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# Histological studies of the effects of oral administration of Damiana (*Turnera diffusa*) on the kidneys of matured Wistar rats

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ABSTRACT: Histological studies of the effects of oral administration of Damiana extract on the kidney of matured Wistar rats were carried out. This study involved the oral administration of 0.52mg of Damiana extract daily on various days. The experimental animals were randomly divided into four groups (A,B,C,D) of five each with the D as control. The rats in group A received 0.52mg in 1ml of Damiana extract for a day, those in group B received 0.52mg Damiana extract in 1ml daily for a period of five days, while those in group C got 0.52mg./ml Damiana for ten days. The animals were sacrificed at the end of each experiment and the kidney sections were obtained and fixed for routine histological investigation.

Histological changes observed in the treated kidney sections included the distortion of the renal cortical structures, reduced size and numbers of the renal corpuscles, and some degree of cellular necrosis. Our results suggested that the functions of the kidney could have been adversely affected due to the distortion of the cytoarchitecture of the renal cortical structures and cellular necrosis associated with the kidney. It is recommended that further studies aimed at corroborating these observations be carried out.

Key Words: Damiana; *Turnera diffusa; Turnera aphrodisiaca*; Histology; Cytoarchitecture.

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## Introduction

Damiana is a small shrub that grows 1-2m high and bears aromatic, serrate leaves that are 10-25cm long. It is found throughout Mexico, Central America, West Indies and some part of South America with the leaves as the medicinal part.[1] Damiana is known botanically as *Turnera diffusa* or *Turnera aphrodesiaca*.[2]

Damiana acts as an aphrodisiac performing functions antidepressant, tonic, diuretic, antitussive and mild laxative. It also has hypoglycemic effect in the body.[3] The effect of damiana as an aphrodisiac has been reported clinically. Damiana was used as an aphrodisiac in the ancient Mayan civilization as well as for treatment of 'giddiness' and loss of balance.[4] It has been found to improve sperm count in males and strengthen the egg in females.[5] It has also been proven to overcome natural inhibitors of human sexual response and allows for improved responses and psychological effects.[6]

Damiana effects on females include balancing of hormonal level, control of hot flushes, relieving anxiety, depression, headaches during menstruation and exhaustion.[7,8] It has further been observed clinically that Damiana, ingested in excess can cause damage to the liver as similar to alcohol effect.[9]

In Germany, Damiana is taken to relieve excess mental activity, nervous debility, tonic for hormonal and central nervous system.[2] While in Holland, it is known for its sexual enhancing qualities and its positive effect on the reproductive organs.[5] Damiana is widely available in most health food and natural product stores in a variety of forms from tea blends, capsule, tablets to liquid, it has a traditional use as abortive plant and it is contraindicated during pregnancy.

In Mexico, the plant is also used for asthma, bronchitis, neurosis, diabetes, dysentery, dysmenorrheal, headaches and dyspepsia.[11]

Kidney is a paired organ located in the posterior abdominal wall, whose functions include the removal of waste products from the blood and regulation of the amount of fluid and electrolytes balance in the body. As in humans, the majority of drugs administered are eliminated by a combination of hepatic metabolism and renal excretion.[12] The kidney also plays a major role in drug metabolism, but its major importance to drugs is still its excretory functions. Since the kidney is involved in the excretion of many toxic metabolic waste products, particularly the nitrogenous compounds, it would therefore be worthwhile to examine the effects of damiana (*Turnera diffusa*) on the kidney of adult Wistar rat.

## Materials and Methods

### *Animals*

Twenty adult Wistar rats were used from the breed rats in the Animal holdings of Department of Anatomy, University of Ilorin, Kwara State, Nigeria. The animals were fed with rat pellets obtained from Ladokuv Feeds Lth, Ibadan and were given water liberally. The animals were housed and maintained in the animal holdings of Department of Anatomy, University of Ilorin until they gained maximum acclimatization and weighed between 180-220g. They were randomly divided into four groups of five rats each. Group A, B, and C were used as experimental while group D as control animals.

