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EVALUATION OF NEPHRO-PROTECTIVE & CURATIVE EFFECT OF IKSHUMOOLA (*SACCHARUM OFFICINARUM* LINN) IN ALBINO RATS

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ABSTRACT

The plant *sacchrum officinarum* Lin. (family Graminaceae/ Poeceae) is commonly known as Sugar cane in English. It is bambuseae shrub, stem up to 6 meter high many nodded glabrous. Leaves long with sharp edges. Flowers flossy and root gray to blackish brown fibrous roots. This plant is explained by Sutrasta in Susharuta Samhita in the group of five drug call it as "Trunapanchmoola". Which is diuretic in action and also used in the management of oligouria. To evaluate Nephro-protective and curative effect of Ikshu (*Saccharum officinarum* Linn.) moola Kwatha in Gentamicin induced Nephro-toxicity in Albino rats. To observe the side effects if any. The kidney damage was evidenced by elevated level of serum urea, serum criatinine, and electrolytes, urineproteins, and pH and by histopathological observations of kidney sections. The nephro-curative activity found prolonged in Kwatha (1.9 ml /200g rat) of Ikshumool (*Saccharum officinarum* Linn.) plant as it significantly reduced these evaluated levels as compare to protective group. Histopathological observations also confirm the Nephro-curative activity of *Saccharum officinarum* Linn. root Kwatha in albino rats.

KEYWORDS: *Saccharum officinarum*Linn; Nephro- protective and curative; Ikshu (*Saccharum officinarum* Linn.) moola Kwatha; Gentamicin.

INTRODUCTION

The plant *sacchrum officinarum* Lin. (family Graminaceae/ Poeceae) is commonly known as Sugar cane in English. It is bambuseae shrub, stem up to 6 meter high many nodded glabrous. Leaves long with sharp edges. Flowers flossy and root gray to blackish brown fibrous roots.[1] This plant is explained by Sutrasta in Susharuta Samhita in the group of five drug call it as "Trunapanchmoola". Which is diuretic in action and also used in the management of oligouria.[2]

Incidence rate of urinary tract disorder are very high, it has been survived by WHO. The urinary tract disorder is second largest problem in whole world after respiratory disorders. In modern era with the first development in Allopathic medicines Antibiotics are very effective in disease management but the improper use of these drugs can develop diseases. The importance of herbs started declining. On the contrary herbs were found to be much safer when use in proper dose in proper formulation.Toxicology like medicine is multidisciplinary subject which encompasses many areas. This makes it an absorbing and challenging area of research. In present study an efforts has been made to establish scientific validity to Nephro-protective and curative property of root extract (moolaKwatha) of *Saccharum officinarum* Linn. For this purpose male albino rats have been selected as experimental animals. Gentamicin was used as toxicant causing acute kidney damage.

Kwatha of *Saccharum officinarum* Linn.root was prepared as per Sarangdhara Samhita.[3] The effect of Kwatha was studied on the experimental animals showing acute kidney failure due to Gentamicin. The Nephro-protective and curative effect were studied by bio-chemical and histopathological parameters.

MATERIALS AND METHODS

The roots of *Saccharum officinarum* Linn. were collected from Belgaum district and authenticated by Central Research Laboratory Shri B.M.K. Ayurveda Mahavidyalaya, Belgaum. The plant material was dried at room temperature.

Preparation of Kwatha

Kwatha of Ikshumoola was prepared by the slandered method of preparation mentioned in Sharangdhara Samhita.[3]

One part drug with eight part water boil on small heat and reduced one fourth parts.

Experimental

For Nephro-protective and curative studies male albino rats were used after approval of animal ethical committee. The feeding was done with commercially available rat feed pallets and tap water. All the animals put in four groups having six in each groups.

The groups were as follow:-[4]

Group I (N-group) Normal control group.

Group II (T-group) Toxic control group.

Group III (ITP-group) Ikshu toxic –protective group.

Group IV (ITC-group) Ikshu toxic –curative group.

Only tap water and commercially available rat feed pellets were administer orally for this group no drug no Nephro toxic agent was given to Normal control group(Group I) for the period of 29 days. Toxic control group (Group II) was administering 80mg /kg/dayinj. Gentamicin by intraperitonial rout for 8 days. Ikshu toxic – protective group (Group III) was given IP inj.Gentamicin for 8 days and simultaneously Kwatha of Ikshu moola (1.9 ml / 200gm rats) was given orally for 21 days. Ikshu toxic – curative group (Group IV) was given IP inj. Gentamicin for 8 days and from 9th day Kwatha of Ikshu moola was given orally for a period of 21 days.

After dosing individual rats were placed in separate metabolic cage and collect urine in watch glass before sacrificing the animals to determine the pH and urine protein by strip method .Under anesthesia blood sample were collected by puncturing the retro-orbital plexus. Serum was separated by centrifugation at 1000 rmp for 15 min and use for investigation of various bio-chemical parameters.[5]

Assessment of kidney function

On the 30th day of experiment all the rats were sacrificed except animals form Ikshu toxic – protective (Group III).The animals from Group III were sacrificed on 22nd day of experiment after anesthetized by high dose of Holothane inhalation and blood samples were collected from the animals. Serum was separated for estimation like Serum urea, S. createnine, S. electrolytes levels were measured. Urine pH and protein level were measure by strip method from the urine samples.

