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Impact of Ethanol Extract of *Lasianthera Africana* Leaf on Kidney Function Biomarkers of Testosterone Propionate-Induced Prostatitis in Male Wistar Rats

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Abstract:- The impact of the ethanol extract of the plant on kidney function markers of Testosterone propionate induced prostatitis were studied and the PSA level of the male wistar rats used was also studied. Thirty male wistar rats were grouped into six groups (group1-6) of five rats each. Normal water and the rat feeds were given to rats in group 1 *ad libitum* and they were not treated. Prostatitis was induced to the rats in groups 2 to 6 for four days after which treatment commenced for 28 days. The reference drug (Contiflo XL (400µg)) was administered to Group 3, the rats in groups 4 and 5 received 100mg and 200mg of the plant extract respectively while group 6 were administered a combined dose of 100mg of plant extract and contiflo XL. Qualitative phytochemical analysis of the plant leaf revealed the presence of polyphenols (+++), alkaloids (+++), saponins (++), tannins (++) and flavonoids (+). The PSA Level that was observed to be increased after induction of prostatitis in group2 was significantly decreased when 200mg of the leaf ethanol extract of the plant was administered to group 4. The other groups (3, 5 and 6) were also decreased when compared to group 2. For all the kidney function biomarkers analyzed, a significant increase was observed in group2 when compared with group 1. After the period of treatment, urea, creatinine and the electrolytes (Na^+, Cl^-, K^+ and HCO_3^-) were observed to be significantly decreased when 100mg of the extract was administered showing the much potency it has in the disease management except for bicarbonate where 200mg of the extract had more potency. This study has revealed that the plant leaf ethanol extract is suitable for the management of prostatitis and has ameliorative effect on the kidney function biomarkers of male wistar rats induced with prostatitis.

Keywords:- *Testosterone Propionate, Lasianthera Africana, Kidney, Prostatitis.*

I. INTRODUCTION

A healthy kidneys carries out its function by filtering about a half cup of blood every minute, removing wastes and extra water to make urine thereby maintaining the homeostatic balance of body fluids. The urine flows from the kidneys to the bladder through two thin tubes of muscle called ureters, one on each side of your bladder. The bladder stores urine. The kidneys, ureters, and bladder are part of your urinary tract. The kidneys also remove acid that is produced by the cells of the body and maintain a healthy balance of water, salts, and minerals—such as sodium, calcium, phosphorus, and potassium—in the blood. Without this balance, nerves, muscles, and other tissues in the body may not work normally.

The kidneys also make hormones that help to control your blood pressure, keep your bones strong and healthy.

Biochemical markers play an important role in accurate diagnosis and in assessing risk and adopting therapy to improve clinical outcome (Pandya *et al*., 2016). Also, the kidney function markers help to detect any kidney-related health condition that one might have and to ensure the kidney function properly.

Prostatitis is a disorder of the prostate gland usually associated with inflammation and it causes a painful or difficult urination, as well as pain in the groin, pelvic area or genitals. It is the most common urological diagnosis in young men under 50 years after benign prostatic hyperplasia and prostate cancer. And, the primary causes of the illness such as infections, immunologic status, urine reflux, and mental stress have been identified (Suárez & Maya, 2021).

Rabeea *et al*., (2021) in their study stated that prostatitis is also one of the deadliest cancers in the universe especially in Africa and it can occur at any age, after its enlargement, even as it puts pressure on the urinary tracts and causes urinary symptoms and the factors influencing the prevalence of prostatitis are: age, genetic, diet, cancer, hormonal factors, and environmental factors. A microbial infection often can also cause prostatitis (Rabeea *et al*., 2021)

The Prostate cancer is the second most common cancer in men. An estimated 1.1 million cases were diagnosed worldwide with prostrate cancer in 2012, accounting for 15% of the cancers diagnosed in men (Bicakliglu *et al*., 2021).

Anatomically, the prostate gland is located in the abdomen, in front of the rectum and between the penis and bladder. It is involved in regulating the sperm count in men and it's excreted through the urethra through the prostate like urine, through the penis. The human prostate is a compact

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walnut-sized musculo-gladular organ in contact with the inferior surface of the bladder, and it weighs about 20gm in adult makes and forms part of the males' reproductive system. The gland us made up of two lobes or region, enclosed by an outer layer of tissue and is located in front of the rectum and just below the bladder. It also surrounds the urethra (Leissner and Tisell, 2012).

