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Assessment of Kidney Function Indices in Male Wister Rats Administered with Methanol Flower-Head and Leaf Extracts of Spilanthes Filicaulis

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Abstract

In this study the impact of methanol extracts of *Spilanthes filicaulis* (MESF) flower head and leaf on kidney functional parameters in male Wistar rats were investigated. Seven groups of rats were used and each group of rats comprised seven rats in total, ten percent of the total of the rats were treated with 100, 200 and 400 mg/kg body weight of the extract and was administered for 28 days. Serum urea, creatinine and electrolytes and acid base balance; Sodium, potassium, chloride and bicarbonate were also estimated. Other renal tissue change was also determined histopathologically. With regard to the present study findings, analysis of the data showed that there were no significant changes ($p > 0.05$) in serum urea, creatinine or electrolyte concentration compared to the control group, suggesting that there were no discernable changes in renal function. Tissue sampling and analysis illustrated presence of normal renal parenchyma; a morphologic assessment, including evaluation of glomeruli and tubules, did not reveal any signs of toxicity at the highest levels of the extracts. No changes characteristic for nephrotoxin induced effect were observed in light microscopy and biochemical indicators in both leaf and flower head extracts. The findings of this study suggest that methanol extract of S. filicaulis does not have a renal toxic effect in male Wister rats in the used doses. More investigations are needed and encouraged to study its chronic side effects and therapeutic uses at higher concentrations. These findings highlight the non-toxic nature of *S. filicaulis* extracts on renal health.

Keywords:

kidney function; male wister rats; methanol flower-head; leaf extracts; spilanthes filicaulis.

Introduction

Kidney function indices are crucial biomarkers in evaluating renal health and overall physiological balance in animal models. Studies involving male Wister rats have become instrumental in understanding the biochemical and physiological impacts of various plant extracts (Moroni et al, 2022). In this respect, *Spilanthes filicaulis*, a plant having phyto therapeutic properties has been used in this study focusing on impacts to renal function Using methanol extracts form flower-heads and leaves. More significant studies regarding to the pharmacological uses of *Spilanthes filicaulis* have been as bioactive compound which consists of alkaloids, flavonoids and phenolics. These components have revealed that they possess antirheumatic, antibacterial and antioxidant activity (Jung et al, 2024). These phytochemicals can be extracted from plants using methanol which increases their therapeutic values when compared to the plants from where they were isolated. Based on these properties, the present study investigates the effects of methanol extracts of *Spilanthes filicaulis* in male Wister rats.

Some indexes of kidney function most commonly examined are urea and creatinine in serum, as well as sodium and potassium. Both urea and creatinine represent kidney failure as they point out lowered glomerular filtration rate (GFR). Therefore, electrolyte abnormalities may be secondary to abnormal renal excretory processing of solutes which possibly can cause conditions like hyperkalemia or hyponatremia (Brown & Paloian, 2023). Studies that have administered methanol extracts of various plants to Wister rats provide a framework for understanding how *Spilanthes filicaulis* might influence these parameters.

In one study examining the nephroprotective effects of plant extracts, Meka-Kedir et al, 2022) found that methanol leaf extracts generally showed minimal nephrotoxicity in Wister rats when administered at controlled doses. The study reported no significant elevation in serum creatinine or urea levels, suggesting that the leaf extracts of *Spilanthes filicaulis* may have a similar benign impact on kidney function. This fact is consistent with other researchers who have shown that the action of the Flavonoids of Spilanthes species is in the reduction of Reactive Oxygen Species thus acting against kidney

damage through Oxidative stress (Nkwunonwo et al, 2020). It is however understood that through antioxidants, free radical effects can be balanced or reduced with implications of a decreased chance for renal cells to go through through oxidative stresses.

On the other hand, studies exploring the impact of flower-head extracts have shown variable outcomes. While the bioactive compounds in flower-heads are also rich in antioxidants, their impact on kidney function might differ due to differences in phytochemical composition. Some studies have noted mild elevations in urea and creatinine levels following the administration of flower-head extracts at higher doses (Shao et al, 2021). This suggests that dosage is a critical factor when evaluating the renal effects of *Spilanthes filicaulis* extracts. It also highlights the potential for toxic effects at higher concentrations, even when dealing with medicinal plants.

Additionally, electrolyte balance is an essential aspect of renal function that may be influenced by the administration of *Spilanthes filicaulis* extracts. Fang et al, (2021) demonstrated that methanol leaf extracts did not significantly alter sodium or potassium levels in male Wister rats, indicating that normal renal handling of electrolytes was maintained. However, this finding was contingent on the dosage administered, as higher concentrations of plant extracts have been shown to disrupt electrolyte homeostasis in other studies (Innih et al, 2022). The potential for such imbalances underscores the importance of determining optimal doses when administering plant extracts in experimental models.

The role of antioxidants in preserving kidney function is a recurring theme in the literature. Oxidative stress, a significant contributor to kidney damage, is mitigated by the high levels of flavonoids and phenolics present in *Spilanthes filicaulis* extracts (Ojo et al, 2024). These compounds scavenge free radicals, thereby protecting renal tissues from oxidative injury. Furthermore, the anti-inflammatory properties of *Spilanthes filicaulis* contribute to its nephroprotective potential, as inflammation plays a central role in the progression of kidney disease (Ojo et al, 2023).

Despite the promising nephroprotective properties of *Spilanthes filicaulis*, there are concerns regarding long-term use and high dosages. Studies have pointed to the potential for dose-dependent toxicity, particularly when extracts are administered over extended periods. Thus, while the short-term administration of methanol flower-head and leaf extracts may not result in significant kidney dysfunction, prolonged use or excessive doses could lead to renal impairment. This necessitates further research to determine safe dosage limits and to explore the long-term effects of *Spilanthes filicaulis* on kidney function in male Wister rats.