### *Drug Administration*

The stock solution of Turnera diffusa was obtained by dissolving 0.052g of Turnera diffusa (Damiana) leaves obtained from the capsule in 100ml of distilled water. The animals in group A, B and C were given 1ml of the stocked solution daily considering the therapeutic dose of 3.6mg/kg body weight while animals in group D (control) were given equal volume of distilled water daily for the period of the experiment. Animals in group A were sacrificed twenty-four hours (24 hours) after the first day treatment, those in group B and C were sacrificed on the sixth and eleventh day of treatment respectively. The control group animals were also sacrificed at the end of the experiment.

All the sacrificed animals in each group were quickly dissected, the kidney tissues were removed and fixed in an appropriate fixative (10% formal saline) for histological study.

*Histological Study*

The fixed kidney tissues were dehydrated in an ascending grade of alcohol (ethanol), cleared in xylene and embedded in paraffin wax. Serial sections of 7 microns thick were obtained, using a rotatory microtome and the paraffin sections were stained routinely with Haematoxyline and Eosin. Photomicrographs of the desired sections were made for further observation.

## Results

The micrograph of the kidney in the control group (D) showed normal histological features. The section indicated a detailed cortical parenchyma and the renal corpuscles appeared as dense rounded structures with the glomerulus surrounded by a narrow Bowman's spaces. (Fig.1)

The kidney of the animals in group A treated with 0.52mg/ml of *Turnera diffusa* for a day revealed that the renal corpuscles (RC) and the Bowman's space were still clearly intact. There was no significant difference from that of the control group. (Fig.2)

The kidney sections of animals in group B treated with 0.52mg/ml of *Turnera diffusa* daily for five days revealed some level of cytoarchitectural distortion of the cortical structures and reduce number of renal corpuscles as compared with the control. (Fig.3)

The kidney sections of animals in group C treated with 0.52mg/ml of *Turnera diffusa* daily for ten days revealed marked distortion of cytoarchitecture; distortion of the renal cortical structures. The renal corpuscles were less identified and the Bowman's spaces were sparsely distributed as compared to the control group.

## Discussion

This study showed that administration of Damiana extract caused varying degrees of cyto-architectural distortion and reduction in the number of renal corpuscles in the treated groups which was at variance with that of the control group. The necrosis observed is probably due to the high concentration of the Damiana extract on the kidney. Pathological or accidental cell death is regarded necrotic and could result from extrinsic insults to the cell as osmotic thermal, toxic and traumatic effects.[13] Physiological cell death is regarded as apoptotic and organized programmed cell death (PCD) that is mediated by active and intrinsic mechanisms. The process of cellular necrosis involves disruption of membranes, as well as structural and functional integrity. Cellular necrosis is not induced by stimuli intrinsic to the cells as in programmed cell death (PCD), but by an abrupt environmental perturbation and departure from the normal physiological conditions.[14] It has been reported that Damiana extract causes disruption of the cytoarchitecture of the liver in adult Wistar rats, and that these findings might probably have an adverse effect on the normal functions of the liver.[15]

The experiment also revealed some histological abnormalities and cytoarchitectural distortion of the renal cortical structures, which may be ascribed to the effects of the Damiana extract on the kidney. The renal cortical structures are distorted as against that of the control rats. The results of this experiment suggest that the distortion of the cytoarchitecture of the kidney could have been associated with functional changes that may have been detrimental to the health status of the animal. The reduction in the number and size of the renal corpuscle as shown in this experiment may have been due to the interference of the Damiana extract on the kidney.

In cellular necrosis, the rate of progression depends on the severity of the environmental insults. The greater the severity of the insults the more rapid the progression of neuronal injury.[16] The principal holds true for toxicological insult to the brain and other organs.[17] It may have been inferred from the present study that prolonged administration of Damiana resulted in increased toxic effect on the kidney. It has been reported that Damiana may have the same effect as alcohol. The effect of alcohol on the liver is the cirrhosis, which can be described as the disorganization of the liver structure.[9,15,18] The kidney sections treated for ten days were most severely affected in this experiment.

