WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A Review on Nephroprotective Herbal Plant

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DOI: https://doi.org/10.55248/gengpi.234.4.38215

A B S T R A C T

The discovery of powerful new chemicals from medicinal plants may be essential for the creation of successful treatments for a range of renal issues. One of the most frequent kidney issues, nephrotoxicity happens when the body is exposed to a toxin or medicine. The compounds that have protective effect against nephrotoxicity are known as nephroprotective agents. Due to the existence of several complex chemical compounds, medicinal plants offer healing qualities.

Keywords: Medicinal plants, Nephroprotective agents, Therapeutic agents

Introduction

Nephrotoxicity is the most common kidney problems and occurs when body is exposed to a drug or toxin. When kidney damage to occurs, body unable to ride of excess urine and wastes from the body and blood electrolytes (such as potassium and magnesium) will all become elevated. Nephrotoxicity is manifested functionally by decreased urine concentrating capacity, tubular proteinuria, lysosomal enzymuria and mild glucosuria, decreased ammonium excretion lowering of glomerular filtration rate, creatinine clearance and increase in serum BUN, serum creatinine level with kidney tissue morphological alteration[1].

A number of therapeutic agents can adversely affect the kidney resulting in acute renal failure, chronic interstitial nephritis and nephritic syndrome because increasing number of potent therapeutic drugs like aminoglycoside antibiotics, chemotherapeutic agents and NSAIDS have been added to the therapeutic arsenal in recent years. Exposure to chemical reagents like ethylene glycol, carbon tetra chloride, sodium oxalate and heavy metals like lead, mercury, arsenic and cadmium also induces nephrotoxicity. Prompt recognition of disease and cessation of responsible drug are usually the only necessary therapy. Nephroprotective agents are the substances which possess protective activity against nephrotoxicity. Medicinal plants have curative properties due to the presence of various complexes Chemical substances. Ancient literature has prescribed various herbs for the cure of kidney disease. Co-administration of various medicinal plants possessing nephroprotective activity along with different nephrotoxic agents may attenuate its toxicity. The following are some of the medicinal. Plants review possessing nephroprotective activity[6,7,8]

Risk factors for nephrotoxicity:

- The elderly are more likely to overdose on antibiotics or analgesics.
- Kidneys already weakened by conditions such as diabetes can be particularly susceptible to nephrotoxicity.
- Severe dehydration.
- Prolonged exposure to heavy metals or solvents.
- Presence of diseases that cause the overproduction of uric acid.

Symptoms:

- Excess urea in the blood (azotemia).
- Anemia.
- Increased hydrogen ion concentration in the blood (acidosis).
- Excess fluids in the body (over hydration).

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- High blood pressure (hypertension).
- Serious symptoms of kidney failure may leads to seizures and coma.

Fig no 1 Warning sign of kidney failure

Pathopysiology

- Drugs produce nephrotoxicity by interfering with renal blood flow, increase in the kidney weight, glomerular function or tubular function.
- Many drugs are nephrotoxic because they are excreted from the body primarily by the kidneys.
- Most nephrotoxic drugs cause proximal renal tubular necrosis.[1]

Kidney toxicity induced by nephrotoxic agents:

- Renal failure:

Renal failure is a common clinical syndrome. It is defined as a rapid decline in renal function resulting in abnormal retention of serum creatinine and blood urea which must be excreted. The clinical manifestations of renal failure are the decline in glomerular filtration rate (GFR) and the inability of the kidney to excrete the toxic metabolic substances produced in the body. In addition, there is failure of regulation of fluids and electrolyte balance along with endocrine dysfunction. Depending up on the severity, it is divided as acute and chronic renal failure.[2]

There are two types of renal failure:

1. **Acute renal failure.**
2. **Chronic renal failure**

1. **Acute renal failure (ARF):** 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.
2. **Chronic renal failure (CRF):** 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 [3]