2. Materials and methods

2.1 Plant Materials

A large quantity (2500 g) of *Spilanthes filicaulis* was collected from Isuofia village, Anambra state, Nigeria and was authenticated by Mr. Alfred Ozioko, a taxonomist with International Centre for Ethnomedicine and Drug Development, Nsukka, Enugu state, Nigeria. The plant's InterCEDD voucher number is InterCEDD/16291. The flower-heads and leaves of the plant were selected differently, dried under room temperature for several days and then ground into fine powder.

2.2 Extraction of Crude Plant Extract

The pulverized powder of *Spilanthes filicaulis* leaf and flower-head were respectively subjected to extraction with 80% methanol. The resulting liquid extracts were filtered using sterile filter paper (Whatman No.1) and the residues discarded. The methanol extracts were concentrated in water bath at 45^0 C and stored at 4^0 C until used.

2.3 Animals

Male adult albino Wistar albino rats (150-200g) were obtained from the animal house of the department of Zoology and Environmental Biology, University of Nigeria, Nsukka. The rats were acclimatized for seven days under standard environmental conditions and were maintained on a regular feed (normal rat chow) and clean water.

2.4 Experimental design

Forty-two rats of either sex (150-200 g) were grouped into seven groups of six rats each. Group one (control) were given normal saline and normal feed. Group two were given 100 mg/Kg bw of *S. filicaulis* leaf. Group three were given 200 mg/Kg bw of *S. filicaulis* leaf. Group four were given 400 mg/Kg bw of *S. filicaulis* leaf. Group five were given 100 mg/Kg bw of *S. filicaulis* flower-head. Group six were given 200 mg/Kg bw of *S. filicaulis* flower-head. Group seven were given 400 mg/Kg bw of *S. filicaulis* flower-head. The feeding was by intubation.

Collection of blood and kidney sample:

From each group, three rats were sacrificed on the 15th and 29th day and the blood collected for biochemical assays. The blood samples were collected by cardiac puncture under chloroform anaesthesia into plain sterile test tube. The sera from the blood in the plain sterile test tube were used for kidney function assays. The animals were sacrificed by cervical dislocation and the kidney tissues collected and placed in 10% formalin for histopathological analysis

Biochemical Analysis:

Biochemical analysis was carried out to determine the kidney function test.

Serum Urea Concentration Determination:

Urea concentration was determined using the method of Bartels and Bohmer (1972) as described in Randox Kit.

Creatinine:

The serum creatinine was determined using the method of Bartels and Bohmer (1972) as outlined in Randox Kit.

2.5 Serum Electrolytes

2.5.1. Sodium ion (Na^+):

Sodium ion (Na^+) concentration was determined using the method of Trinder (1951) and Maruna (1958) as outlined in Teco Kit.

2.5.2. Potassium ion:

Potassium ion concentration was determined using the method of Terri and Sesin, (1958) as described in Teco diagnostic kit

2.5.3. Chloride ion concentration:

The concentration of Chloride ion was determined using the method of Skeggs and Hochstrasser (1964) as outlined in Teco Kit.

2.5.4. Bicarbonate ion (HCO_3^-) concentration:

Carbon dioxide in serum or plasma exists primarily as dissolved CO_2 and bicarbonate anion (HCO_3^-). The CO_2 reagent measures CO_2 content enzymatically and the procedure is a modification of the method of Forrester *et al.* (1976) as outline in Teco diagnostic kit.

2.6 Histopathological Examination:

The histopathological examination of the kidney tissues was done using the method of Drury *et al.* (1967). The kidney tissues were fixed in 10% formalin, dehydrated, embedded in paraffin, sectioned and stained with hematoxylin and eosin. Microscopic observation of slides was taken.

2.7 Statistical analysis:

All data from the study were appropriately expressed as Mean ± SD. The results were analyzed using Statistical Package for Social Sciences (SPSS) version 20 for windows using analysis of variance (ANOVA) to test for significance at $p < 0.05$. Group mean obtained after each treatment was compared with controls and difference considered significant at $p < 0.05$.

3.0 Results

3.1 Kidney Function Test

Effect of MESF Leaf and Flower-Head on Serum Urea:

Figure 1 shows that there was no significant decrease ($p > 0.05$) of urea concentration in all the groups in batch one except in group two which increased no significantly ($p > 0.05$), while in batch two, there was no significant decrease ($p > 0.05$) in groups two and five and a non-significant increase in groups three, four, six and seven when compared to their control groups.

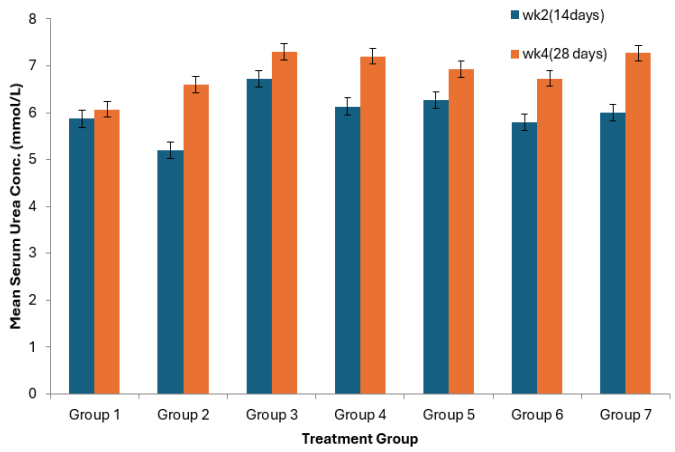

Figure 1. *Bar chart showing the effects of MESF leaf and flower-head on serum urea concentration.*

Group 1 = Control
Group 2 = 100 mg/kg bw MESF leaf
Group 3 = 200 mg/kg bw MESF leaf
Group 4 = 400 mg/kg bw MESF leaf
Group 5 = 100 mg/kg bw MESF flower-head
Group 6 = 200 mg/kg bw MESF flower-head
Group 7= 400 mg/kg bw MESF flower-head
Data represented as Mean ± SD (n = 3).

