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Research article

Determination of Nephroprotective Activity of Ethanolic Leaf Extract of *Moringa pterygosperma* on Paracetamol induced Nephrotoxic Rats

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ABSTRACT

The present study was undertaken to investigate the nephro protective effect of ethanolic leaf extract of Moringa Pterygosperma against paracetamol induced nephrotoxicity in rats. The study is carried out by using five groups of rats. Furosemide was taken as standard drug. The parameters estimated are RBC content, haemoglobin content, urea and creatinine levels. The extract showed nephro-protective activity by significantly reducing the levels of blood urea, serum creatinine, increasing the red blood cell count and haemoglobin content($P<0.01$).

Key words: Moringa Pterygosperma, Paracetamol, Nephrotoxicity and Creatinine.

INTRODUCTION

Kidney failure has many possible causes. Some lead to a rapid decline in kidney function (acute kidney failure); others lead to a gradual decline in kidney function (chronic kidney failure). In addition to the kidneys being unable to filter metabolic waste products (such as creatinine and blood urea nitrogen) from the blood, the kidneys are less able to control the amount and distribution of body water (fluid balance) and the levels of electrolytes (sodium, potassium, calcium, phosphate) in the blood.

When kidney failure becomes chronic, blood pressure often rises. The kidneys lose their ability to produce sufficient amounts of a hormone (erythropoietin) that stimulates the formation of new red blood cells, resulting in a low red blood cell count (anemia). In children, kidney failure affects the growth of bones. In both children and adults, kidney failure can lead to weaker, abnormal bones.

Although kidney failure can affect people of all ages, both acute and chronic kidney failure are more common in older than in younger people. Many causes of kidney failure can be treated, and kidney function may recover. The availability of dialysis has transformed kidney failure from a fatal disease to a chronic one.

EPIDEMIOLOGY

Renal failure is one of the major complications of myeloma, found at presentation in 20% of patients and occurring in 50% of patients during the cause of disease. Only 20% of the adults with a nephritic syndrome have minimal change nephropathy and for that reason a renal biopsy is necessary to establish the type of glomerulonephritis.

Idiopathic glomerulonephritis accounts for 90% of childhood cases of nephritic syndrome and 80% in adult patients. In patients presenting with acute renal failure the proportion with acute interstitial nephritis varies from 1.5-6.5%.

A recent year study (2000) from renal units and ICU in a defined geographical area of Scotland found that 131 patients per million per year required renal replacement therapy for acute renal failure.

The incidence of chronic kidney disease leading to dialysis varies worldwide: the number of patients per million population starting dialysis each year is 110 in the UK.

ACUTE RENAL FAILURE

It is defined as a significant decline in renal excretory function occurring over hours or days. This is usually detected clinically by arise in the plasma concentration of the urea or creatinine. Acute renal failure may arise as an isolated problem, but much more commonly occurs in the setting of circulatory disturbance associated with severe illness, trauma, or surgery; transient renal dysfunction.

Vascular causes of acute renal failure:

- Acute cortical necrosis
- Large vessel obstruction
    - Arterial obstruction
    - Venous obstruction.
- Small vessel obstruction
    - Accelerated phase hypertension
    - Systemic necrosis
- Glomerulonephritic and vasculitic causes of ARF
- Interstetial nephritis.
- Leptospirosis
- Hanta virus disease. (Europe)

CHRONIC RENAL FAILURE

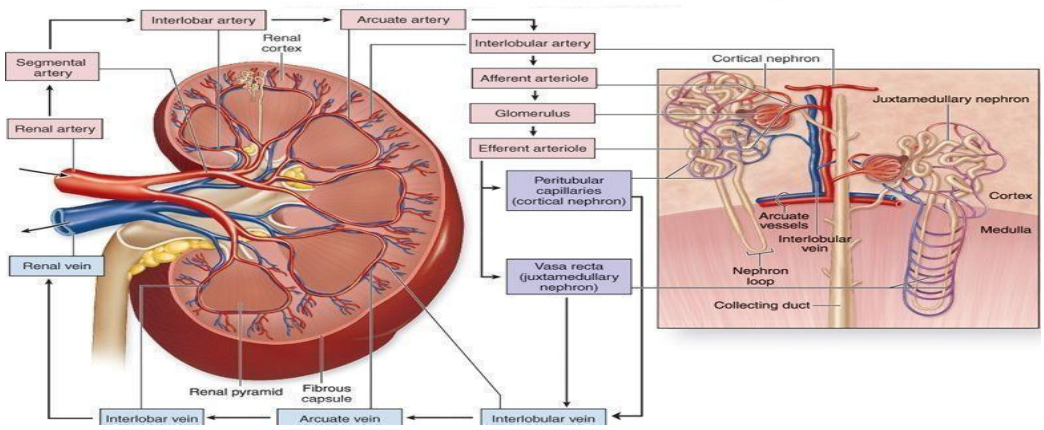
It is the clinical syndrome of the metabolic and systemic consequences of a gradual, substantial and irreversible reduction in the excretory and homeostatic functions of the kidneys.