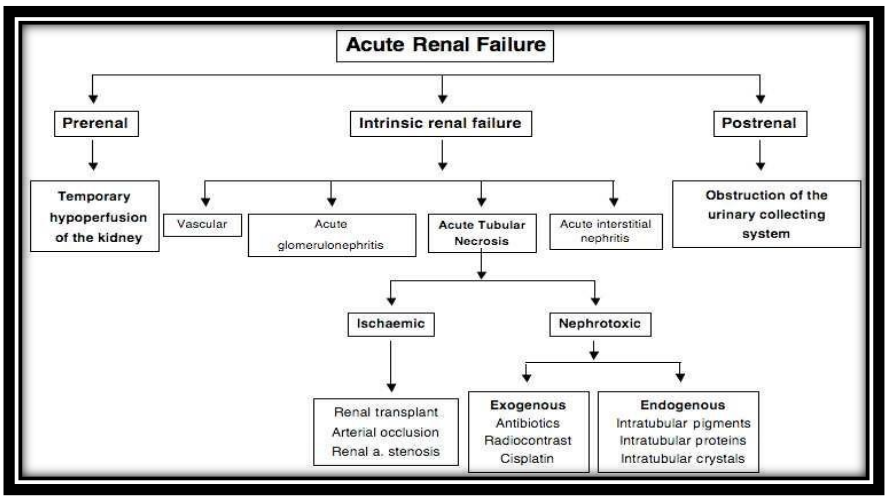

Fig no. 2 Schemating representation of the different causes of ARF

Cause of chronic renal failure

- The most important causes of chronic kidney disease are diabetes, glomerulo nephritis, hypertension and other vascular disease.
- It can be difficult to recognize because the symptoms and clinical manifestations are non- specific Arteriopathic renal disease and hypertension
- Glomerulonephritis
- Diabetes
- Infective, obstructive and reflux nephropathies
- Congenital disease
- Familial or hereditary kidney disease,e.g. polycystic kidneys
- Hypocalcaemia
- Connective tissue diseases
- Neoplasm's
- Myeloma
- Reflux nephropathy
- Renal bone disease is a major cause of disability in patients with terminal renal failure.[4,5]

Treatment

Plants with nephroprotective activity:

1] Bauhinia Variegate:

BINOMIAL NAME	**Bauhinia Variegata**
FAMILY	Fabaceae

KINGDOM	Plantae
GENUS	Bauhinia
SPECIES	B. Variegata

The antioxidant and nephroprotective effect in gentamicin-induced nephrotoxicity of the ethanolic and aqueous extracts of root of *Bauhinia variegata*Linn (200 and 400 mg/kg bw, orally) was examined in rats. Both ethanolic and aqueous root extracts of *Bauhinia variegata*produced significant free radical scavenging activity. Both extracts produced significant nephroprotective activity in gentamicin induced nephrotoxicity model as evident by decrease in elevated serum creatinine, serum urea, urine creatinine and BUN levels, which was further confirmed by histopathological study. Nephroprotective activity of the ethanolic and aqueous extracts of root of *Bauhinia variegata*at a dose of 400 mg/kg bw was evaluated by gentamicin and cisplatin induced nephrotoxicity in rats. Both extracts showed nephroprotective activity in both gentamicin and cisplatin induced nephrotoxicity models as evident by decrease in serum creatinine, serum urea, urine creatinine and BUN levels in extract treated groups which was elevated by gentamicin and cisplatin in the respective models, which also confirmed by histopathological study.[9-10]

2] Bellis Perenns:

BINOMIAL NAME	**Bellis perennis**
FAMILY	Asteraceae
KINGDOM	Plantae
GENUS	Bellis
SPECIES	B. perennis

The effect of *Bellis perennis* was investigated on viability of healthy neuronal cell line. On treatment with 90% alcohol, the cell viability was significantly decreased to 18% as compared to the negative control (only media) which was taken as 100%. The effect of alcohol was neutralized by *Bellis perennis* at 2µl/ml, 4µl/ml and 8µl/ml. It significantly increased the cell viability.[11-12]

3] Benincasahispida:

BINOMIAL NAME	**BenincasaHispida**
FAMILY	Cucurbitaceae
KINGDOM	Plantae
GENUS	Benincasa
SPECIES	B. Hispida