The primary function of the prostate is to contribute prostatic fluid to semen. The prostate contributes 20–30%Trusted Source of fluid to the total semen volume. The remainder comes from the seminal vesicles (50–65%) and the testicles (5%). Prostatic fluid contains components that make semen an ideal substance for sperm cells to live in, including enzymes, zinc, and citric acid. One important enzyme is prostate-specific antigen (PSA), which helps make the semen thinner and more fluid. The fluid in semen helps the sperm travel down the urethra and survive the journey towards an egg, which is essential for reproduction. Prostatic fluid is slightly acidic, but other components of semen make it alkaline overall. This is to counteract the acidity of the vagina and protect the sperm from damage (Coward, 2023).

Also the prostate needs androgens, which are male sex hormones, such as testosterone, to function correctly. The prostate contains an enzyme called 5-alpha reductase, which converts testosterone Trusted Source into a biologically active form called dihydrotestosterone (DHT). This hormone is important Trusted Source for normal prostate development and function. In the developing male, it is crucial for the development of secondary sex characteristics, such as facial hair (Coward, 2023).

According to Okonwu & Osuji, (2018), *Lasianthera africana* is an edible rainforest plant of african origin and belongs to the family *Icacinaceae*. It is widely distributed in the tropical rainforest and is a perennial glaborous shrub that reaches a height of 61 to 136 cm. It is found in southern Nigeria and other tropical countries such as Western Cameroon, Angola, Niger, Guinea, Gabon, Equatorial Guinea, and Congo. The leaves are consumed as vegetables in southern Nigeria and it is one of the majorly consumed green leafy vegetables by the Efik and Ibibio ethnic groups of Nigeria including the Etche ethnic group of Rivers state. *Lasianthera africana* is commonly referred to as "Editan" in Efik and Ibibio local dialects and "Nkanka" in Etche. Traditionally, the leaves are used for both food and therapeutic purposes (Inyang *et al*., 2015). The leaves of *lasianthera africana* are rich sources of nutrition and medicine to humans and in rural communities, the consumption of the leaf is high during the dry season when most vegetables are in short supply (Okonwu & Osuji, 2018).

Ekpo & Anorue, (2020) opined in their research that some of the pharmacological benefits of the plant "*Lasianthera africana*" include the following properties which they exhibits and are useful to the body. The properties include, but are not limited to;

- Analgesic,
- Antimalarial and anti-ulcerogenic properties,
- Antimicrobial
- Anti-diabetic, Anti-inflammatory property, Antioxidant etc.

The pharmaceutical and medicinal values of the applied medicinal plants are in the bioactive phytochemical constituents that produce specific physiological action on the human body. Some of the most important bioactive constituents are saponins, flavonoids, and alkaloids. These naturally occurring compounds form the backbone of modern medicine or drugs. (Gedlu, 2022).

From several studies, the phytochemicals seen in the leaves of *Lasianthera africana* plant showed the Presence of Alkaloids, Glycosides, Saponins, Tannins, Phlobatannins, Flavonoid and Terpenes; of which this phytochemicals shows that the plant contains important class of bioactive substances frequently employed as the starting materials for the synthesis of some useful drugs (Ekanem *et al*., 2016).

II. MATERIALS AND METHOD

➢ *Reagents and Chemicals*

The chemicals and reagents used are of analytical grade.

➢ *Equipment*

- Spectrophotometer
- Test tubes
- Water-bath
- Centrifuge.
- Warring blender
- Soxlet extractor
- Rotary Evaporator

➢ *Purchase of Laboratory Animals*

Thirty (30) male wistar rats weighing between 150-200g were purchased from the Animal house in Faculty of Agriculture, River State University and were used for the study.

The animals were acclamatized for 7days (1week) before the treatment commenced.

➢ *Purchase of Drugs*

The Testosterone propionate drug which was used to induce Prostatitis was purchased from Sigma Company in Lagos while, the Reference Drugs, Contiflo XL (400µg) was purchased from Dooka Pharmacy opposite University of Port Harcourt, UPTH.

➢ *Collection and Identification of Plant Material.*

Fresh leaves of *Lasianthera africana* were collected from Atali playground, Obio/Akpor LGA Rivers State, Nigeria. The plant was identified by a Plant taxonomist in the Department of Plant Science and Biotechnology in River State University, Nigeria.