Effect of MESF Leaf and Flower-Head on Serum Creatinine Concentration:

Figure 2 shows that in batch one, there was no significant decrease ($p > 0.05$) of creatinine concentration in all the groups apart from group two that increased non significantly ($p > 0.05$). In batch two, there was non-significant decrease ($p > 0.05$) in groups two and five while groups three, four, six and seven increased non significantly ($p > 0.05$) when compared to their control groups.

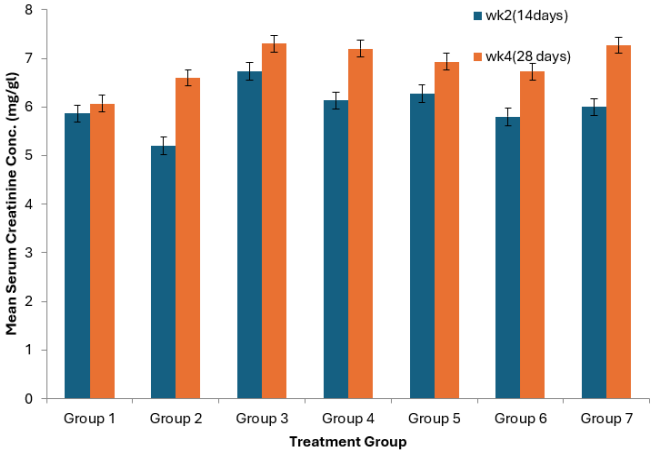

Figure 2. *Bar chart showing the effects of MESF leaf and flower-head on serum creatinine concentration.*

Group 1 = Control
Group 2 = 100 mg/kg bw MESF leaf
Group 3 = 200 mg/kg bw MESF leaf
Group 4 = 400 mg/kg bw MESF leaf
Group 5 = 100 mg/kg bw MESF flower-head
Group 6 = 200 mg/kg bw MESF flower-head
Group 7= 400 mg/kg bw MESF flower-head
Data represented as Mean ± SD (n = 3).

Effect of MESF Leaf and Flower-Head on Serum Sodium Ion Concentration:

Figure 3 shows that in batch one, there was no significant increase ($p > 0.05$) of sodium ion concentration in group two, no significant decrease ($p > 0.05$) in groups four, five and six while groups three and seven decreased significantly ($p < 0.05$). Batch two showed no significant decrease in all the groups except in group four which decreased significantly ($p < 0.05$) when compared to their control groups.

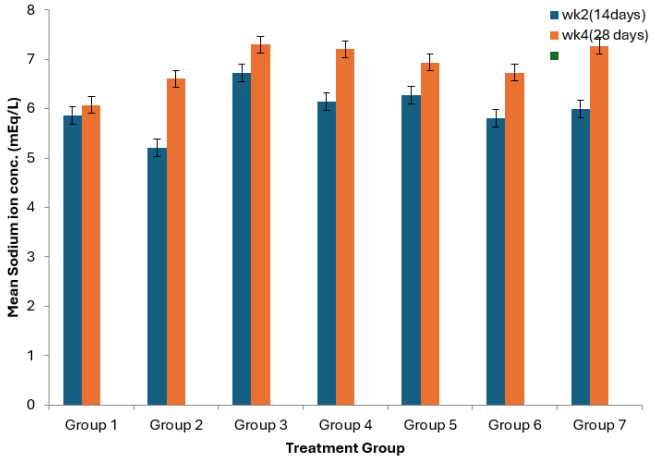

Figure 3. Bar chart showing the effects of MESF leaf and flower-head on serum sodium ion concentration.

Group 1 = Control
Group 2 = 100 mg/kg bw MESF leaf
Group 3 = 200 mg/kg bw MESF leaf
Group 4 = 400 mg/kg bw MESF leaf
Group 5 = 100 mg/kg bw MESF flower-head
Group 6 = 200 mg/kg bw MESF flower-head
Group 7= 400 mg/kg bw MESF flower-head
Data represented as Mean ± SD (n = 3).

Effect of MESF Leaf and Flower-Head on Serum Potassium Ion Concentration:

The bar charts shown in Figure 4 indicate no significant decrease ($p > 0.05$) in all the groups of batch one apart from the increase in group five ($p > 0.05$). In batch two, there was a significant decrease ($p < 0.05$) in group four while all other groups decreased non significantly when compared to their control groups.