It can be difficult to recognize because the symptoms and clinical manifestations are non-specific.

CAUSES OF CHRONIC RENAL FAILURE

The most important causes of chronic kidney disease are diabetes, glomerulonephritis, hypertension and other vascular disease.

- Arteriopathic renal disease and hypertension
- Glomerulonephritis
- Diabetes
- Infective, obstructive and reflux nephropathies
- Congenital disease
- Familial or hereditary kidney disease, e.g. polycystic kidneys
- Hypercalcaemia
- Connective tissue diseases
- Neoplasms
- Myeloma
- Reflux nephropathy
- Renal bone disease is a major cause of disability in patients with terminal renal failure.



RENAL BLOOD SUPPLY

The kidneys, relative to their size, receive a huge fraction of the cardiac output (20-25%), and in times of stress, sympathetically mediated renal vasoconstriction can shunt the large blood flow to extra renal sites. Thus, whereas, the auto regulation gives the impression that the kidneys react to

changes in blood pressure, the reality is that the kidneys play a major role in the regulation of the blood pressure, and many authors have emphasized that renal blood flow decreases whenever cardiac

output is decreased secondary to volume depletion, although there is continuing controversy over the magnitude of the decrease.

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PLANT PROFILE

Moringa pterygosperma	
Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Rosids
Order:	Brassicales
Family:	Moringaceae
Genus:	***Moringa***
Species:	***M. pterygosperma***
Binomial name ***Moringa pterygosperma*** Lam.	

Moringa Pterygosperma plant

COMMON NAMES

English - Moringa, Drumstick tree, Horseradish tree ,Latin - Moringa oleifera ,Sanskrit -Surajana, Hindi - Sahjan , Tamil-Amukira, Kannada-Keramaddinagaddi, Telugu- Mulakkaya Malayalam- Muringa. Marathi - Shevga , Gujarati - Saragvo, Bengali- Sojne danta, or sujana Punjabi- Surajana, Nepali-Sajiwan or Swejan, Assamese-Sojina, Sinhalese- Murunga Chinese -La mu

CHARACTERS

The Moringa plant is a perennial, evergreen tree that grows up to 20 ft (6.1 m) tall, with a straight trunk with corky, whitish bark. It grows well in hot, semi-arid and humid regions and in well-drained sandy or loamy soils. The tree has tuberous taproot and brittle stem is with corky bark. The leaves are pale green, compound, tripinnate, 30-60 cm (11.8 to 23.6 in) in length, with many small leaflets. The lateral leaflets are elliptic in shape while the terminal one is obovate and slightly larger than the lateral ones. The fruit pods are pendulous, green turning greenish brown, triangular and split lengthwise into 3 parts when dry. The pods are 1 to 4 ft (30-120 cm) long and 1.8 cm (0.7 in) wide and tapering at both ends. The pods contain about 10 to 20 seeds embedded in the fleshy pith. The seeds are dark brown and the kernel is surrounded by a lightly wooded shell.

CHEMICALCONSTITUENTS

The main constituents of Moringa plant are: deic, palmitic and stearic acid, saponins, glycoside, gum, protein Vitamins: A, B1, B2, B3, C Minerals: calcium, iron, phosphorus, magnesium. The leaves, flowers and pods are used as significant sources of

vitamins A, B and C, riboflavin, nicotinic acid, folic acid, pyridoxine, ascorbic acid, beta-carotene, calcium, iron, and alpha-tocopherol . The pods are considered good sources of the essential amino acids. A compound found in the flowers and roots of the moringa tree, pterygospermin, has powerful antibiotic and fungicidal effects. More recently the ben oil has also been shown to be particularly effective in the manufacture of soap producing a stable lather with high washing efficiency suitable for some African countries. The root bark contains two alkaloids: moringine and moringinine.