Histopathological examination

After collecting urine and blood both the kidneys of rats and tissue was fixed in 10% formalin and subjected to histopathological examination after staining with haemotoxylin and eosin.[4]

STATISTICAL ANALYSIS

All readings were tabulated and presented Table, significant difference among the mean were calculated. The statistical significance was calculated by comparison of all parameters between the group with unpaired "t" test.

OBSERVATIONS AND RESULTS

Effect of Ikshu Moola Kwatha in Gentamicin induced Nephro-toxicity.

Table No. 1: Average increase or decrease in body weights in grams.

Sl.No.	Groups	1st week	2nd week	3rd week	Last day
1	**Group-N**	12.8	22.5	17.5	17.8
2	**Group-T**	13.7	-14.8	45.84	55.16
3	**Group-ITP**	10	-25.8	39	
4	**Group-ITC**	16.7	-15.2	22	16

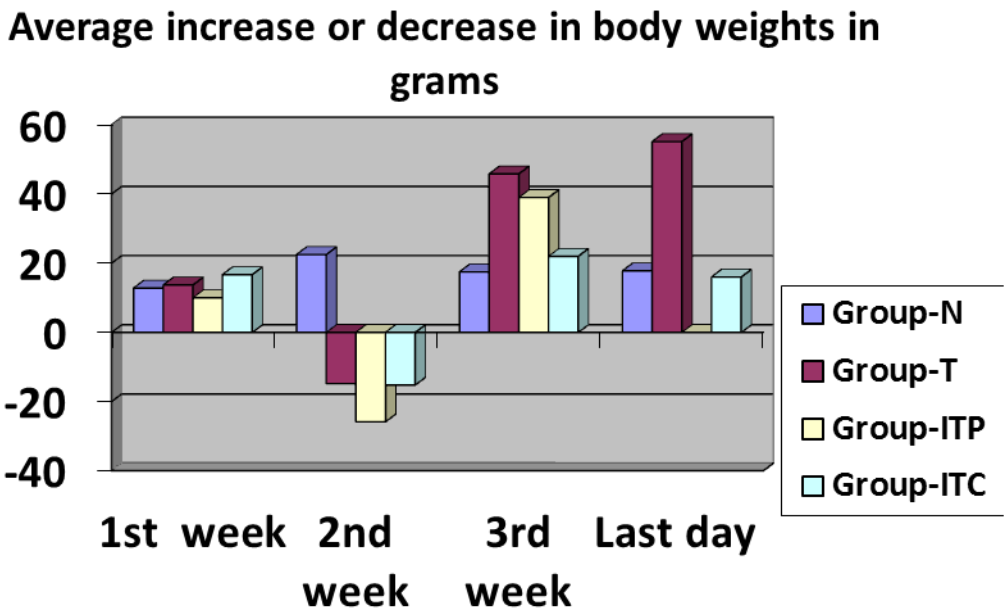


Figure 1: Average Increase or Decrease In Body Weights In Grams.

Table No. 2: Average Kidney Weights As Per Groups.

Groups	Average Kidney weight(gm)
Group-N	0.93
Group-T	1.02
Group-ITP	0.85
Group-ITC	0.92

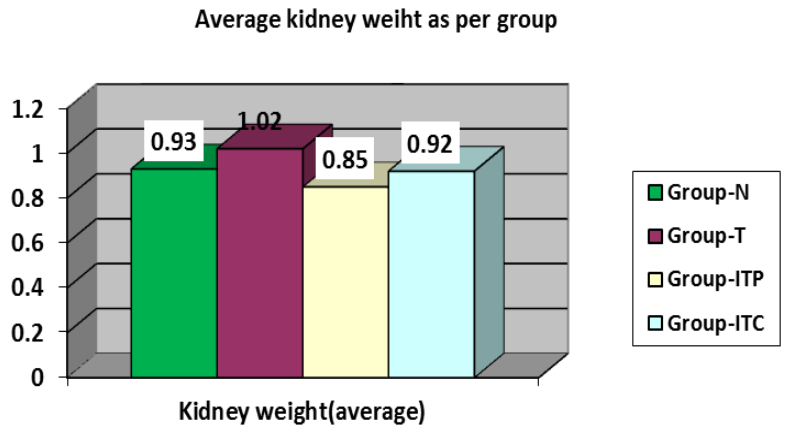


Figure 2: Average Kidney Weight As Per Group.

Table 3: Average Hemoglobin, Urine pH, Urine protein as per group.