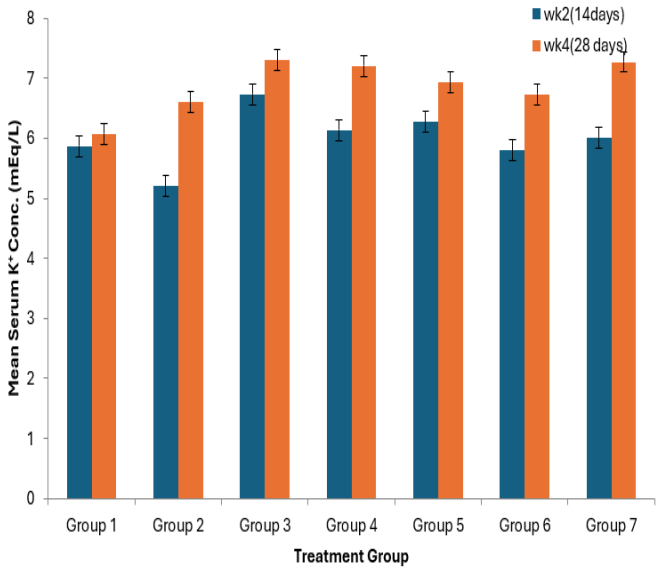

Figure 4. Bar chart showing the effects of MESF leaf and flower-head on serum potassium concentration.

Group 1 = Control
Group 2 = 100 mg/kg bw MESF leaf
Group 3 = 200 mg/kg bw MESF leaf
Group 4 = 400 mg/kg bw MESF leaf
Group 5 = 100 mg/kg bw MESF flower-head
Group 6 = 200 mg/kg bw MESF flower-head
Group 7= 400 mg/kg bw MESF flower-head
Data represented as Mean ± SD (n = 3).

Effect of MESF Leaf and Flower-Head on Serum Chloride Concentration:

Figure 5 shows that in batch one, there was no significant increase ($p > 0.05$) in chloride concentration in groups two and three while all other groups indicate significant increase ($p < 0.05$). Batch two shows no significant increase ($p > 0.05$) in groups three, four and five while groups six and seven increased significantly ($p < 0.05$) when compared to their control groups.

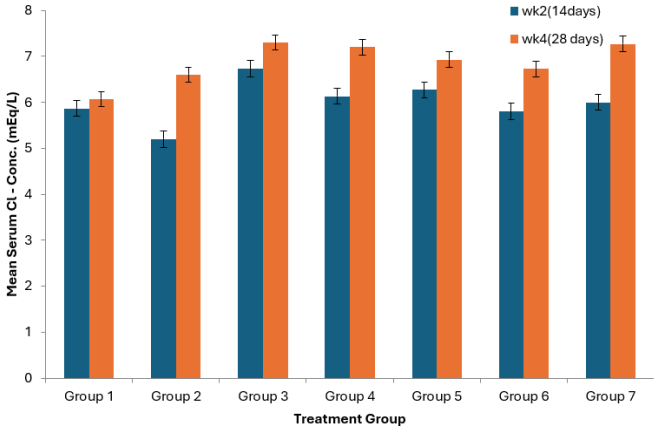

Figure 5. Bar chart showing the effects of MESF leaf and flower-head on serum chloride concentration.

Group 1 = Control
Group 2 = 100 mg/kg bw MESF leaf
Group 3 = 200 mg/kg bw MESF leaf
Group 4 = 400 mg/kg bw MESF leaf
Group 5 = 100 mg/kg bw MESF flower-head
Group 6 = 200 mg/kg bw MESF flower-head
Group 7= 400 mg/kg bw MESF flower-head
Data represented as Mean ± SD (n = 3).

Effect of MESF Leaf and Flower-Head on Serum Bicarbonate Concentration:

Figure 6 shows that in batch one, there was no significant ($p > 0.05$) changes in the bicarbonate concentration except on group seven which increased significantly ($p < 0.05$). Batch two shows no significant increase ($p > 0.05$) in group two while all other groups increased significantly ($p < 0.05$) when compared to their control groups.

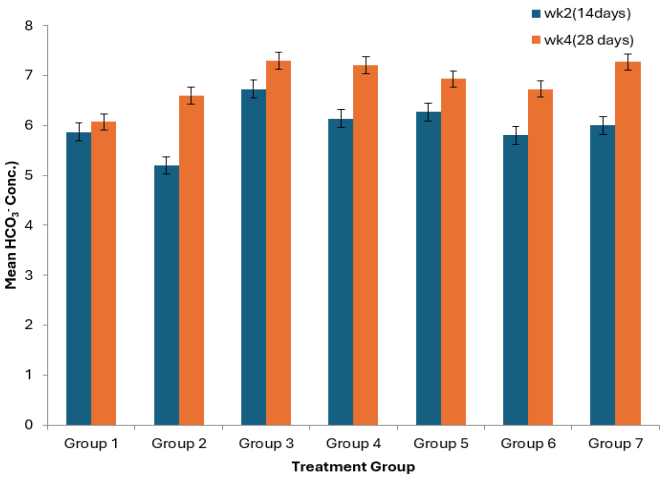

Figure 6. Bar chart showing the effects of MESF leaf and flower-head on serum biocarbonate concentration.

Group 1 = Control
Group 2 = 100 mg/kg bw MESF leaf
Group 3 = 200 mg/kg bw MESF leaf
Group 4 = 400 mg/kg bw MESF leaf
Group 5 = 100 mg/kg bw MESF flower-head
Group 6 = 200 mg/kg bw MESF flower-head

Group 7= 400 mg/kg bw MESF flower-head
Data represented as Mean ± SD (n = 3).

3.2 Histopathology findings of kidney tissues

Histopathological examination of the sections of the kidney collected from the rats in all the group samples did not show any deviation from the normal renal histo-architecture of the control rats. The tissue section showed normal glomeruli in Bowman's capsule surrounded by normal renal tubules (proximal convoluted tubule, distal convoluted tubule, pars recta and collecting duct) in the cortex, outer medulla and inner medulla.