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➢ *Preparation of Ethanol Extract of the Plant*

The leaves of *Lasianthera africana* were properly washed with deionized water to remove dirt. The leaves were sun-dried for seven days and pulverized using warring blender.

The extraction was done using soxlet extractor for continuous extraction processes with Absolute Ethanol as the extracting solvent. A weighed portion of the pulverized sample (200g) was placed in a sample compartment and 1000ml of absolute Ethanol (BDH Chemicals) was used against it for 72 hours. The supernatant were sent to the rotary evaporator. The extracts were concentrated using rotary evaporator set at 60°C. The sample was then prepared in accordance with ISO17025 using oxidizer.

➢ *Induction of Prostatitis using Testosterone Propionate*

In order to induce prostatitis in the male wistar rats, the drug Testosterone propionate (TP) was utilized. The drugs Testosterone propionate (3mg/kg) was administered for a duration of four days prior to the initiation of treatment. The process involved first dissolving the measured amount of Testosterone propionate in Olive oil before administering it to the rats.

The process of administering testosterone propionate drugs involved measuring 0.75g of the drug and dissolving it in 75ml of olive oil to get the stock solution. Once dissolved, 0.5ml of the solution was administered to each male wistar rat for a period of four days. After the four-day administration period, three male wistar rats that were already added to the groups for this purpose were randomly selected from each group and sacrificed. Their blood samples were collected in a heparin sample bottle and taken to the laboratory to test for their PSA (Prostate specific-antigen) levels.

➢ *Administration of Ethanol Extracts*

In order to administer the Ethanol extracts, it was first necessary to dilute it with distilled water and a precise measurement of 0.5ml of the extract was carefully given to each of the rats in groups 4, 5, and 6. This step was crucial in ensuring that each animal received an equal amount of the extract, allowing for accurate and reliable data collection during subsequent observations and analyses.

➢ *Preparation and Administration of the Stock Solution for Contiflo XL (400µg)*

In this experiment, the reference drug Contiflo XL was dissolved in distilled water. To determine the appropriate dosage for the rats, the 400 micrograms of Contiflo XL was first converted to milligrams per kilogram of body weight and then divided by the weight of the rats. The resulting dosage was found to be 0.022 milligrams per kilogram. This dosage was then diluted in 13 milliliters of distilled water, and 0.1 milliliters of Contiflo XL solution were administered to rats in groups 3 and 6 for a period of 28 days. By using distilled water as a solvent, we ensured that any observed effects were due solely to the drug itself, rather than any contaminants present in the solvent.

➢ *Experimental Animal Design.*

The thirty (30) male wistar rats were divided into six (6) groups with five (5) rats distributed to each groups. These animals were selected and divided into the experimental groups.

After 28 days of administration of the ethanol extracts of the plant and the drugs. They were anesthetized by exposure to chloroform and was painlessly sacrificed.

After which, the blood samples were collected into the lithium heparin sample bottles and was centrifuged at 1000ref for 10mins. Then, the serum was collected and stored in the refrigerator for subsequent analysis.

Table 1: Experimental Design Showing Groups and Treatment

GROUP	TREATMENT
Group 1	Control: Only feeds and water
Group 2	Testosterone propionate induced without treatment
Group 3	Testosterone propionate + Contiflo- XL400µg
Group 4	Testosterone propionate + 100mg of Ethanol *Lasianthera africana* leaf extract
Group 5	Testosterone propionate + 200mg of Ethanol *Lasianthera africana* leaf extract.
Group 6	Testosterone propionate + 100mg of Ethanol *Lasianthera africana* leaf extract + Contiflo-XL400µg

➢ *Phytochemical Analysis*

The Phytochemicals of interest were determined using the method of Anacletus *et al.*, 2021.

➢ *Determination of Serum Total Prostate Specific Antigen (tPSA) Activity.*

The serum activity of Total Prostate Specific Antigen (tPSA) was determined using AccuBind ELISA test system (Monobind Inc., Lake Forest, California, USA).

➢ *Analysis of Kidney Function Biomarkers*

The Kidney function markers were assessed (Serum Creatinine, Urea and Electrolytes concentration such as, Sodium (Na), Potassium (K), Chloride and Bicarbonates using diagnostic test kits and by the methods of Nwauche *et al.*, 2019.