No.	Groups	Haemoglobin in mg	Urine pH	Urine protein
1	**N-group**	10.95	6	Nil
2	**T-group**	10.68	6	30
3	**ITP-group**	9.61	5.16	38.3
4	**ITC-group**	11.8	5.8	26.6

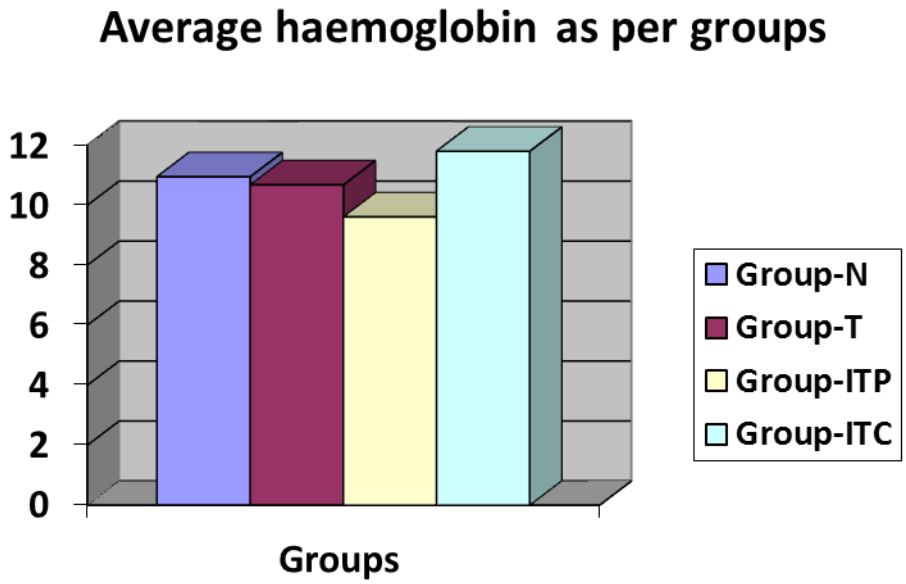


Figure 3.Average Haemoglobin As Per Groups.

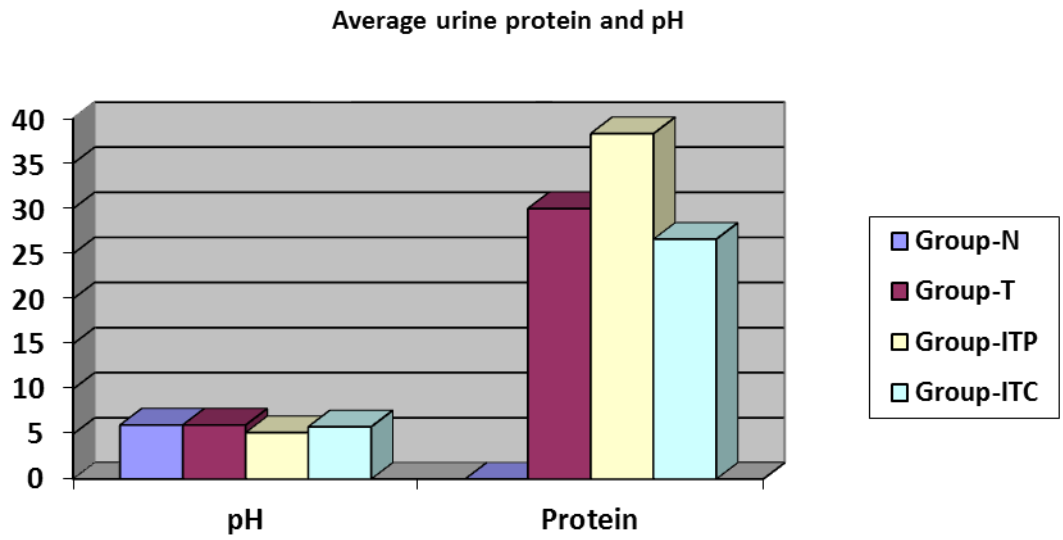


Figure 4.Average Urine Protein And Urine pH.

Table 4: Average S. Urea S. Creatinine and Electrolytes As Per Groups.

No.		S. Urea	S. Criatinine	Sodium	Potassium	Chloride
1	**N-group**	38	0.2	141	103	4.51
2	**T-group**	43	0.25	140	103	4.3
3	**ITP-group**	51	0.65	143.1	102.16	5.05
4	**ITC-group**	38	0.25	141	103.66	4.43

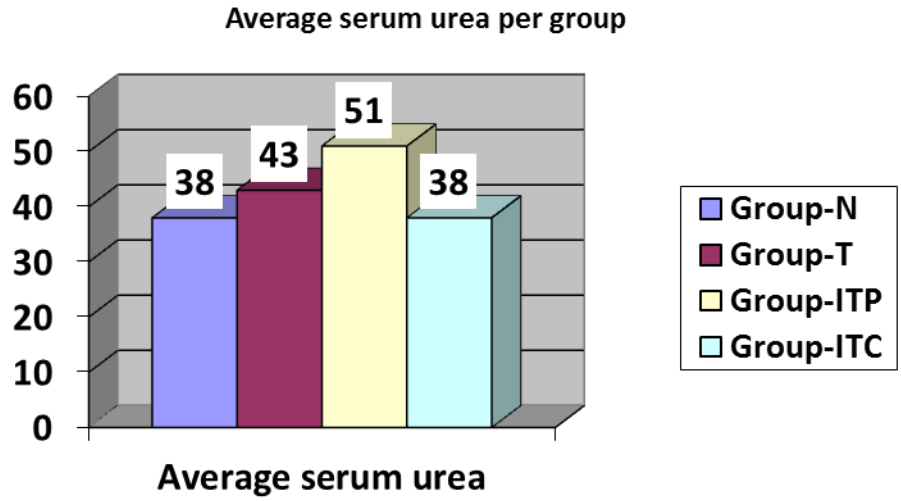


Figure 5: Average Serum Urea Per Group.