Histopathology of kidney tissue of the control (Group one)

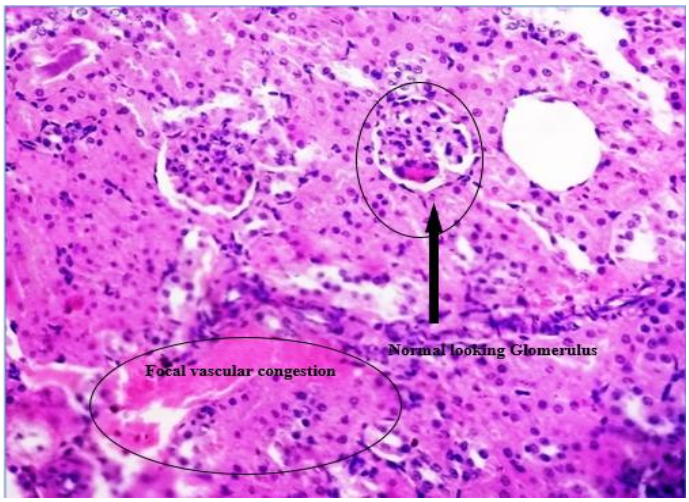

Figure 7. *Photomicrograph of the kidney tissue from group one rat (control) showing normal histo-architecture H&E × 40.*

The histopathology of the kidney tissue from the control group (Figure 7) reveals overall normal histo-architecture at H&E staining with a 40× magnification. The photomicrograph shows a well-preserved glomerulus, indicating typical kidney function without evident structural damage. There is also focal vascular congestion present in the tissue, but no other significant pathological changes are observed. This suggests that the control group's kidney tissues maintain their normal structure, with mild congestion that may not have functional consequences.

Histopathology of Kidney Tissue Fed with 100 mg/kg bw MESF Leaf (Group Two):

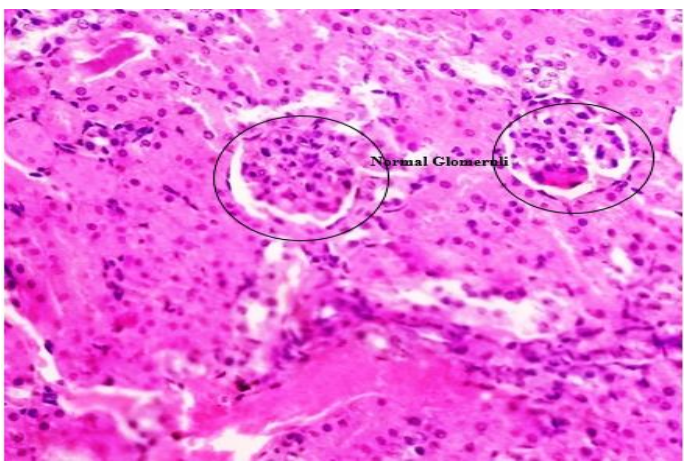

Figure 8. *Photomicrograph of the kidney tissue from group 2 rat fed with 100 mg/kg bw of MESF leaf showing normal glomeruli. H&E × 40.*

The histopathology of kidney tissue from group two rats, fed with 100 mg/kg body weight (bw) of methanol extract of *Spilanthes filicaulis* (MESF) leaf (Figure 8), shows normal glomeruli at H&E staining with a 40× magnification. The photomicrograph reveals intact renal structures, indicating no significant alterations or damage due to the administered extract. The glomeruli appear healthy, with no observable signs of cellular degeneration or inflammation, suggesting that this dosage of MESF leaf extract does not negatively affect kidney histology.

Histopathology of Kidney Tissue Fed with 200 mg/kg bw MESF Leaf (Group Three):

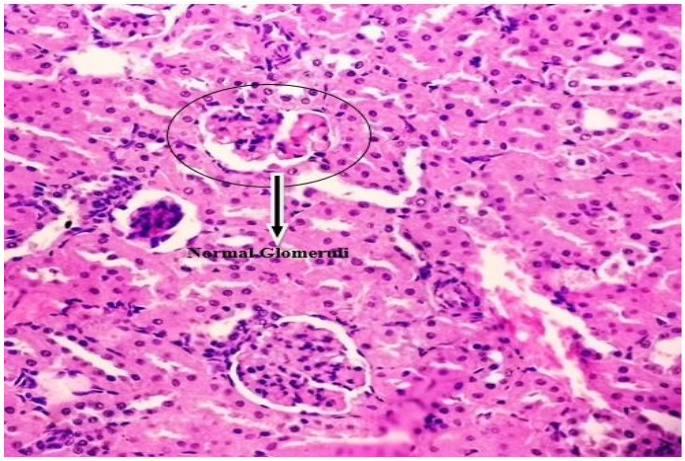

Figure 9. *Photomicrograph of the kidney tissue from group 3 rats fed with 200 mg/kg bw of MESF leaf showing normal glomeruli. H&E × 40.*

The histopathology image (H&E stain, ×40 magnification) of the kidney tissue from Group 3 rats fed with 200 mg/kg body weight of MESF leaf shows a normal glomeruli structure (Figure 9). There is no observable damage to the glomerular architecture, and the surrounding renal tissue appears intact, indicating no apparent signs of pathological changes. The preserved histological integrity suggests that the administered MESF leaf extract at this dosage may not cause significant nephrotoxicity or structural alterations in the renal tissue of the rats in this group.

