty-one (21) adults male Wistar rats, were purchased from the animal house of the Department of Human Anatomy, University of Cross River State (UNICROSS), Okuku campus, and were used for this study. The animals were randomly distributed into three (3) groups: Control, Low Dose, and High Dose, with seven (7) animals for each group. The animals were acclimatized for two (2) weeks. They were housed in Perspex cages under controlled light (12 hours daylight cycle and 12 hours dark cycle) and were fed with standard growers' vital feed and water before the start of the administration.

2.3 Experimental design

The 21 experimental animals were allotted into three groups consisting of seven animals in each group.

Group A (Control) animals received food and water only.

Group B (Low Dose) animals received food, water, and an extract of *Abelmoschus esculentus* at a dose of 1.0 mg/Kg BW.

Group C (high-dose) animals received food, water, and an extract of *Abelmoschus esculentus* at a dose of 3.0 mg/Kg BW.

2.3 Termination of the experiment

At the end of the two (2) weeks of administration of the aqueous extract of *Abelmoschus esculentus*, animals in all groups were sacrificed a day after the end of

the administration by cervical dislocation. The seminal vesicles of animals from each group were removed and washed with 10% formalin.

3.0 Result

3.1 Gross measurement of body weight

The measurement from the study showed an observable significant ($p<0.05$) increase in the final mean body weight when compared with the initial body weight observable in control vs low dose, control vs high dose, and low dose vs control but not observable in low dose vs high dose and high dose vs control dose. The final body weight of the control animals (133.9±7.058) was significantly ($p<0.05$) higher than the initial body weight (111.4±8.162). However, the mean final body weight of the low-dose group (142.3±4.716) and high-dose group (145.7±4.786) were significantly ($p<0.05$) higher than their initial body weights (128.0±6.856) and (130.3±6.157) respectively.

3.2 Histological observation of the Seminal Vesicle

The histological observation on Hematoxylin and Eosin (H&E) stained sections of seminal vesicles revealed normal epithelial folds in the mucosa (M) and the smooth muscle layer (SM) in control animals (Plate 1) when compared to the low-dose animals (receiving 1.0 mg/kg BW *Abelmoschus esculentus*) which showed foliation of epithelial folds of the mucosa (M) with mild smooth muscle (SM) loss (Plate 2).

Comparing the seminal vesicles of control rats and high-dose rats (receiving 3.0 mg/kg BW *Abelmoschus esculentus*), normal epithelial folds in the mucosa (M) alongside smooth muscle layer (SM) were seen in control rats (Plate 3), while mild epithelial dysplasia in the mucosa (M) and normal smooth muscle (SM) layer were seen in high-dose rats (Plate 4).

Table 1: Initial and final body weights of animals in various experimental groups

Animal groups	Initial Body weights (kg BW)	Final Body weights (kg BW)
Control	111.4 ± 8.162	133.9 ± 7.058
Low dose	128.0 ± 6.856	142.3 ± 4.716
High dose	130.3 ± 6.157	145.7 ± 4.786