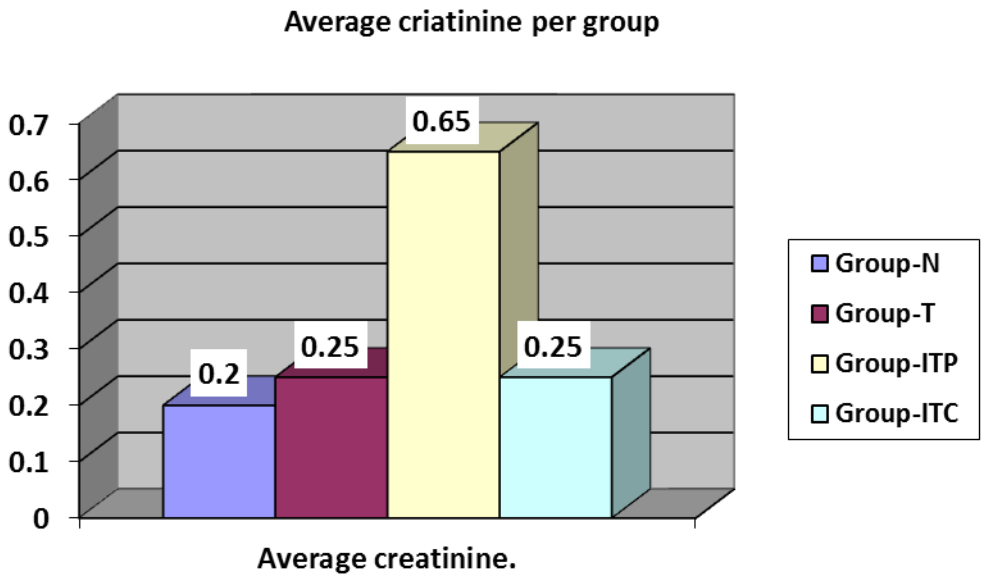


Figure 6: Average S. Criainine Per Group.

From the above table it was revealed that Kwatha of *Saccharum officinarum* Lin. roots revealed Gentamicin induced Nephro-toxicity by decreasing Serum Urea, Serum Criatinine and thus showing significant activity in ITC-group than ITP-group compare with normal control group.

Table No.5: Histopathological Changes As Per Groups.

Group	Histopathological Changes
Group-N(Normal)	Three Normal glomeruli.(in Photo plate No.2/1
Group-T(Toxic)	Enlarged congested glomeruli.(in Photo plate No.2/2
Group-ITP(Protective)	Enlarged mild congested glomeruli.(in Photo plate No.2/3
Group-ITC(Curative)	Two enlarged non congested glomeruli(in Photo plate No.2/4

Table No. 6: Comparision of All Parameters Between Normal Control (N) And Nephro-Protective (Itp) Group By Applying Unpaired 'T' Test.

	R.k.Wt	L.K.WT	B.WT	S.UREA	S.CRET.	Na+	k+	CL-
N-group	0.965	0.905	260.8	38.5	0.2	141.6	4.51	103.6
ITP-group	0.87	0.82	196	51.83	0.41	143	5.05	102.1
P VALUE	0.226	0.07	-	0.004	0.147	0.32	0.35	0.29
SIGNIFICANCE	insignificant	Insig.	-	Signi.	Insig.	Insig.	Insig.	Insig.

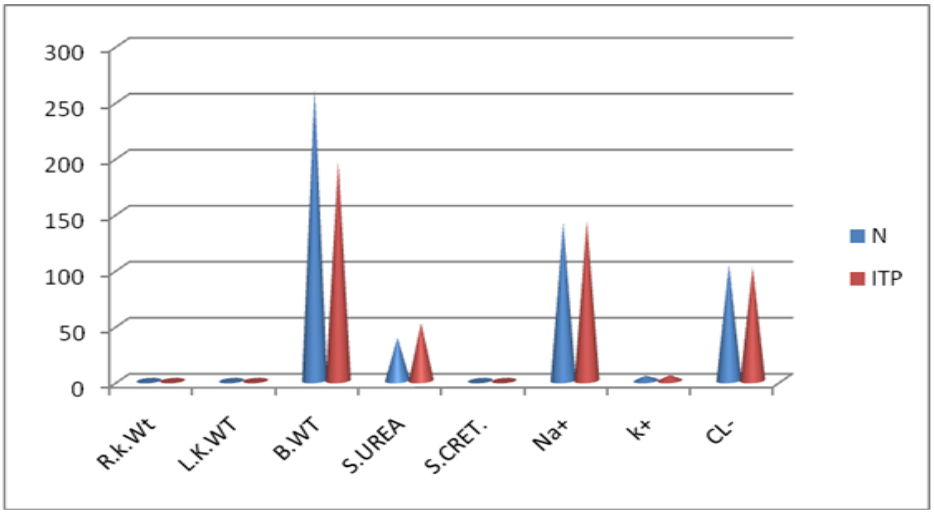


Fig no. 7: Comparision of All Parameters Between Normal Control (N) and Nephro-protective (ITP) Group By Applying Unpaired 't' test.