The nephroprotective activity of hydro-alcoholic extract of Benincasahispida whole fruit extract was investigated in paracetamol induced nephrotoxicity in rats. Treatment with hydro-alcoholic extract of Benincasahispidawhole fruit extract at doses of 200 and 400 mg/kg bw prevented the paracetamol - induced nephrotoxicity and oxidative impairments of the kidney, as evidenced by a significantly reduced in kidney weight, blood urea, blood creatinine, urinary glucose, urinary potassium level and also increased body weight, urine volume, urinary creatinine and blood total protein level. Hydro-alcoholic extract of Benincasahispida whole fruit extract significantly increased the tissue GSH levels and reduced lipid peroxidation levels. Furthermore, it was confirmed by the histopathological observation that the degenerative changes caused by paracetamol were also restored by treatment with hydro-alcoholic extract of Benincasahispidawhole fruit extract [7-8]. It was also produced nephroprotective activity against mercury poisoning in rats.[13-14]

4] Brassica rapa:

BINOMIAL NAME	**Brassica Rapa**
FAMILY	Brassicaceae
KINGDOM	Plantae
GENUS	Brassica
SPECIES	B. Rapa

The effect of the ethanol extract of the roots of *Brassica rapa*(EBR) to ameliorate cisplatin-induced nephrotoxicity was studied in terms of oxidative stress, as characterized by lipid peroxidation, reactive oxygen species (ROS) production, and glutathione (GSH) depletion in LLC-PK1 cells. Pretreatment of cells with EBR prevented cisplatin-induced decreases in cell viability and cellular GSH content. The effect of EBR was then investigated in rats given EBR for 14 d before cisplatin administration. A single dose of cisplatin (7 mg/kg, i.p.) caused kidney damage manifested by an elevation in blood urea nitrogen (BUN), serum creatinine, and urine lactate dehydrogenase (LDH) levels. Also, renal tissue from cisplatin-treated

rats showed a significant increase in malondialdehyde (MDA) production, and in the activities of aldehyde oxidase (AO) and xanthine oxidase (XO). A significant decrease in the activities of antioxidant enzymes, such as, glutathione peroxidase (GPx), superoxide dismutase (SOD) and catalase (CAT) was observed in cisplatin-treated rats versus saline treated normal group. In contrast, rats given EBR showed lower blood levels of BUN and creatinine, and of urinary LDH. Moreover, EBR prevented the rise of MDA production and the induction of AO and XO activities. This extract also recovered the reduced activities of GPx, SOD and CAT.[15]

5]Calendula officinalis:

BINOMIAL NAME	**Calendula officinalis**
FAMILY	Asteraceae
KINGDOM	Plantae
GENUS	Calendula
SPECIES	C. officinalis

The neuroprotective effect of *Calendula officinalis* Linn. flower extract (COE) on Monosodium glutamate (MSG)-induced neurotoxicity was evaluated in rats. Adult Wistar rats were administered systemically for 7 days with MSG and after 1h of MSG injection, rats were treated with COE (100 and 200 mg/kg) orally. At the end the treatment period, animals were assessed for locomotor activity and were sacrificed; brains were isolated for estimation of LPO, GSH, CAT, TT, GST, Nitrite and for histopathological studies. MSG caused a significant alteration in animal behavior, oxidative defense (raised levels of LPO, nitrite concentration, depletion of antioxidant levels) and hippocampal neuronal histology.Treatment with COE significantly attenuated behavioral alterations, oxidative stress, and hippocampal damage in MSG- treated animals.[16-17]

The neuroprotective effect of *Calendula officinalis* flower extract (COE) on 3-NP-induced neurotoxicity in rats was evaluated by observing behavioral changes, oxidative stress and striatal damage in rat brain. Adult female Wistar rats were pretreated with vehicle or COE (100 and 200 mg/kg) for 7 days, followed by cotreatment with 3-NP (15 mg/kg, intraperitoneally) for the next 7 days. At the end of the treatment schedule, rats were evaluated for alterations in sensory motor functions and short-term memory. Animals were sacrificed and brain homogenates were used for the estimation of lipid peroxidation (LPO), glutathione, total thiols, glutathione S-transferase, catalase and nitrite. A set of brain slices was used for the evaluation of neuronal damage in the striatal region of the brain. 3-NP caused significant alterations in animal behavior, oxidative defense system evidenced by raised levels of LPO and nitrite concentration, and depletion of antioxidant levels. It also produced a loss of neuronal cells in the striatal region. Treatment with COE significantly attenuated behavioral alterations, oxidative damage and striatal neuronal loss in 3-NP-treated animals.[18]

6] Carthamustinctorius:

BINOMIAL NAME	**CarthamusTinctorium**
FAMILY	Asteraceae
KINGDOM	Plantae
GENUS	Carthamus
SPECIES	C. Tinctorium