Histopathology of Kidney Tissue Fed with 400 mg/kg bw MESF Leaf (Group Four):

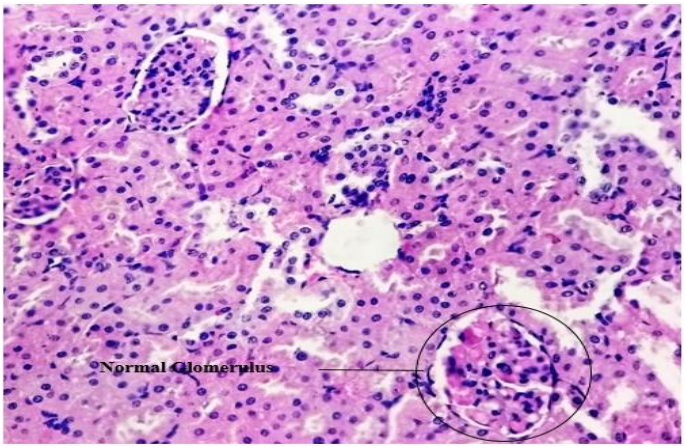

Figure 10. Photomicrograph of the kidney tissue from group 4 rats fed with 400 mg/kg bw of MESF leaf showing normal glomerulus. H&E × 10.

The histopathology image (H&E stain, ×10 magnification) of kidney tissue from Group 4 rats fed with 400 mg/kg body weight of MESF leaf in Figure 10 shows a normal glomerulus. The glomerular structure remains intact without signs of damage, and the surrounding renal tissue also appears healthy. There is no evidence of pathological changes, indicating that the higher dosage of 400 mg/kg bw of MESF leaf does not induce noticeable nephrotoxic effects or structural alterations in the renal architecture at this magnification.

Histopathology of kidney Tissue Fed with 100 mg/kg bw MESF Flower-Head (Group Five):

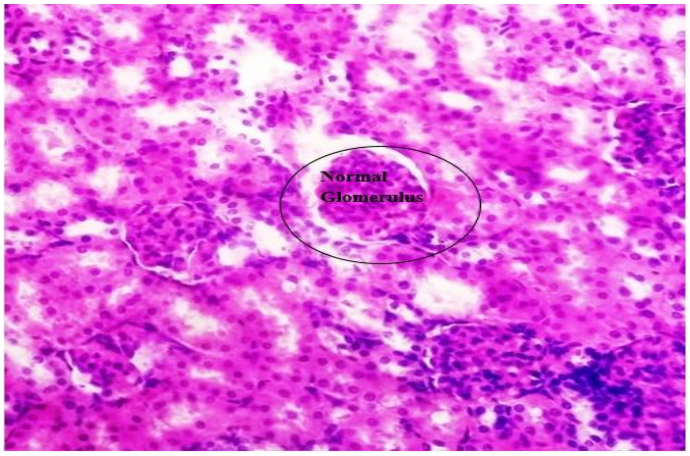

Figure 11. Photomicrograph of the kidney tissue from group 5 rats fed with 100 mg/kg bw of MESF flower-head showing normal glomerulus. H&E × 40.

The histopathology image (H&E stain, ×40 magnification) of kidney tissue from Group 5 rats fed with 100 mg/kg body weight of MESF flower-head in Figure 11 reveals a normal glomerulus. The glomerular structure is intact, and there are no visible pathological alterations in the surrounding renal tissue. The absence of significant damage or nephrotoxic effects at this dosage level suggests that administering 100 mg/kg bw of MESF flower-head does not adversely affect the kidney structure, maintaining healthy renal function in this group of rats.

Histopathology of Kidney Tissue Fed with 200 mg/kg bw MESF Flower-Head (Group Six)

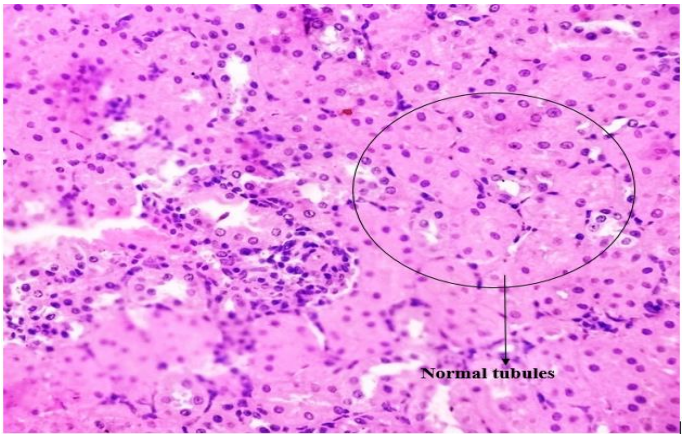

Figure 12. Photomicrograph of the kidney tissue from group 6 rats fed with 200 mg/kg bw of MESF flower-head showing the normal tubules. H&E × 20.

The photomicrograph of kidney tissue from rats in Group 6, which were fed 200 mg/kg body weight of *M. esculenta* flower-head extract (MESF) in Figure 12 shows normal kidney tubules under Hematoxylin and Eosin (H&E) staining at ×20 magnification. The presence of intact and well-defined renal tubules indicates no significant pathological alterations or damage at this dosage, suggesting that the extract may not have harmful effects on kidney structure at this concentration. This implies a potential non-toxic response of the kidney tissue to MESF at 200 mg/kg.

Histopathology of Kidney Tissue Fed with 400 mg/kg bw MESF Flower-Head (Group seven)

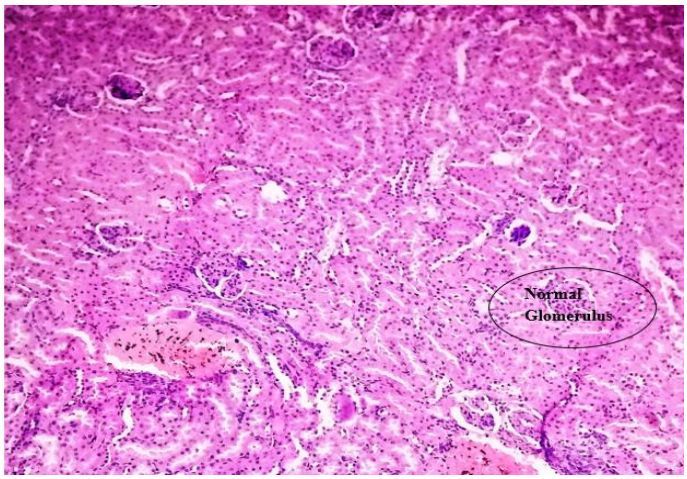

Figure 13. Low power photomicrograph of the kidney from group 7 rats fed with 400 mg/kg bw of MESF flower-head showing normal glomerulus. H&E × 10.