Values are presented as Mean ± SEM

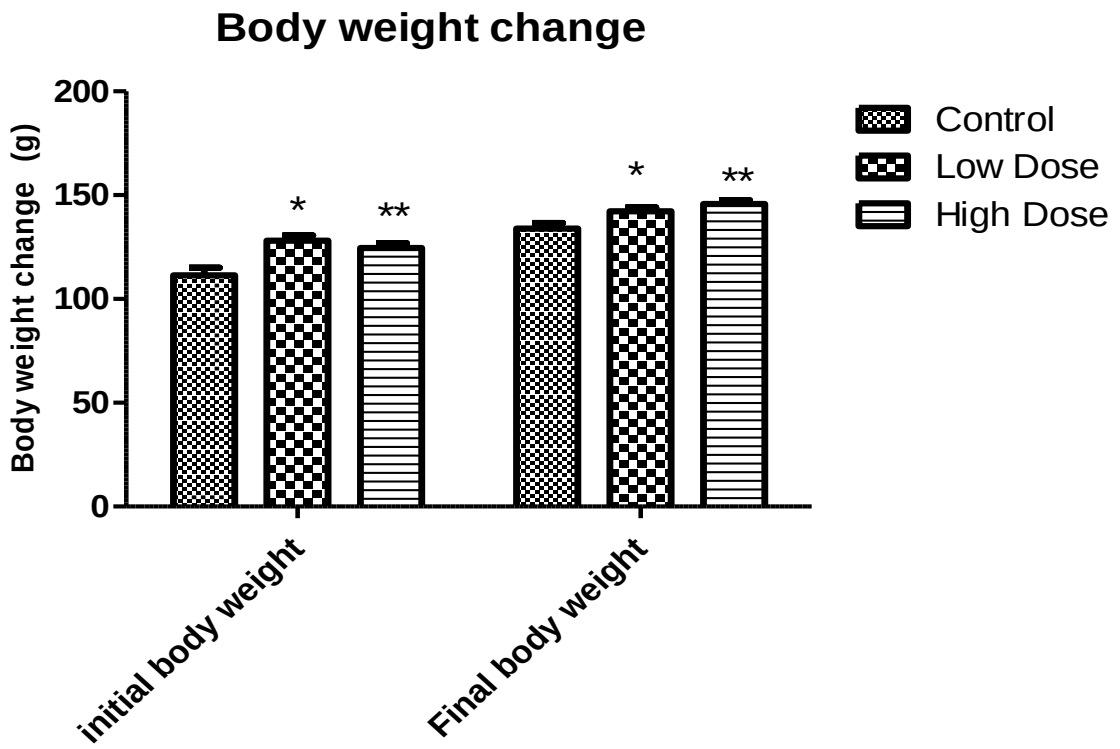

Figure 2: s 1owing effect of daily administration of *Abelmoschus esculentus* on male Wistar rats
Values are expressed in Mean +SEM, n=7, p<0.05
****=P<0.05 vs control**

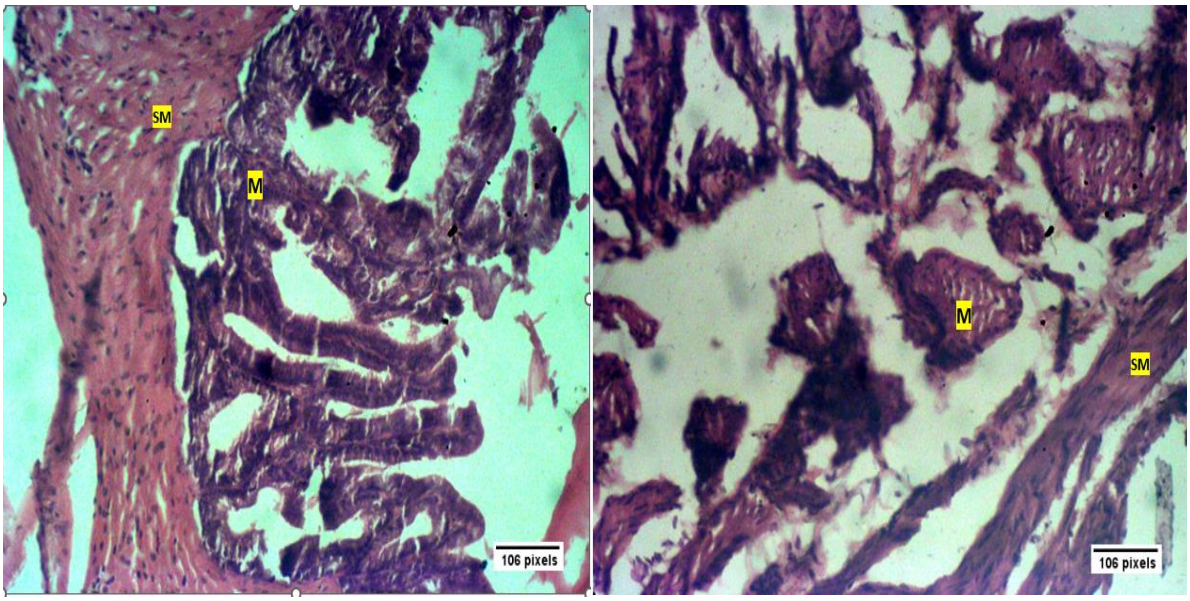

Plate 1: Photomicrograph of the control group showing the epithelial folds in the mucosa (M) and the smooth muscle layer (SM) appearing normal. **H & E. X100**

Plate 2: Photomicrograph of the low dose showing foliation of epithelial folds of the mucosa (M) with mild smooth muscle (SM) loss. **H & E. X100**