The neuroprotective properties of Hydroxysafflor yellow A (HSYA) on neurotoxicity of glutamate in primary cultured rat cortical neurons along with its possible mechanism of action were examined. The excitotoxic neuronal death was attenuated markedly by HSYA treatment. HSYA decreased expression of Bax and rescued the balance of pro-and anti- apoptotic proteins. In addition, HSYA significantly reversed up-regulation of NR2B-containing NMDA receptors by exposure to NMDA, while it did not affect the expression of NR2A-containing NMDA receptors.[19]

The neuroprotective efficacy of the combination of (Astragali, *Ligusticumwallichii*, *Angelica sinensis*and *Carthamustinctorius*) on mitigating brain infarction and global ischemia as well as preventing the neurodegeneration following ischemia was studied. They improved cerebral blood circulation, which refer to a potential to alleviate the symptoms of degenerative diseases, Alzheimer's disease and Parkinson's disease.[20]

Free radical scavenging activity of the extracts of petals (bud, early stage, full blooming and ending stage), leaf, stem, root and seeds of Mogami-benibana (*Carthamustinctorius*), the contents of the major active components of carthamin and polyphenols, and neuroprotective effect of the petal extracts and carthamin in the brain of mice and rats were examined. Water extracts of Mogami-benibana petals scavenged superoxide, hydroxyl and 1,1-diphenyl-2- picrylhydrazyl (DPPH) radicals and singlet oxygen. There was also a relationship between DPPH radical scavenging activity and carthamin content in the petal extracts of safflower.[22]

7]Carumcarvi:

BINOMIAL NAME	**CarumCarvi**
FAMILY	Apiaceae

KINGDOM	Plantae
GENUS	Carum
SPECIES	C. Carvi

The renoprotective effect of aqueous extract of Carumcarvi seeds was evaluated in experimentally induced diabetic nephropathy (DN) in rodents. The diabetic rats showed a variable increase in the serum levels of glucose, urea, creatinine, total urinary protein and microalbuminuric levels. Body weight decreased and urine volume increased in the diabetic groups. 30 and 60 mg/kg body weight of Carumcarvi significantly decreased the levels of the biochemical parameters. High dose of Carumcarvi aqueous seeds extract (60 mg/kg) showed renoprotection against STZ induced diabetic nephropathy in rats [124]. The renoprotective effect of Carumcarvi essential oil (10 mg/kg of body weights orally) was also studied in diabetic rats. Diabetic rats showed an increase in the serum level of glucose, and decrease in glutathione peroxidase. 10 mg/kg body weight of Carumcarvi oil significantly corrected these parameters. The morphological examination of untreated diabetic rats kidneys showed glomerular and tubular degeneration with massive cellular infiltration, hemorrhage in interstitial tissue and deformed renal tissue architecture. Whereas the kidney of Carumcarvi essential oil treated rats showed marked improvement with minor pathological changes.[27-28]

8]Casuarina Equisetifolia:

BINOMIAL NAME	***Casuarina Equisetifolia***
FAMILY	*Casuarinaceae*
KINGDOM	Plantae
GENUS	*Casuarina*
SPECIES	*C. Equisetifolia*

The nephroprotective activity of methanolic extract of *Casuarina equisetifolia*leaves was studied in gentamicin induced nephrotoxicity in Wistar rats. Subcutaneous injection of rats with gentamicin (80 mg/kg body weight/day) for six consecutive days induced marked acute renal toxicity, manifested by a significant increase in serum urea, creatinine and uric acid levels, along with a significant depletion of serum potassium level. Also oxidative stress was noticed in renal tissue as evidenced by a significant decrease in glutathione level, superoxide dismutase, glutathione- S-transferase activities, with a significant increase in malondialdehyde and nitric oxide levels when compared to control group. Administration of plant extract at a dose of 300 mg/kg once daily for 4 weeks restored normal renal functions and attenuated oxidative stress. *Casuarina equisetifolia*leaves extract ameliorates gentamicin-induced nephrotoxicity and oxidative damage by scavenging oxygen free radicals, decreasing lipid peroxidation and improving intracellular antioxidant defense.[29-30]

9]Coriandrum sativum:

BINOMIAL NAME	**Coriandrum Sativum**
FAMILY	Apiaceae
KINGDOM	Plantae
GENUS	Coriandrum Sativum
SPECIES	C. Sativum