ACTIONS

It is a multifunctional and choleretic agent.

HEPATOPROTECTIVE EFFECTS

Moringa pterygosperma protect the liver against several toxicants both in vitro and in vivo and Moringa pterygosperma reduces the iron-induced hepatic damage by lowering lipid peroxidation.

ANTICANCER, ANTITUMOR AND ANTIPROLIFERATIVE ACTIVITIES

Curative action of moringa pterygosperma contains moringinine against cancer at various sites in the body and tumorigenesis.

COLON CANCER

Moringa pterygosperma was found to be more effective in preventing colon tumorigenesis than mammary cancer.

MAMMARY CANCER

An interesting study explored the synergistic inhibitory effects Moringa pterygosperma on the growth of human breast cancer MCF-7 cells induced by estrogenic pesticides or 17-beta estradiol.

SKIN CANCER

The use of Moringinine in the treatment of skin tumors has been reported in earlier studies.

OTHER CANCER TYPES

Oral administration of Moringa pterygosperma has been shown in several earlier studies to inhibit oral, fore stomach, duodenal and colon cancer. One study also reports the cytotoxicity of moringinine against human ovarian cancer OVCAR-3 cells. Another study was directed towards oral cancer.

ANTIOXIDANT/ANTI-INFLAMMATORY ACTION

The antioxidant and anti-inflammatory properties of moringinine were directed towards elucidating the mechanism of action and obtaining further insight into the role in moringinine the management of inflammatory conditions such as arthritis as well as autoimmune disorders.

IMMUNOMODULATION

Many of the beneficial actions of natural compounds may be attributed to their immune modulating effects.

ANTIMICROBIAL PROPERTIES

Helicobacter pylorus is implicated as an etiologic agent in the development of chronic gastritis, duodenal ulceration, and gastric adenocarcinoma. Helicobacter strains differ in their virulence and in their ability to induce cytokine production with high degrees of virulence correlating with enhanced IL-8 production. Moringa pterygosperma, which inhibits NF-kappaB activation, was found to also completely suppress IL-8 induction by H. pylori, thereby suggesting the potential use Moringa pterygosperma, in the control of pathogenicity of H. pylori .

MATERIALS AND METHODS

ANIMALS

Healthy, adult male rats of Sprague dawely strain, weighing 170±5gm were selected for study. The animals were kept in a well-ventilated room and the animals had exposed to 12 hours day and night cycle with a temperature between 20±2°C. The animals were housed in large spacious, hygienic polypropylene cages during the course of the experimental period. The animals were fed with water and mice pellet feed *ad libitum.*

CHEMICALS

The chemicals that were used for the present study were from Arova chemicals in hydrabad and gouranga laboratory in Narasaraopet.

PREPARATION OF EXTRACT

- The leaves were separated from the plant.
- These were dried & extracted by ethanol in soxhlet extractor for 48 hrs.
- Then the extract was evaporated to dryness at 35-40 C to get a solid mass free from solvent.

- The solid mass has characteristic odour.

PRELIMINARY PHYTOCHEMICAL SCREENING

TEST FOR ALKALOIDS

A small portion of the aqueous extract was stirred with a few drops of dilute hydrochloric acid and filtered. The filtrate tested with various alkaloidal reagents such as

Mayer's reagent - Cream precipitate show the presence of alkaloids

Dragendroff's reagent- Reddish brown precipitate show the presence of alkaloids

Hager's reagent - Yellow precipitate show the presence of alkaloids

Wagner's reagent - Reddish brown precipitate show the presence of alkaloids

TEST FOR CARBOHYDRATES

The minimum amount of the extract was dissolved in 5ml of distilled water and filtered. The filtrate was subjected to test for carbohydrates.

MOLISCH'S TEST

The filtrate was treated with 2-3 drops of alcoholic α-naphthol and 2ml of concentrated sulphuric acid was added along the sides of the test tube. Purple to violet ring appears at the junction.

FEHLING'S TEST

The filtrate was treated with 1ml of Fehling's solution A and B then heated. Reddish orange precipitate shows the presence of carbohydrates.

BORNTRAGER'S TEST

Filtrate was treated with chloroform and the layer was separated. To this equal quantity of dilute ammonia solution was added. Colour change in the ammonia layer shows the presence of carbohydrates.