Table No. 7: Comparision of All Parameters Between Normal Control (N) And Nephro-Curative (Itc) Group By Applying Unpaired 'T' Test.

	R.k.Wt	L.K.WT	B.WT	S.UREA	S.CRET.	Na+	k+	CL-
N-group	0.965	0.905	260.8	38.5	0.2	141.6	4.51	103.6
ITC-group	0.86	0.98	213	38.6	0.23	141	4.4	103.6
P VALUE	0.232	0.629	-	0.64	0.145	0.72	0.9	1
SIGNIFICANCE	Insigni.	Insigni.	-	Insigni.	Insigni.	Insigni.	Insigni.	Insigni.

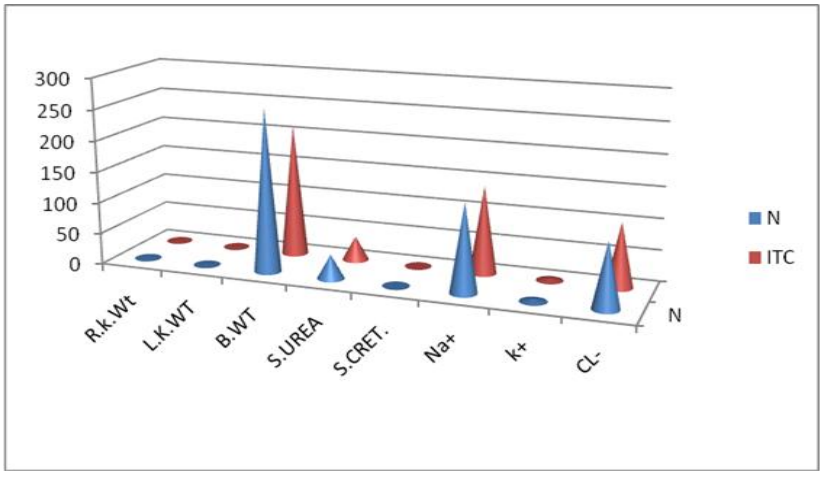


Figure 8: Comparison of All Parameters Between Normal Control (N) and Nephro-curative (ITC) Group By Applying Unpaired 't' test.

Table No. 8: Comparision of All Parameters Between Toxic Control (T) and Nephro-Protective (Itp) Group By Applying Unpaired 'T' Test.

	R.k.Wt	L.K.WT	B.WT	S.UREA	S.CRET.	Na+	k+	CL-
T-group	1.04	1.01	230.8	42.5	0.28	140	4.3	103
ITP-group	0.87	0.82	196	51.83	0.41	143	5.05	102.1
P VALUE	0.04	0.01	-	0.019	0.35	0.14	0.19	0.66
SIGNIFICANCE	Signi.	Signi.	-	signi.	Insig.	Insig.	Insig.	Insig.

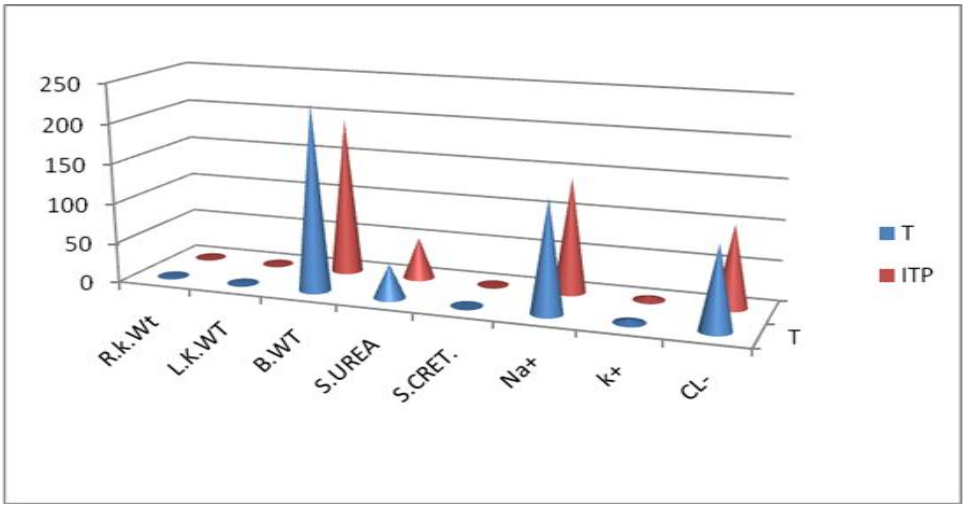


Figure 9: Comparision of All Parameters Between Toxic Control (T) And Nephro-protective (ITP) Group By Applying Unpaired 't' test.

Table No. 9: Comparision of all Parameters Between Toxic Control (T) And Nephro-Curative (Itc) Group By Applying Unpaired 'T' Test.