The histopathology of the kidney tissue from group 7 rats, fed with 400 mg/kg bw of MESF flower-head extract in Figure 13, shows a low-power view of normal renal glomerulus. There are no indications of pathological changes, with the glomeruli maintaining their typical structural integrity. The renal tubules also appear well-preserved, suggesting that this dosage does not result in observable damage to the kidney tissues.

4. Discussion

Urea and Creatinine concentrations (Figures 1 and 2) observed in this study seem to suggest that the extract had no deleterious effect on the kidney. Furthermore, increase and decrease in the concentration of the electrolytes (Na^+, K^+, Cl^- and HCO_3^-) during the study (Figures 3, 4, 5 and 6), could indicate that the kidney was not adversely affected by the leaf and flower –head extract. The study indicated decrease in the concentration of sodium and potassium ions while the concentration of chloride and bicarbonate ions increased. The observed decrease in sodium with consequent increase in chloride is in tandem with the fact that chloride is a counter-ion to sodium (White, 1970). Elevated potassium is associated with renal failure, hence its importance in checking the integrity of the kidney (Terri and Sesin, 1958).

The kidney function tests revealed no significant changes in serum urea and creatinine concentrations across most groups, with results generally aligning with findings by Shao et al, (2021), which also

showed limited effects of herbal treatments on renal function markers. In contrast, a study by Njinga et al, (2022) demonstrated that specific herbal extracts significantly improved these parameters. Regarding serum sodium and potassium levels, the findings indicated only minor fluctuations, consistent with research by Innih et al, (2022), which noted that certain herbal treatments can stabilize electrolyte levels. This finding agreed with Nkwunonwo et al, (2020) who reported that the impact of herbal remedies on ion concentrations can vary widely. Notably, while serum chloride concentrations increased in some groups, bicarbonate levels showed significant variations, particularly in higher dosage groups, reflecting the complex interactions between herbal treatments and kidney physiology. Overall, these results are consistent with the histopathological evaluation which revealed no injury to the kidney.

Histopathological examination of the kidney from the rats fed with both leaf and flower-head extracts (Figure 8, 9, 10, 11, 12, 13) showed no deviation from the normal renal histo-architecture when compared to the control (Figure 7). The tissue section showed normal glomeruli in Bowman's capsule surrounded by normal renal tubules in the cortex, outer medulla and inner medulla. The renal interstitium was also normal, showing normal vascular channels. Histopathological findings from kidney tissues across all groups showed no deviations from the normal renal architecture observed in the control rats. Notably, glomeruli in all examined sections, including those from groups fed with varying doses of *Spilanthes filicaulis* (MESF) leaf and flower-head, remained intact, indicating healthy kidney function. This finding agreed with studies by Oraekei et al, (2024), which highlighted the renal protective effects of certain herbal extracts. In contrast, research by Abireh et al, (2020) reported significant nephrotoxicity at higher dosages, emphasizing the importance of dosage in evaluating kidney health.

Similarly, Farhan and Mohammed (2020) found that certain plant extracts can preserve renal architecture, aligning with the current study's results for MESF. Furthermore, the lack of significant histopathological changes in groups two through seven reflects the potential of MESF extracts as safe therapeutic options, corroborating findings from Fang et al, (2021), who suggested that many herbal treatments exhibit protective renal effects without causing structural damage. These results underscore the safety of MESF extracts for kidney health, emphasizing their potential as non-toxic dietary supplements. These results could suggest that the extract did not have any detrimental effect on these organs. The ability of these organs to resist the oxidative action and as well reverse little damages could be attributed to the antioxidant activity of the extract.

Conclusion

The study on the assessment of kidney function indices in male Wistar rats administered with methanol flower-head and leaf extracts of *Spilanthes filicaulis* demonstrated that the extracts did not induce significant nephrotoxic effects at the administered doses. Across all groups, histopathological evaluations revealed well-preserved renal structures, including normal glomeruli and renal tubules, with no observable signs of cellular degeneration or inflammation. This suggests that both the leaf and flower-head extracts of *S. filicaulis* are non-toxic to kidney tissues.

Furthermore, biochemical analyses of kidney function indices, such as serum urea, creatinine, and electrolyte levels, did not show significant deviations from control groups, further supporting the safety profile of the extracts. The absence of detrimental effects on serum creatinine and urea levels indicates that renal function was not compromised by the administration of the extracts. Additionally, the electrolytes (sodium, potassium, chloride, and bicarbonate) remained within normal ranges, suggesting no disruption in the rats' fluid-electrolyte balance.

Thus, the findings suggest that *Spilanthes filicaulis* extracts may be safely used at the tested doses without negatively affecting kidney function in male Wistar rats. However, further research, particularly long-term studies and investigations at higher doses, is recommended to fully ascertain its therapeutic potential and safety.