TEST FOR PHYTOSTEROLS

1gm of extract was dissolved in few drops of dilute acetic acid, 3ml of acetic anhydride was added by followed few drops of concentrated sulphuric acid. Appearance of bluish green colour show the presence of phytosterols.

TEST FOR FIXED OILS AND FATS

Small quantity of extract was pressed between two filter papers. Appearance of oil stain on the paper indicates the presence of fixed oil.

Few drops of 0.5N alcoholic potassium hydroxide were added to small quantity of extract along with a drop of phenolphthalein. The mixture was heated on water bath for 1-2 hours. Formation of soap or partial neutralization of alkali indicated the presence of fixed oils.

TEST FOR SAPONINS

The extract was diluted with 20ml of distilled water and it was agitated on graduated cylinder for 15minutes.The presence of saponins was indicated by formation of 1cm of foam.

TEST FOR TANNINS AND PHENOLIC COMPOUNDS

Small quantity of extract was taken separately in water and tested for presence of phenolic compounds and tannins. With dilute ferric chloride solution (5%) violet colour indicates the presence of phenols. 1% solution of gelatine containing 10% sodium chloride, white precipitate shows the presence of phenols. 10% Lead acetate solution, white colour indicates the presence of tannins.

TEST FOR PROTEINS AND AMINO ACIDS

Dissolve small quantity of extract in few ml of water treated with

Millon's reagent - Appearance of red colour shoed the presence of proteins and free amino acids.

Ninhydrin reagent - Appearance of purple colour shows the presence of proteins and free amino acids.

Biuret test - Equal volume of 5% solution and 1% copper sulphate solutions were added. Appearance of pink or purple colour shows the presence of proteins and free amino acids.

TEST FOR GUMS AND MUCILAGE

About 10 ml of extract was added separately to 25 ml of absolute alcohol with constant stirring and filtered. The precipitate was dried in air and examined for its swelling properties and for the presence of carbohydrates.

TEST FOR FLAVONOIDS

With aqueous sodium hydroxide solution blue to violet colour (anthocyanins), yellow to orange colour (flavonones).With concentrated-sulphuric acid-yellowish orange colour (anthocyanins), yellow to orange (flavones), orange to crimson (flavonones).

SHINODA'S TEST

Test extract was dissolved in alcohol, to that piece of magnesium followed by concentrated hydrochloric acid drop wise added and heated. Appearance of pink scarlet, crimson red colour shows the presence of flavonoids.

TEST FOR LIGNINS

With alcoholic solution of phloroglucinol and hydrochloric acid appearance of red colour show the presence of lignins.

PREPARATION OF STANDARD MORINGA PTERYGOSPERMA DOSE

The standard moringa pterygosperma leaf extract was weighed accurately and suspended in 0.2% w/v carboxy methyl cellulose (CMC) suspension. The moringa pterygosperma leaf extract was administered orally to animals at 2 dose levels, of 100, 200 mg/kg body weight (b.wt.) at a dose volume of 0.1ml/100g of rat body weight.

ACUTE TOXICITY OF MORINGA PTERYGOSPERMA

The study was carried out according to OECD guideline 423 (OECD, 1992). 3 female Swiss mice of weight (20-25gm) were taken and kept for overnight fasting. Next day, body weight was taken and standardised moringa pterygosperma leaf extract was administered orally to animals at a dose of 2000 mg/kg in 0.2% w/v CMC. Then the animals were observed for mortality and morbidity at 0,1/2,1,2,4,6,8,12 and 24h.Feed was given to the animals after 4h of the dosing and the body weight was checked at 6h after dosing. Morbidity like convulsions, tremors, grip strength, lethargy, ptosis, and pupil dilation were observed. The animals were observed twice daily for 14 days and body weight was taken. The experiment was repeated once again on 3 mice (20-25gm) as there was no observable clinical toxicity for the animals on the phase I study.

GROUPING OF ANIMALS

The total numbers of animals required for nephroprotective study are:30 animals.

These 30 animals are further divided into 5 groups of six animals eac

Control-I (Normal rats treated with saline).

Control II (Paracetamol induced nephrotoxicity in control rats treated with vehicle)

Control III standard (Paracetamol induced nephrotoxicity in rats treated with frusemide. 0.36mg/kg).

Control IV (Paracetamol induced nephrotoxicity in rats treated with moringa pterygosperma leaf extract-100mg/kg).

Control V (Paracetamol induced nephrotoxicity in rats treated with moringa pterygosperma leaf extract-200mg/kg).