The neuroprotective effect of *Coriandrum sativum* was evaluated against ischemic-reperfusion insult in brain. The global cerebral ischemia in albino rats was induced by blocking common carotid arteries for 30 mins followed by 45 mins of reperfusion. At the end of reperfusion period, histological changes, levels of lipid peroxidation, superoxide dismutase, catalase, glutathion, calcium and total protein were measured. Bilateral common carotid artery occlusion produced significant elevation in lipid peroxidation, calcium levels and infarct size, and decrease in endogenous antioxidants such as reduced glutathion, superoxide dismutase and catalase levels. Pretreatment with methanolic extract of leaves of *Coriandrum sativum* (200 mg/kg, po) for 15 days increased endogenous enzyme levels of superoxide dismutase, glutathion, catalase and total protein levels, and reduces cerebral infarct size, lipid peroxidation and calcium levels. It also attenuated reactive changes in brain histology like gliosis, lymphocytic infilteration and cellular edema. Accordingly, *Coriandrum sativum* possessed protective effect in ischemic-reperfusion injury and cerebrovascular insufficiency states.[31]

The neuroprotective effect of *Coriandrum sativum*against glucose/serum deprivation (GSD)-induced cytotoxicity was studied *in vitro*. The PC12 cells were cultivated for 24 h in standard media (high-glucose DMEM containing Fetal Bovine Serum) or for 6 h in GSD condition (glucose-free DMEM, without serum) in the absence or presence of various concentrations (0.1, 0.2, 0.4, 0.8 and 1.6 mg/ml) of hydroalcoholic extract (HAE), water fraction (WF), ethyl acetate fraction (EAF) or N-butanol fraction (NBF) of *Coriandrum sativum*. At the end of the treatments, the cell viability was determined using MTT assay. With the exception of 1.6 mg/ml of EAF or NBF which decreased cell survival, the HAE and its fractions exhibited no cytotoxicity under standard condition. Exposure of the cells to GSD condition showed 52% decrease in the viability. Accordingly, the HAE, EAF and NBF not only failed to increase cell viability but also increased the toxicity. On the other hand, WF at 0.4, 0.8 and 1.6 mg/ml significantly attenuated the GSD-induced decrease in cell survival. The study revealed that *Coriandrum sativum* bearing water-soluble compound(s) could induce neuroprotective activity, while, some constituents from this plant may serve as cytotoxic agents under stressful conditions like hypoglycemia.[32]

10]Crocus sativus:

COMMON NAME	**Saffron Crocus**
BINOMIAL NAME	Crocus Sativus
FAMILY	Iridaceae
KINGDOM	Plantae
GENUS	Crocus
SPECIES	C. Sativus

The protective effects of saffron extract and crocin was evaluated in chronic - stress induced oxidative stress damage of the brain, liver and kidneys in rats. Rats were injected with a daily dose of saffron extract (30 mg/kg, ip) or crocin (30 mg/kg, ip) during a period of 21 days following chronic restraint stress (6 h/day). In order to determine the changes of the oxidative stress parameters following chronic stress, the levels of the lipid peroxidation product, malondialdehyde (MDA), the total antioxidant reactivity (TAR), as well as antioxidant enzyme activities glutathione peroxidase (GPx), glutathione reductase (GR) and superoxide dismutase (SOD) were measured in the brain, liver and kidneys tissues after the end of chronic stress.[33-34]

\The effect of ethanol extract of *Crocus sativus* was evaluatedin the treatment of experimental autoimmune encephalomyelitis (EAE) in C57BL/6 mice. EAE was induced by immunization of 8 week old mice with MOG(35-55) with complete Freunds adjuvant. Therapy with saffron was started on the day of immunization. After daily oral dosage the saffron significantly reduced the clinical symptoms in C57BL/6 mice with EAE. Also, treated mice displayed a delayed disease onset compared with control mice. Total antioxidant capacity (TAC) production was significantly elevated in saffron treated mice. Effect of saffron on serum NO production was not significant. Typical spinal cord leukocyte infiltration was observed in control mice compared with saffron treated mice. The results suggested that saffron was effective in the prevention of symptomatic EAE by inhibition of oxidative stress and leukocyte infiltration to central nervous system (CNS) and may be potentially useful for the treatment of multiple sclerosis (MS).[36]