	R.k.Wt	L.K.WT	B.WT	S.UREA	S.CRET.	Na+	k+	CL-
T-group	1.04	1.01	230.8	42.5	0.28	140	4.3	103
ITC-group	0.86	0.98	213	38.6	0.23	141	4.4	103.6
P VALUE	0.03	0.86	-	0.122	0.09	0.66	0.84	0.77
SIGNIFICANCE	Signi	Insign.	-	Insig.	Insig.	Insig.	Insig.	Insig.

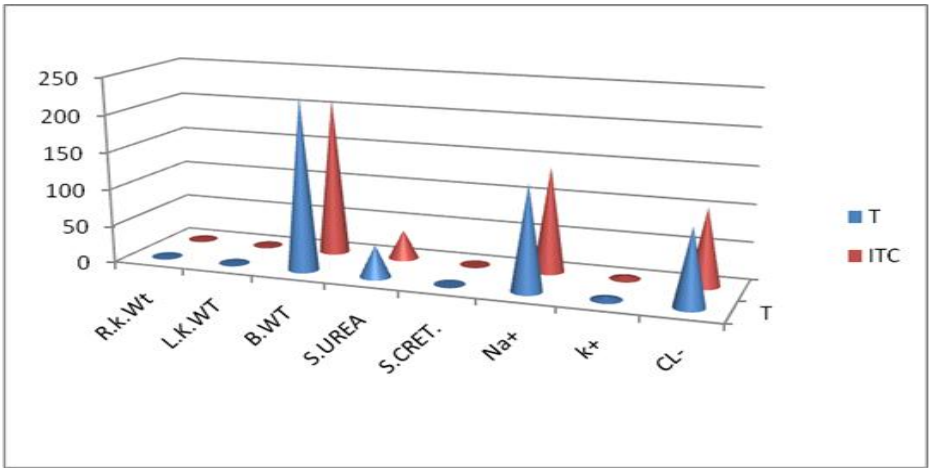


Figure 10: Comparision of All Parameters Between Toxic control (T) and Nephro-curative (ITC) GroupBy Applying Unpaired 't' test.

Table No. 10: Comparision of All Parameters Between Nephro-Protective (Itp) Group And Nephro-Curative (Itc) Group By Applying Unpaired 'T' Test.

	R.k.Wt	L.K.WT	B.WT	S.UREA	S.CRET.	Na+	k+	CL-
ITP-group	0.87	0.82	196	51.83	0.41	143	5.05	102.1
ITC-group	0.86	0.98	213	38.6	0.23	141	4.4	103.6
P VALUE	0.91	0.347	-	0.002	0.21	0.34	0.24	0.45
SIGNIFICANCE	Insignificant	I.S.	-	S.	Insig.	Insig.	Insig.	Insig.

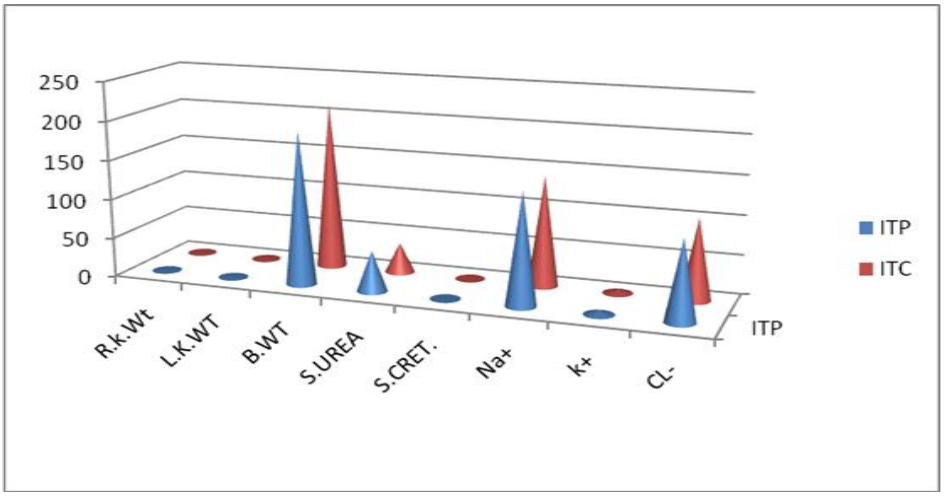
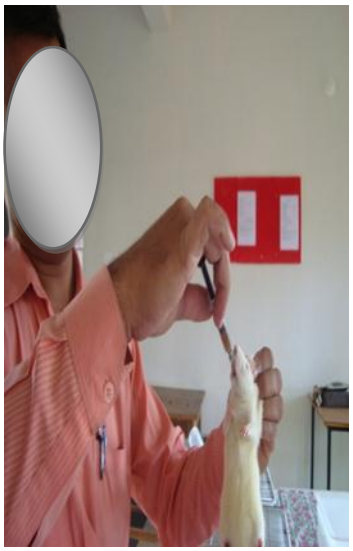


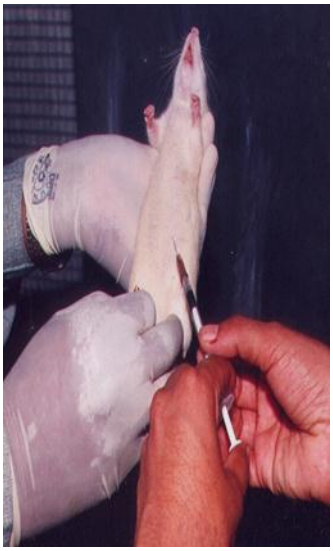
Figure 12: Comparision of All Parameters Between Nephro-protective (ITP) Group and Nephro-curative (ITC) Group By Applying Unpaired 't' test.