The standard and test drugs are administered continuously for 15 days by oral route. The drugs were administered to all the groups twice daily. They were given the treatment at 8.00am and 18.00 pm.

At the end of 15 days study the rats are sacrificed with excess dose of anaesthestic ether. Then the blood is collected by Sino orbital puncture and subjected to Haematological parameters determination like RBC, Haemoglobin (Hb), total lipids such blood cholesterol, blood urea are estimated.

PARACETAMOL INDUCED NEPHRO TOXICITY

- ✓ Male adult albino rats weighing between 170-185gm were grouped as mentioned previousiy. Food was withdrawn 16 hours before paracetamol administration to induce the nephrotoxicity.
- ✓ Except first group,remaining all groups were treated with paracetamol(750mg/kg, i.p.) diluted with propylene glycol (12.5% soiution) was administered for 7 days.
- ✓ On 7th day all the animais were anaesthetised uning anaesthetic ether.Blood samples were collected by retro orbital puncture method and serum was used to estimation of RBC, haemoglobin,, urea and creatinine.

PHARMACOLOGICAL EVALUATION AT 15^{TH} DAY

After induction of nephrotoxicity standard & test drugs were administered for 15 days. At the end of 15 days study the blood was collected by retro orbital puncture under light ether anaesthesia in heparinised tubes and subjected to Hematological and Biochemical parameters determination like RBC, Haemoglobin (Hb), blood urea and Creatinine are estimated.

PARAMETERS ESTIMATED

The following parameters were taken into account for evaluating the nephroprotective activity of

moringa pterygosperma from moringa pterygosperma *Lam* for its paracetamol induced nephrotoxicity in rat model.

ESTIMATION OF RED BLOOD CORPUSCLES (RBC)

RBC was estimated by using the RBC pipette and Newbar's slide, which contains the charged counting chamber, is placed under microscope. Located the RBC Square Q under low power. Closing the diaphragm, until the red cells and the squares become distinctly visible should cut off the light. Now under high power, moving the counting chamber such that squares A of big RBC square Q is seen. Counting the number of RBCs in the whole square A, B, C, D and E. Let the total number of RBCs in all five squares A, B, C, D and E, be X. The RBC was expressed in million cells per cubic millimeter (million cells/ mm^3).

HAEMOGLOBIN (HB):

Haemoglobin was estimated by Gouranga Lab (NRT) Auto analyzer, using Randox diagnostic kit; U.K. Haemoglobin was expressed in g/dl.

CREATININE

Creatinine was estimated by Gouranga Lab (NRT)) Auto analyzer, in serum by Ecoline diagnostic kit. 50 µl of serum is mixed with buffer solution 250 µl and incubated for 5 minute at constant temperature between 20°Cand 37 °C. Add 250 µl picric acid solutions mix and started measurement immediately. Standard and sample reaction must proceed at constant temp and timing condition. The creatinine level in serum was expressed in mg/ dl.

UREA

Urea was estimated by Gouranga Lab (NRT) Auto analyzer, in serum by Ecoline diagnostic kit.10 µl of serum is mixed with reagent solution 500 µl and incubated for 10 minute at 37°C. Read absorbance of sample and standard against blank. The urea level in serum was expressed in mg/ dl.

STATISTICAL ANALYSIS

The collected data were subjected to appropriate statistical test like one-way ANOVA (Analysis of variance). P values of less than 0.01 were considered as significant. The analysis was carried out using Graph pad prism software of version 4.

RESULTS

Table.01: Qualitative analysis of the crude extract

S.No	Phytoconstituents	Aqueous extract
1	Alkaloids	+
2	Carbohydrates	+
3	Phytosterol	-
4	Fixed oils	-
5	Saponins	+
6	Tannins and Phenols	-
7	Proteins and Amino acids	-
8	Gums and Mucilages	+
9	Flavonoids	+
10	Lignins	-