11] Daucus carota:

COMMON NAME	**Wild Carrot,**
BINOMIAL NAME	Daucus Carota
FAMILY	Apiaceae
KINGDOM	Plantae
GENUS	Daucus
SPECIES	D. Carota

Renal pedicles of rats were occluded for 45 minutes followed by 24 hours reperfusion. Six days prior to induction of I/R, groups of rats received petroleum ether extract, fractional methanolic extract and methanolic extract of *Daucus carota*root (250 & 500 mg/kg, orally). Renal ischemia reperfusion caused significant impairment of kidney function. Six day administration of *Daucus carota*, minimized this effect. Rats with renal I/R only showed significantly decreased activity of superoxide dismutase, catalase, and reduced glutathione compared with the sham operated rats. These declining trends were significantly less in the group treated with petroleum ether, fractional methanolic and direct methanolic extract of *Daucus carota*root compared with those in I/R group. Renal I/R produced a significant increase in malondialdehyde level, while pretreatment with *Daucus carota*extracts was associated with a significantly lower malondialdehyde level. Accordingly, *Daucus carota*extracts exerted renoprotective activity probably by the free radical scavenging activity. [38-39]

12] Dalbergia sissoo:

COMMON NAME	**Shisham**
BINOMIAL NAME	Dalbergia Sissoo
FAMILY	Fabaceae
KINGDOM	Plantae
GENUS	Dalbergia
SPECIES	D. Sissoo

The neuroprotective effects of the ethanolic extract of *Dalbergia sissoo* leaves was evaluated by checking brain weight, antioxidant levels, histopathological and TTC staining studies in cerebral ischemia induced rats. The extracts (ethanolic 300, 600 mg/kg) were compared to negative control (global cerebral ischemic rats). It is observed that prior treatment of *Dalbergia sissoo* extract (DSE) (300mg/kg and 600mg/kg, po for 10days) markedly reversed the brain weight, antioxidant levels and restored to normal levels as compared to ischemia- reperfusion induced oxidative stress

groups. Moreover, brain coronal sections staining and histopathological studies revealed protection against ischemic brain damage in the extract treated groups.[41-42]

The neuroprotective effect of ethanolic extract of *Dalbergia sissoo* leaves was evaluated in 3-Nitropropionic acid induced neurotoxic rats. The ethanolic extract of *Dalbergia sissoo* leaves was administered orally at different doses (300 and 600 mg/kg) to neurotoxic rats. During treatment psychopharmacological parameters were recorded, 24 hours after experiment antioxidant profiles from brain isolates were estimated and histopathology of brain was performed. The ethanolic extract significantly attenuated behavioral alterations, oxidative damage, mitochondrial dysfunction, and striatal/hippocampus damage in 3-Nitropropionic acid treated rats.[43]

13]Foeniculum vulgare:

COMMON NAME	**Sweet Fennel, Bronze Fennel**
BINOMIAL NAME	Foeniculum Vulgare
FAMILY	Apiaceae
KINGDOM	Plantae
GENUS	Foeniculum
SPECIES	F. Vulgare

The nephroprotective effects of different oral doses of aqueous extract of *Foeniculum vulgare* seeds 250 mg/kg, *Solanum nigrum* 500 mg/kg fruit and their mixture (of 250 and 500 mg/kg/oral respectively) were studied in gentamicin induced nephrotoxicity in albino rabbits. All the treatments were continued for 21 days. Blood samples were taken from all groups at day 21 to determine serum urea, creatinine, albumin, plasma malondialdehyde and catalase. Histopathological parameters of kidneys were also examined at day 21. Gentamicin induced oxidative stress and caused structural changes in the kidneys. The aqueous extract of *Foeniculum vulgare* seeds, *Solanum nigrum* fruit and their mixture significantly prevented renal damage by normalizing increased levels of renal markers. Mixture of both plants at high doses exhibited improved nephroprotective and antioxidant activities [44].

The renoprotective effect of the aqueous extract of *Foeniculum vulgare* (150 mg/kg bw) was studied in experimental PCOS female rats. The mean values of blood urea nitrogen in PCOS rats treated with low dose of extract of *Foeniculum vulgare* and estradiolvalerate and non-treated, was significantly ($p<0.05$) increased compared with non-PCOS and PCOS rats treated with high dose of extract of *Foeniculum vulgare*. Moreover, histopathological changes of kidney samples were comparable in PCOS rats with respect to treated groups with extract of *Foeniculum vulgare* [44].