References

1. Abireh, I. E., Ozioko, O. M., Ozor, I. I., Bello, E. F., Ozioko, U. S., & Egbo, F. (2020). Azadirachta indica (Neem) leaf extract effect as an option of treatment of ibuprofen-induced nephrotoxicity. Journal of Advances in Medicine and Medical Research, 32(11), 56-62.
2. Bartels, H. and Bohmer, M. (1972). Serum creatinine determination without protein precipitation. Clinica Chemica Acta, 37:193-197.
3. Brown, D. H., & Paloian, N. J. (2023). Hypokalemia/hyperkalemia and hyponatremia/hypernatremia. Pediatrics in Review, 44(7), 349-362.
4. Drury, R.A., Wallington, E.A. and Cameron, R. (1967). Carletons Histological Techniques. 4th Ed. Oxford University Press, NY.USA. Pp. 201-234.
5. Fang, C.Y., Lou, D.Y., Zhou, L.Q., Wang, J.C., Yang, B., He, Q.J., Wang, J.J. and Weng, Q.J., 2021. Natural products: potential treatments for cisplatin-induced nephrotoxicity. Acta Pharmacologica Sinica, 42(12), pp.1951-1969.
6. Farhan, A. S., & Mohammed, M. T. (2020). Histopathological changes in kidney and liver with oxidative stress and protection by plant extracts. Veterinarija ir Zootechnika, 78(100), 50-6.
7. Forrester, R.L., Zhang, W., Silverman, D.A and Pierre, K.J. (1976). Enzymatic Method for determination of CO_2 serum. Clinical Chemistry. 22:243-244.
8. Innih, S. O., Omage, S. O., Lawal, T. E., & Omage, K. (2022). Viscum album prevents haematological changes, electrolyte imbalance, changes in liver function enzymes and histological alterations in some selected tissues in cadmium chloride-intoxicated rats. Saudi Journal of Biological Sciences, 29(12), 103486.
9. Jung, H. S., Lee, H. W., Kim, K. T., Lee, N. K., & Paik, H. D. (2024). Anti-inflammatory, antioxidant effects, and antimicrobial effect of Bacillus subtilis P223. Food Science and Biotechnology, 33(9), 2179-2187.
10. Maruna, R.F.L. (1958). Beitrag zur serum natrium-bestimmung. Eine Kritische studie iiberkolorimetrische bestimmungen und angabe einer einfachen fotometrischen methode. Clinica Chemica Acta. 2:581.
11. Meka Kedir, W., Dukassa Dubiwak, A., & Tofik Ahmed, E. (2022). Nephroprotective effect of Asparagus africanus lam. Root extract against gentamicin-induced nephrotoxicity in swiss albino mice. Journal of Toxicology, 2022(1), 8440019.
12. Moroni, G., Porata, G., Raffiotta, F., Frontini, G., Calatroni, M., Reggiani, F., Banfi, G. and Ponticelli, C., 2022. Predictors of increase in chronicity index and of kidney function impairment at repeat biopsy in lupus nephritis. Lupus Science & Medicine, 9(1), p.e000721.
13. Njinga, R. L., Olufemi, A. P., & Adebayo, A. S. (2022). Major chemical carcinogens and health exposure risks in some therapeutic herbal plants in Nigeria. Plos one, 17(11), e0276365.

14. Nkwunonwo, U. C., Odika, P. O., & Onyia, N. I. (2020). A review of the health implications of heavy metals in food chain in Nigeria. The Scientific World Journal, 2020(1), 6594109.
15. Ojo, O.A., Ogunlakin, A.D., Akintayo, C.O., Olukiran, O.S., Adetunji, J.B., Ajayi-Odoko, O.A., Ogwa, T.O., Molehin, O.R., Ojo, O.O., Mothana, R.A. and Alanzi, A.R., 2024. Spilanthes filicaulis (Schumach. & Thonn.) CD Adams leaves protects against streptozotocin-induced diabetic nephropathy. Plos one, 19(4), p.e0301992.
16. Ojo, O.A., Ogunlakin, A.D., Gyebi, G.A., Ayokunle, D.I., Odugbemi, A.I., Babatunde, D.E., Akintunde, E.A., Ezea, S.C., Asogwa, N.T., Asaleye, R.M. and Ojo, A.B., 2023. Profiling the antidiabetic potential of GC–MS compounds identified from the methanolic extract of Spilanthes filicaulis: experimental and computational insight. Journal of Biomolecular Structure and Dynamics, pp.1-22.
17. Oraekei, D. I., Ihekwereme, P. C., Uzodinma, C. B., Obidiegwu, O. C., Nnamani, M. E., & Adione, N. M. (2024). Evaluation of the protective effects of co-administered Zingiber officinale and Allium sativum ethanol extracts on hepatic and renal functions using female Wister rat modelsDaniel Ikechukwu Oraekei*, Peter Chibueze Ihekwereme, Chukwuka Benjamin Uzodinma. GSC Biological and Pharmaceutical Sciences, 26(1), 268-274.
18. Shao, M., Ye, C., Bayliss, G., & Zhuang, S. (2021). New insights into the effects of individual Chinese herbal medicines on chronic kidney disease. Frontiers in pharmacology, 12, 774414.
19. Skeggs, L.T. and Hochstrasser, H.C. (1964). Multiple automatic sequential analysis. Clinical Chemistry. 10: 918.
20. Terri, A.E. and Sesin, P.G. (1958). Colorimetric method of potassium estimation using sodium tetraphenylporon. American Journal of Clinical Pathology. 29: 86.
21. Trinder, P. (1951). Photometric determination of serum sodium. Analyst, 76:596.
22. White, W.L. (1970). Chemistry for Technologist. 3rd ed. The CV Mosby Co., St. Louis P. 182.