PHOTO PLATE NO: 1

ALBINO RATS



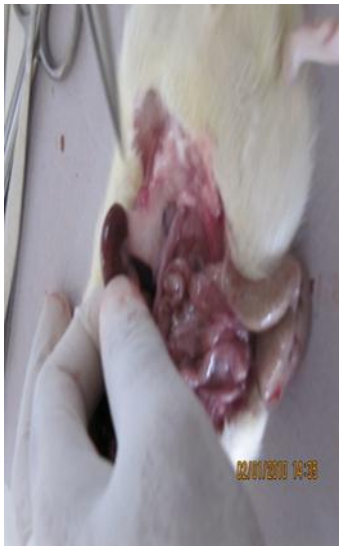
TEST DRUDFEEDING



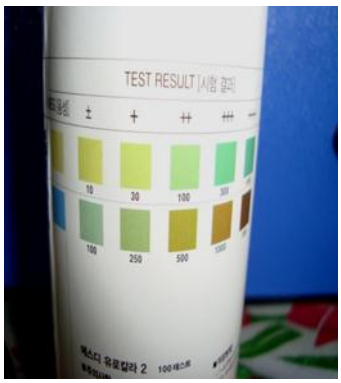
IP INJECTION

ANESTHESIA

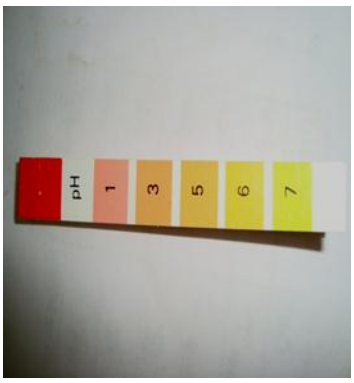
DISECTION



RESULT



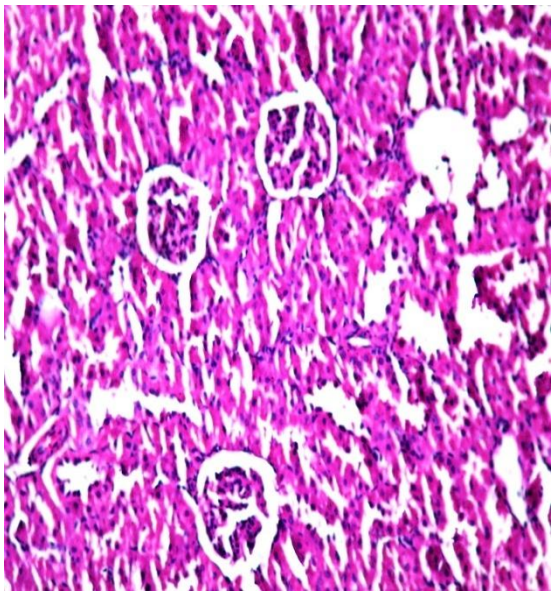
URINE PROTEIN



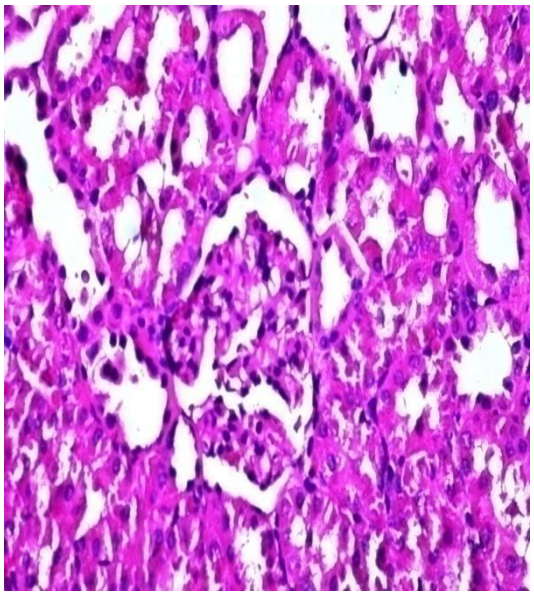
pH STRIP

10% FORMALIN

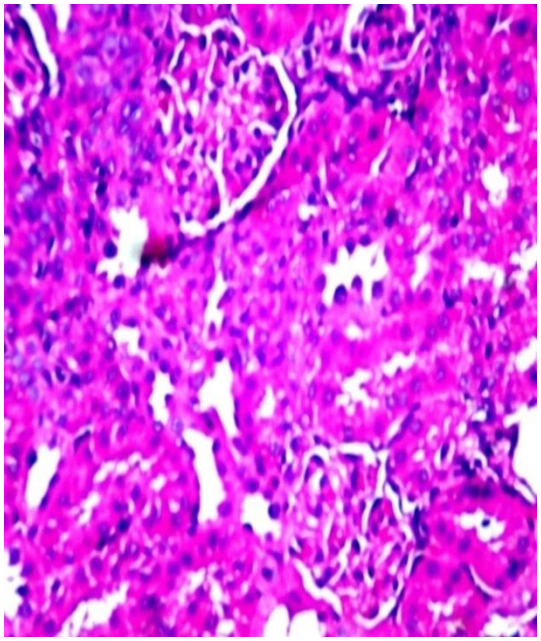
PHOTO PLATE NO 2.