14]Geumurbanum:

COMMON NAME	**Wood Avens, Herb Bennet, Colewort**
BINOMIAL NAME	GeumUrbanum
FAMILY	Rosaceae
KINGDOM	Plantae
GENUS	Geum
SPECIES	G. Urbanum

The extracts from three Romanian medicinal plants (*E. planum, G. urbanum, and C. benedictus*) were investigated for their possible neuroprotective potential. The in vitro neuroprotective activity of the extracts were investigated via inhibition of acetylcholinesterase and tyrosinase. AChE inhibitory activities of *Geumurbanum*aqueous extract were 27.03±1.5, 36.48±1.7 and 79.11±3.9 % at concentration of 0.75 mg/ml, 1.5 mg/ml and 3 mg/ml respectively and IC50 was 2.293±0.14 mg/ml, while AChE inhibitory activities of *Geumurbanum*ethanol extract were 54.74±2.7, 73.53±5.1 and86.77±5.1 respectively and IC50mg/ml was0.513±0.03. All the concentration of aqueous and ethanol extracts (0.75 mg/ml, 1.5 mg/mland 3 mg/ml) inhibited tyrosinase more than 50%, ethanolic extract was more potent tyrosinase inhibitor than aqueous[46-47].

15]Glycyrrhiza glabra:

COMMON NAME	**Licorice OrSweetwood Or Mulaithi**
BINOMIAL NAME	Glycyrrhiza Glabra
FAMILY	Fabaceae
KINGDOM	Plantae
GENUS	Glycyrrhiza

SPECIES	G. Glabra

Polyuria in rats with gentamicin-induced acute renal failure was associated with down-regulation of renal aquaporin 2 in the inner and outer renal medulla, and cortex. Glycyrrhizin (200 mg/kg/day) administration restored the expression of aquaporin 2 with paralleled changes in urine output. The changes in renal functional parameters (creatinine clearance, urinary osmolality, and solute-free reabsorption), accompanying acute renal failure were also partially restored after administration of glycyrrhizin. Histological changes in rats with gentamicin-induced acute renal failure were also abrogated by glycyrrhizin treatment. [48]

Glycyrrhizic acid (GA) also alleviated sepsis-induced acute kidney injury (AKI) by improving the pathological changes, decreasing the levels of blood urea nitrogen, creatinine, and increasing the survival rate of rats with AKI significantly. The production of inflammatory cytokines, such as TNF-α, IL-1β, and IL-6, was markedly inhibited by GA. Furthermore, GA inhibited the production of nitric oxide and prostaglandin E2 and expression levels of induced nitric oxide synthase and cyclooxygenase-2 in kidney tissues. GA also suppressed the apoptosis in kidney tissue induced by AKI and inhibited the activation of NF-κB signaling pathway. [49]

Conclusion

The current review discussed the nephroprotective effects of medicinal plants against gentamicin, paracetamol, profenofos, D galactosamine (D-GalN), chronic-stress, sepsis and cytotoxic drugs induced kidney injury as well as streptozotocin induced diabetic nephropathy, in addition to chemically induced nephrolithiasis. The review showed that many medicinal plants can attenuate the biochemical, functional and structural renal toxicities of a wide range of drugs and toxins representing effective nephroprotective alternatives. Nephrotoxicty is the one of the most common kidney problems occurs when body is exposed to drug or toxin. When kidney damaged occurs body is unable to ride of excess of urine and waste from the body. A number of therapeutic agents can adversely affect the kidney resulting in acute renal failure and intestinal nephritis and nephritic syndrome. From the study clear that the medicinal plant play a prominent role against were as disease. Many plants having use for the treatment of kidney failures in traditional system of models. Throughout world because number of chemicals and drugs available in the market are producing drug adverse effect and drug interactions. Due to this the use of available drugs reduces in use. A second alternative drug as herbal drugs having polyphenols includes flavonoids, tannins and phenols. Which have better antioxidant activity play a drastic effect in urinary tract as well as kidney disorders. Hence the review of study is concluded that the herbal drug posses nephroprotective activity and it has been proven by different animal models

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