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➢ *Statistical Analysis*

After all analyses were done, all data gotten from the research were analyzed for statistical difference using Statistical Product and Service Solutions (SPSS) software, version 25. The results were expressed, as mean ± standard deviation of measurements. Mean value with $p \leq 0.05$ were considered statistically significant.

III. RESULTS AND DISCUSSION

A. Results

Table 2: Qualitative Screening for Phytochemical Components in *L*asianthera *Africana*

Sr. no	Components	*Lasianthera africana*
1	Flavanoid	+
2	Polyphenol	+++
3	Saponins	++
4	Tannins	++
5	Oxalates	-
6	Alkaloids	+++
7	Cardiac Glycosides	-

KEY: +++ Absolutely detected, ++ Moderately detected, + Detected, -- Not Detected. The above result is in accordance with ISO 17025.

Table 3: Prostate specific antigen (PSA) levels of Male Wistar Rats Induced with TP, Contiflo XL and Ethanol Extract of *Lasianthera africana.*

GROUPS	PSA LEVEL (ng/ml)
1	$0.61 \pm 0.19^{a,b}$
2	$1.54 \pm 0.74^{a,b}$
3	0.90 ± 0.57^{b}
4	0.62 ± 0.08^{b}
5	0.55 ± 0.06
6	0.93 ± 0.43^{b}

Each values is a mean of three replication expresses as mean ± standard deviation. Values in the same column with common superscript letters are significantly different at $P \leq 0.05$ when compared to the control groups.

Table 4: Urea and Creatinine Levels of Male Wistar Rats Induced with TP, Contiflo XL and Ethanol extract of *Lasianthera africana*

Groups	Urea (mmol/L)	Creatinine (mmol/L)
1	$4.70 \pm 0.10^{a,b}$	$63.66 \pm 4.04^{a,b}$
2	$5.40 \pm 1.66^{a,b}$	100.66 ± 16.77^{b}
3	5.33 ± 2.13^{a}	90.66 ± 12.89
4	5.30 ± 0.00	85.00 ± 0.00
5	5.90 ± 1.64^{a}	89.00 ± 29.26
6	9.60 ± 0.40^{a}	92.66 ± 9.29^{a}

Each values is a mean of three replication expresses as mean ± standard deviation. Values in the same column with similar superscript letters are significantly different at $P \leq 0.05$ when compared to the control groups.

Table 5: Electrolytes Levels of Male Wistar Rats induced with TP, Contiflo XL and Ethanol extract of *Lasianthera africana.*

Groups	K^+ (mmol/L)	Na^+ (mmol/L)	Cl^- (mmol/L)	HCO_3^- (mmol/L)
1	5.00 ± 0.30^{a}	145.66 ± 9.01^{a}	40.66 ± 2.08^{a}	20.66 ± 1.52^{a}
2	5.56 ± 0.51^{b}	160.33 ± 12.66^{b}	43.33 ± 1.52^{b}	26.66 ± 1.15^{b}
3	$6.43 \pm 0.20^{a,b}$	177.00 ± 2.00^{a}	48.00 ± 6.55	41.33 ± 33.54^{a}
4	5.50 ± 0.00^{b}	157.00 ± 0.00	$43.00 \pm 0.00.$	88.0 ± 0.00
5	6.33 ± 0.15^{a}	$183.00 \pm 8.50^{a,b}$	$58.00 \pm 23.51^{a,b}$	22.33 ± 0.57
6	5.86 ± 0.32^{a}	158.33 ± 5.33	44.66 ± 3.05	25.33 ± 4.04

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Each value is a mean of three replication expresses as mean ± standard deviation. Values in the same column with similar superscript letters are significantly different at $P \leq 0.05$ when compared to the control groups.

B. Discussion

Lasianthera africana, known locally as "editan,"is a highly regarded vegetable consumed mainly by the Ibibio speaking tribes in the Niger Delta region of Nigeria. Its green, soft leaves are used in soups and have a delicious flavor. However, beyond its culinary uses, this plant has also been found to possess medicinal properties. It is used as an antianalgesic, laxative, antidiabetic, antipyretic and antimalarial therapy.

In addition to its medicinal benefits, *L. africana* has also been shown to be a rich source of nutrients. Proximate composition analysis revealed that it contains numerous beneficial components (Ebana *et al.*, 2016).