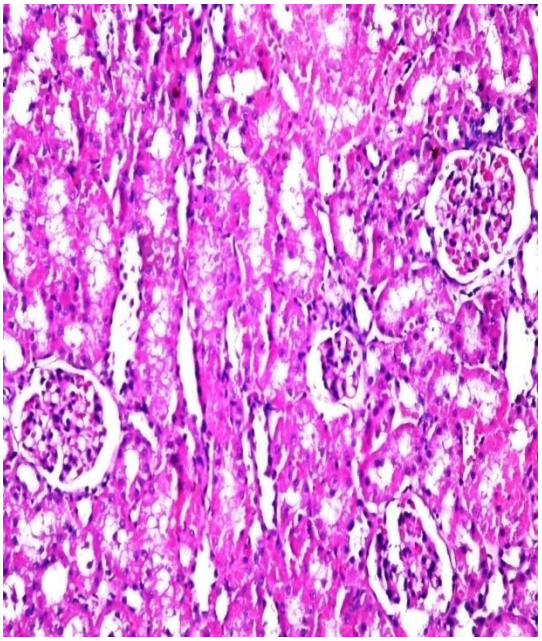
1.PLAIN CONTROL GROUP(N)



2.GENTAMICIN TREATED GROUP (T)



3.GENTA +IKSHU TREATED (ITP)



4.AFTER 8 DAY GENTA IKSHU TREATED (ITC)

TREATED (ITC)

HISTO-PATHOLOGY OF KIDNEY

NEPHRO-PROTECTIVE AND CURATIVE STUDY OF IKSHU MOOLA

DISCUSSION

Gentamycin over dose is often linked to many metabolic disorders including serum electrolyte, urea and creatinine dearrangements. Increased concentration of serum urea and creatinine are considered for investigating drug induced nephrotoxicity in animals and man.[6] The vital function that blood cells perform, together with the susceptibility of this highly proliferative tissue to intoxication by xenobiotics, makes the hematopoietic system unique as a target organ. Certain drugs including alkylating cytotoxic agents could also affect blood formation rate and the normal range of hematological parameters.[7] The present study was undertaken to establish the nephron-protective and curative activity of the root of *Saccharum officinarum* Linn. From our study Gentamycin induced renal injury was evidenced by decrease in renal functionin experimental animals. Eight days administration of Gentamycin at 80 mg/kg/day produced a significant increase in blood urea, serum creatinine and electrolytes level followed by significant loss in body weight of the experiment animals. Also the blood hematological parameters such as Hb was decreased significantly. However this study shows that the root of *Saccharum officinarum* Linn. could contain candidate molecules

that cures the hematotoxic effect of Gentamycin with ensuing improvement of hematopoiesis. The curative treatment with root of *Saccharum officinarum* Linn. significantly increases Hb. Root of *Saccharum officinarum* Linn.is recommended as better drug of choice in anemia (Pandu) in Sushrutsamhita.[8]

In renal disease, serum urea accumulates because the rate of serum urea production exceeds the rate of clearance. Creatinine, on the other hand, is mostly derived from endogenous sources by tissue creatinine breakdown.[9] Elevation of urea and creatinine levels in the serum was taken as the index of nephrotoxicity.[10,11,12] Thus serum urea concentration is often considered a more reliable renal function predictor than serum creatinine.

The root of *Saccharum officinarum* Linn. in Nephro-curative group was found to normalize the kidney weight, raised blood urea, blood protein,serum urea and serum creatinine than that of Nephro-protective group. The animals showed the signs of recovery and an increase in the body weight were observed on the final day of observation. Thuse the Ikshu Kwatha in Nephro-curative group found to be more potent than the Nephro-protective.

The Histopathological sections of Normal control group shows normal kidney while, toxic control T showed enlarged moderate congested glomerulus, showed tubulules and blood vessel congestion resulting in inflammations in renal cells. Concurrent administration of Ikshumoola Kwatha (in ITP group), reduced mild changes induced by gentamicin and reduced moderate changes in the treatment of Ikshumoola Kwatha after 8 day administration of Gentamicin (in ITC group).

CONCLUSIONS

The study conclusions as follows –To conclude our studies have shown that the roots of *saccharum officinarum* Linn. Possesses marked nephron-curative activity and could have promising role in the treatment of acute renal injury induced by nephrotoxins, especially Gentamycin. Further work envisages evaluating its nephron-protective activity in chronic renal failure models.

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