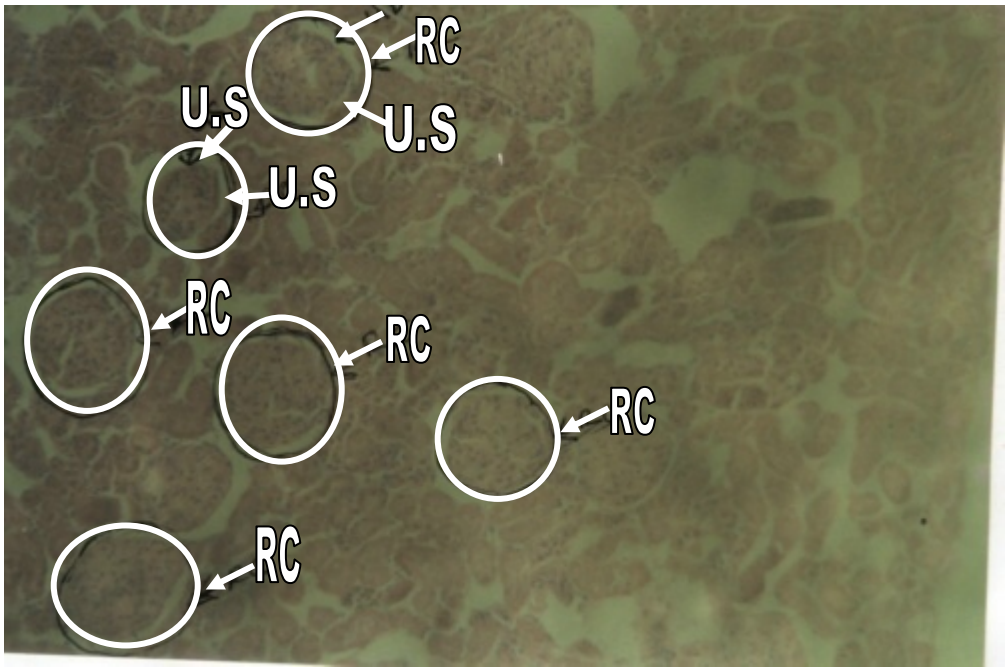


Fig.1: Photomicrograph of the kidney of control animals (Group D)
(H & E method x200)

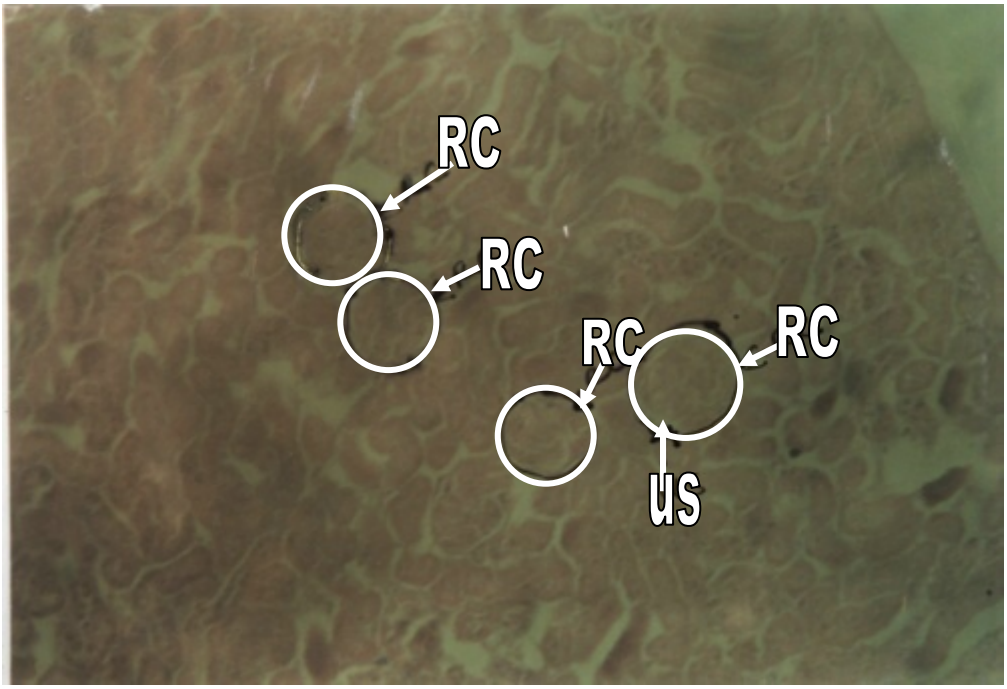


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Fig.2: Photomicrograph of the kidney of the Rat treated with 0.52mg/ml of Damiana Exract for One Day (Group A).
(H & E method x200)