From Table 2 above, the present study indicates that the ethanol extract of *Lasianthera africana* contains several important phytochemicals such as flavonoids, polyphenols, saponins, tannins and alkaloids. Polyphenols and alkaloids were found to have the highest number of secondary metabolites with a higher degree of precipitation (+++). Saponins and tannins followed closely behind with (++), while flavonoids were present in lesser amounts (+) within the extract.

Interestingly, Oxalates and Cardiac Glycosides were not detected during qualitative screening of the Phytochemicals in the plant extract. This suggests that *L. africana* contains bioactive substances that may serve as useful starting materials for synthesizing drugs.

This helps to highlights the potential health benefits of consuming *Lasianthera africana* and further research could uncover even more potential uses for this versatile plant.

In line with our current research, we have found that the Phytochemicals detected in our study are consistent with those discovered in a prior study conducted by Ebana *et al.*, 2016. The only exception being the absence of cardiac glycosides, which were identified in previous studies but not present in our current investigation of the same medicinal plant. This affirmation reinforces the validity of both studies and contributes to further understanding of the chemical composition and potential therapeutic benefits of this particular plant species.

In Table 3, the study of the Prostate specific antigen (PSA) level of the male wistar rats showed a significant elevation in the PSA Level after the induction of prostatitis through Testosterone propionate (TP). This shows that Prostatitis induction through the TP drugs was confirmed in this study, as there was an increase in the PSA level when compared to the control group 1 (i.e from 0.61± 0.19 to 1.54 ± 0.74) and from the table also, it was observed that there was a significant difference in group 2 (induced TP) when compared to the control group 1. Above all treatments, the group with 200mg of ethanol extract of the leaf (i.e Group 5) showed a much significant decrease in the value when it's been compared to the induced prostatitis control group 2 but there was no significant difference. The decrease, shows its ability to help in decreasing the PSA level after the Induction process.

According to recent biological studies, there is agreement that serum-prostate specific antigen (PSA) can be used as a key biological marker in the early detection of prostate cancer. This conclusion is supported by previous research, such as the study conducted by Berroukche *et al*., (2017), which found that an increase in serum PSA levels indicates the presence of prostate cancer.

Furthermore, a study conducted by Rosita *et al.*, (2019) revealed that PSA levels tend to increase with age among males. As a result, it is crucial to conduct serum PSA level tests in order to confirm the presence of prostate cancer. Also, the study analyzed data from healthy men across various age groups between 2014 and 2018 showed that significant increases in PSA levels among these men were indicative of the presence of prostate cancer. These findings underscore the importance of monitoring PSA levels as part of routine healthcare for men, particularly as they age and become more susceptible to prostate cancer (Rosita *et al*., 2019).

Table 4 and 5reveals the impact of the ethanol extract of the leaf on the kidney function markers like urea, creatinine, and electrolytes like potassium (K), sodium (Na), Chloride (Cl^-), and bicarbonate (HCO_3). The results of the study shows that when TP was administered without treatment to group 2. Across all kidneys function biomarkers assayed, there was a significant increase in values in group 2 suggesting that prostatitis was successfully induced in male wistar rats.

The first table for the Urea level shows a significant difference in the parameters. As group 2 significantly increased from 4.70 ± 0.10 to 5.40 ± 1.60 and a significant difference was observed in the group when compared to group1 (control group), thereby showing that the disease prostatitis was sufficiently induced through testosterone propionate. There was also a much significant increase in the group treated with TP + Contiflo XL + 100mg of ethanol extract (i.e Group 6) which affected the urea level significantly, while a significant difference was also observed in the group when compared to the control group 1. The groups treated with Contiflo XL, 100mg of ethanol extract and 200mg of the ethanol extract significantly decreased the value, showing the potency of the extract dose in the management of the disease, even as a significant difference was observed in the group treated with 200mg of the extract when compared to control group1 only but the much significant decrease was observed in the group treated with 100g of the extract.

For creatinine, the group 2 where the TP was induced without treatment showed a significant increase in the value (63.66 ± 4.04 to 100.66 ± 16.77) when compared to the control group 1, thereby showing the effect of prostatitis on the creatinine level. A significant decrease was observed in

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the groups treated with 100mg of the extract, 200mg of the extract and Contiflo XL but especially in the group administered 100mg of the extract. Also, a significant difference was observed in the group treated with TP+ Contiflo XL+ 100g of extract when been compared to the control group.