(+) – Present,(-) – Absent

ESTIMATION OF RBC

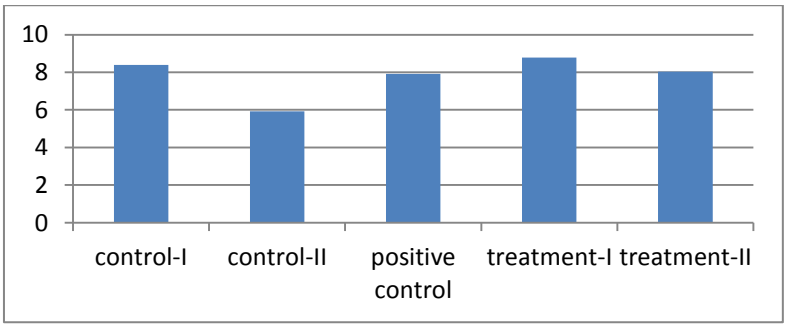
In the RBC from the serum of nephrectoxic induced and non-treated groups (Nephrectomized control) was found to be 5.92±0.019. The normal animal, which received only the solvent, had the value of 8.39±0.008 ($p<0.01$). The animals treated with frusemide showed the value of 7.91±0.013 ($P<0.01$) whereas animals treated with moringa pterygosperma at a dose of 100 mg/kg and 200 mg/ kg had showed the value of 6.79±0.110 ($p<0.01$) and 7.03±0.022 ($P<0.01$) correspondingly. The

above values showed that moringa pterygosperma treatment increased the RBC level.

Table: 02. Estimation of RBC

S.No	Treatment groups	Dose	RBC (million cells/mm^3)
1	Control-I (Normal)	1ml/kg	8.39±0.008
2	Control-II (Nephrectomized control)	1ml/kg	5.92±0.019
3	Positive control(Frusemide, p.o)	100mg/kg	7.91±0.013
4	Treatment-I (M.Pterygosterma, p.o)	100mg/kg	6.79±0.110
5.	Treatment-II (M.Pterygosterma, p.o)	200mg/kg	7.03±0.022

Values are mean ± SEM; n=6 in each group. P<0.01 when compared to control



Estimation of RBC

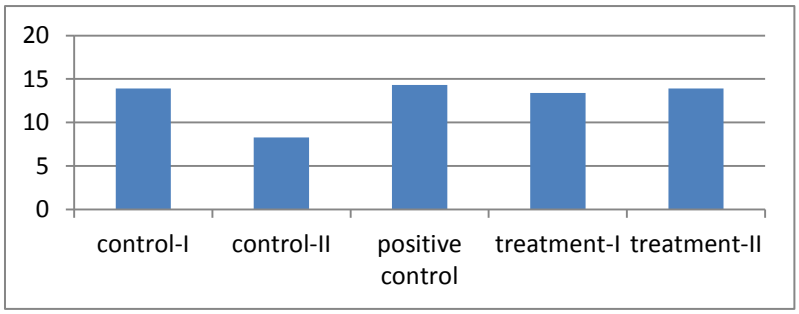
ESTIMATION OF HAEMOGLOBIN

In the Haemoglobin concentration from the serum of nephrectomy induced and non-treated groups (Nephrectomized control) was found to be 8.26±0.02g/ dl. The normal animal, which received only the solvent, had the value of 13.9±0.0632 (p<0.01). The animals treated with frusemide showed the value of 14.32±0.84 (P<0.01) where as animals treated with moringa pterygosperma at a dose of 100 mg/kg and 200 mg/ kg had showed the value of 13.4±0.172 (p<0.01) and 13.9±0.060 (P<0.01) correspondingly. The above values showed that moringa pterygosperma treatment normalizes the haemoglobin level in experimental rats.

Table: 03. Estimation of Haemoglobin (Hb)

S. No	Treatment groups	Dose	Haemoglobin(g/dl)
1	Control-I (Normal)	1ml/kg	13.9±0.0632
2	Control-II (Nephrectomized control)	1ml/kg	8.26±0.02
3	Positive control (Frusemide, p.o)	100mg/kg	14.32±0.84
4	Treatment-I (M.Pterygosterma, p.o)	100mg/kg	13.4±0.172
5.	Treatment-II (M.Pterygosterma, p.o)	200mg/kg	13.9±0.060

Values are mean ± SEM; n=6 in each group. P<0.01 when compared to control-I.



Estimation of Haemoglobin.