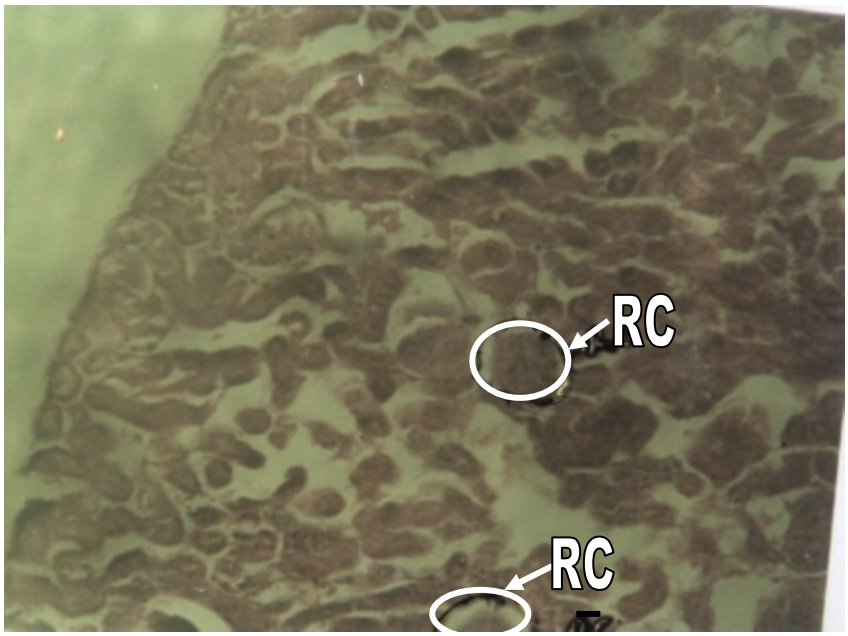


Fig.3: Photomicrograph of the kidney of the Rat treated with 0.52mg/ml of Damiana Exract daily for Five Days (Group B). (H & E method x200)

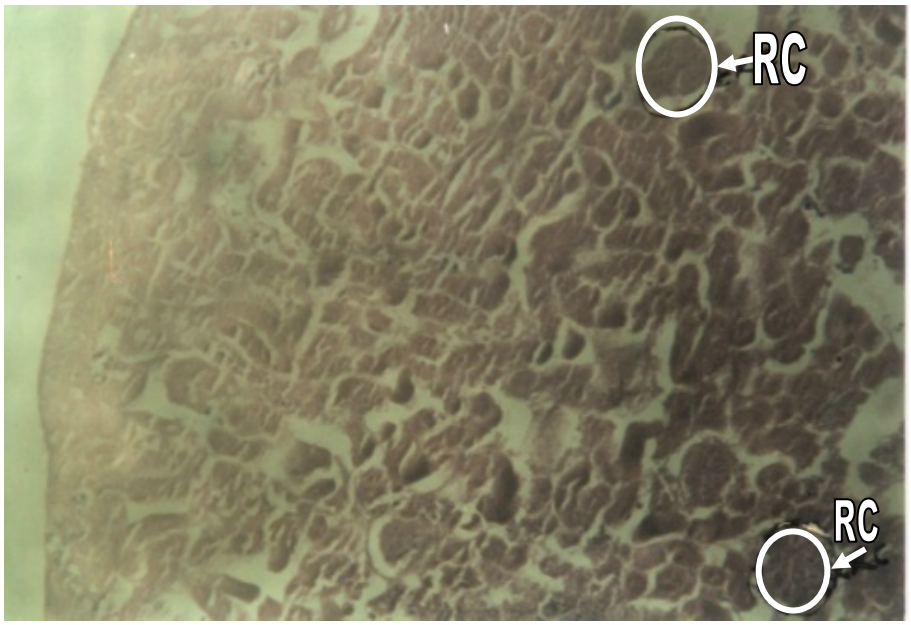


Fig.4: Photomicrograph of the kidney of the Rat treated with 0.52mg/ml of Damiana Exract daily for Ten Days (Group C). (H & E method x200)

*Conclusion and Recommendation*

In conclusion, our study revealed that Damiana extracts disrupts and distorts the cytoarchitcture of the kidney. This resulted in the cellular necrosis, and sparsely distribution of the Bowman's spaces. With these results, it is probable that the functions of the kidney may be adversely affected. It is recommended that further studies be carried out to examine these findings.

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