In the potassium ion, a significant increase was observed in the group treated with Contiflo XL and the group treated with 200g of extracts showing the much effect they had on the potassium levels also, and a significant difference was seen in these groups when compared to normal control group and prostatitis induced control group.

A significant decrease was observed in the groups treated with 100g of extract and TP + Contiflo XL +100mg of extract showing their efficacy and potency in the treatment of prostatitis. Also, a significant difference was seen in the group treated with 100g extract when compared to prostatitis induced control group and there was also a significant difference in the group treated with TP + Contiflo XL+100mg extract when compared to the control group.

For the sodium ion, a significant increase was observed in the group administered with TP without treatment and it showed the effect of prostatitis on the sodium ion level. Also, a much significant increase was observed in the group treated with Contiflo XL and the group treated with 200mg of the extract, thereby also showing their effects on the sodium ion level by increasing the value above and a significant difference was observed when compared to the control group and prostatitis control group. A significant decrease was observed in the group treated with 100g of extract and the group treated with TP+ Contiflo XL+ 100mg of extract and there was no significant difference in these groups when been compared to the control groups.

For chloride ion, the group administered TP without treatment showed a significant increase in the value and there was no significant difference when been compared to control group. Also, same as the groups treated with Contiflo XL, 200mg of extract and TP + Contiflo XL + 100g of extract which significantly increased but no significant difference observed except for the group treated with 200g of the extract. For the group treated with 100g of the extract, there was necessarily no reduction neither was there any increase (i.e 43.33±1.52 to 43.00±0.00).

In this present study, the effects of various treatments on Bicarbonate parameters were analyzed in relation to prostatitis. The group that received TP without treatment showed a significant increase in value, which had an impact on the bicarbonate level. However, when compared to the control group, there was no significant difference observed. On the other hand, in the groups treated with Contiflo XL and 100g of extract, there was a significant increase observed, indicating the effect these treatments had on bicarbonate levels. While there was a significant difference in the group treated with Contiflo XL compared to the control group, there was no significant difference observed in the group treated with 100g of extract.

The group that received 200mg of extract and TP + Contiflo XL + 100mg of extract showed a significant decrease, demonstrating its potency in treating prostatitis. There was also no significant difference observed in this group. It is clear from this study that 100mg of ethanol extract significantly reduced values in kidney function markers after induction of prostatitis (except for bicarbonate), highlighting its medicinal ability and potency when treating prostatitis-related complications in kidneys. These findings are important for further research and development of effective treatments for prostatitis patients.

The current study placed great emphasis on the determination of creatinine, urea, and electrolytes as they serve as reliable markers for kidney function, according to Oduola *et al*., (2007). Creatinine is exclusively excreted by the kidneys while urea is predominantly eliminated through the kidneys and to a lesser extent via microbial degradation in the intestinal tract, as stated by Abdullahi *et al*., (2020). Sodium is a vital mineral that can be found in various food sources and plays a crucial role in maintaining fluid equilibrium within the body. However, excessive amounts of sodium can lead to kidney damage. Previous research has shown that elevated serum levels of creatinine, urea, and electrolytes in untreated prostatitis rats indicate impaired kidney function or disease, as highlighted by Abdullahi *et al*., (2020).

The study also revealed that treatment with the leaf extract resulted in reduced serum levels of creatinine, urea, and electrolytes, which suggests that it has potential in preserving renal integrity among treated rats. The observed apparent kidney protection exhibited by the leaf extract may be attributed to its naturally occurring phytochemical components present within its leaves.

IV. CONCLUSION

The study conducted has successfully demonstrated the impact of the ethanol extract of the leaf on kidney function markers. The findings have revealed that there was a significant decrease in the PSA Level as compared to the control groups and other markers found in the kidney parameter levels of male Wistar rats. This decline suggests an important activity that was carried out by the plant ethanolic extract, especially at the lower dosage (100g of the extract) for treating prostatitis.

The results of this study have far-reaching implications on our understanding of how ethanol leaf extract of this plant can ease complications arising from kidney diseases induced by testosterone propionate. In conclusion, it is evidently clear that this particular extract has shown potential for treating such ailments and can be considered as a viable option for patients suffering from similar conditions. The efficacy of this treatment method has been proven in this study and further research may be conducted to explore its full potential in clinical settings.

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