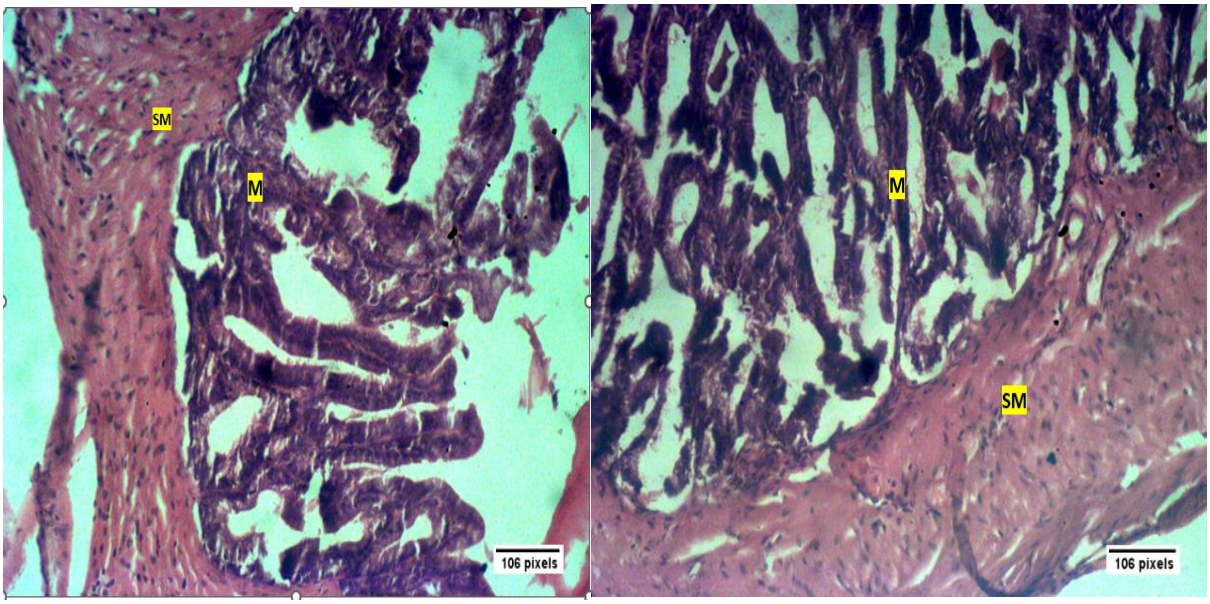

Plate 3: Photomicrograph of the control group showing the epithelial folds in the mucosa (M) and the smooth muscle layer (SM) appearing normal. **H & E. X100**

Plate 4: Photomicrograph of the high dose group showing mild epithelial dysplasia in the mucosa (M) while the smooth muscle (SM) layer appears normal. **H & E. X100**

4.0 Discussion

The increase in final body weight observed in *Abelmoschus esculentus* extract (AEE) treated rats is congruent with other works that have evidenced the impact of natural extracts on weight control among experimental animals (Haque *et al*., 2022). Indeed, several investigations involving distinct herbal extracts or individual bioactive compounds have returned a difference in body weight in rodents compared to their respective controls (Hui *et al*., 2023, Nikpayam *et al*., 2022). Nonetheless, the absence of significant differences in body weight between the low and high-dose groups is in contrast with similar studies indicating that several such works have shown such results, considering not only the origin of extracts but also the compounds isolated and used (Haque *et al*., 2022, Ebenezer *et al*., 2022, Rafeeq *et al*., 2020). The observed rise in body weight might be due to AEE's possible metabolic effects, which could have implications for its usage in weight control or metabolic diseases as supported by Nikpayam et al., (2022). However, more metabolic and biochemical evaluations would be required to understand the underlying processes causing this weight shift and to identify any potential side effects. This study's histological studies of seminal vesicles indicate remarkable alterations in epithelial folds and smooth muscle layers in response to AEE. The low-dose group had foliation of epithelial folds and modest smooth muscle loss, whereas the high-dose group had mild epithelial dysplasia and normal smooth muscle layers. These findings

indicate a dose-dependent influence on the histomorphology of seminal vesicles after treatment with the extract. Histological alterations in the seminal vesicles, such as epithelial dysplasia and smooth muscle modifications, underline the importance of exercising caution while administering AEE, particularly in terms of its influence on male reproductive health (Dikko *et al.*, 2018, Olorunnisola *et al.*, 2018). These findings call for additional exploration into the biochemical and molecular processes implicated in these histomorphological changes to better understand the extract's safety profile and therapeutic potential.

The study's strength is its distinct histomorphological assessment of seminal vesicles after treatment with AEE, which provides unique insights into potential structural alterations in this reproductive organ. The study's limitations include a lack of further functional assessments for male reproductive factors such as sperm quality, hormone levels, and reproductive behavior. Incorporating such assessments would reinforce the study's results and offer a more complete picture of the extract's impact on male reproductive health.

Future research should focus on conducting longitudinal studies to assess the long-term effects of AEE on body weight regulation and male reproductive parameters. Investigating the extract's mechanisms of action at the molecular level, exploring its potential interactions with hormonal pathways, and evaluating its safety in prolonged use would be valuable directions for further investigation.

5.0 Conclusion

Our study highlights the potential metabolic effects of *Abelmoschus esculentus* extract, as evidenced by significant increases in body weight in treated rats. Histological findings revealed dose-dependent changes in seminal vesicles, indicating the need for further research to elucidate both the therapeutic benefits when taken moderately and the potential risks of this natural plant when taken in high quantity; in male reproductive health.

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