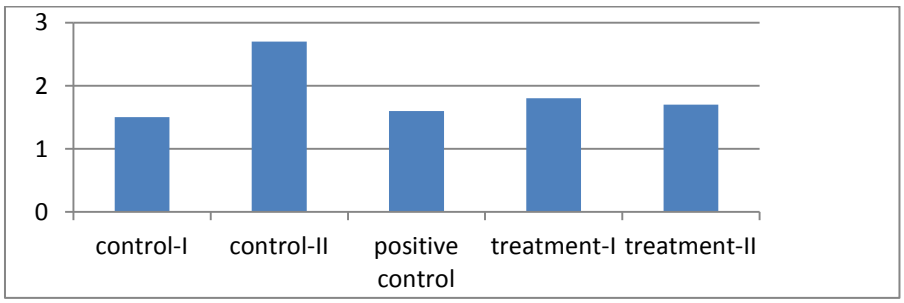
ESTIMATION OF CREATININE

In the creatinine concentration from the serum of nephrectomy induced and non-treated groups (Nephrectomized control) was found to be 2.7±0.020 mg/dl. The normal animal which received only the solvent had the value of 1.54± 0.006($p<0.01$). The animals treated with frusemide showed the value of 1.67± 0.010($P<0.01$) where as animals treated with moringa pterygosperma at a dose of 100 mg/kg and 200 mg/ kg had showed the value of 1.84± 0.009($p<0.01$) and 1.72± 0.0230($P<0.01$) correspondingly. The above values showed that moringa pterygosperma treatment normalizes the elevated creatinine level in experimental rats.

Table: 04. Estimation of Creatinine

S.No	Treatment groups	Dose	Creatinine (mg/dl)
1	Control-I (Normal)	1ml/kg	1.54±0.006
2	Control-II (Nephrectomized control)	1ml/kg	2.72±0.004
3	Positive control (Frusemide, p.o)	100mg/kg	1.67±0.010
4	Treatment-I (M.Pterygosterma, p.o)	100mg/kg	1.841±0.009
5	Treatment-II (M.Pterygosterma, p.o)	200mg/kg	1.725±0.0230

Values are mean ± SEM; n=6 in each group. $P<0.01$ when compared to control-I.



Estimation of Creatinine

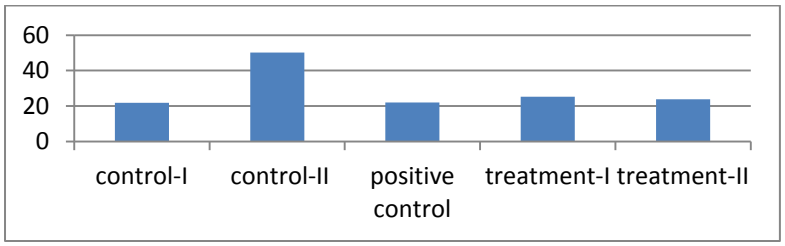
ESTIMATION OF UREA

In the urea concentration from the serum of nephrectomy induced and non-treated groups (Nephrectomized control) was found to be 50.23±0.261 mg/dl. The normal animal, which received only the solvent, had the value of 21.89±0.024 ($p<0.01$). The animals treated with frusemide showed the value of 22.1±0.030 ($P<0.05$) where as the animals treated with moringa pterygosperma at a dose of 100 mg/kg and 200mg/ kg had showed the value of 25.4±0.213 ($p<0.01$) and 23.32±0.151 ($P<0.01$), correspondingly. The above values showed that moringa pterygosperma treatment reduced the elevated urea level in experimental rats.

Table: 05. Estimation of Urea

S.No	Treatment groups	Dose	Urea (mg/dl)
1	Control-I (Normal)	1ml/kg	21.89±0.024[a]
2	Control-II (Nephrectomized control)	1ml/kg	50.23±0.261
3	Positive control (Frusemide, p.o)	100mg/kg	22.1±0.030[b]
4	Treatment-I (M.Pterygosterma p.o)	100mg/kg	25.4±0.213[a]
5.	Treatment-II (M.Pterygosterma, p.o)	200mg/kg	23.32±0.151 [a]

Values are mean ± SEM; n=6 in each group. [a] P<0.01 when compared to control-I , [b]P <0.05 when compared to control



Estimation of Urea

CONCLUSION

Moringa pterygosperma was found to be an effective herbal medicine in the animal models of renal failure. From our pharmacological studies we demonstrated the renal protectant activity of moringa pterygosperma, its toxic effects and undesired properties are none or minimal. The use of moringa for treating further kidney and its associated diseases may be performed on the basis of our pharmacological investigations. The rat species are widely used for most of the pharmacological studies and can be compared with human diseased models. The efficacy of moringa for curing or alleviating chronic renal failure (CRF) may be a light for developing a potential herbal medicine for the future. So, it needs further detailed pharmacological and clinical investigations to prove it as an effective therapeutic agent for renal failure in humans.

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