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Nephro- Protective Effects Of Arabian Medicinal Plants.

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ABSTRACT

Kidneys play an important part in the maintenance of our endocrine, acid-base balance, blood pressure, erythropoiesis etc. Kidney harm is one of the most vital health issues. Nephrotoxicity is one of the most common kidney problems and occurs when body is exposed to a drug or toxin. Many medicinal plants have been reported to exhibit protective effect of renal tissues against injuries. Nephroprotective effects were mediated via modulating the expression of inflammatory, oxidative stress and apoptotic mediators. The current review will highlight the medicinal plants possessed nephroprotective effects.

Keywords: Medicinal plants, Pharmacology, Nephroprotective, Toxicology.

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INTRODUCTION

Kidneys play an important part in the maintenance of our endocrine and acid-base balance, blood pressure, erythropoiesis etc. Kidney harm is one of the most vital health issues. Nephrotoxicity is one of the most common kidney problems and occurs when body is exposed to a drug or toxin[1]. A number of potent therapeutic drugs like penicillins, cephalosporins, tetracycline, sulfonamides, amino glycosides, NSAID's, chemotherapeutic agents and chemical reagents like ethylene glycol, carbon tetrachloride, sodium oxalate and heavy metals such as lead, mercury, cadmium and arsenic can adversely affect the kidney resulting in acute renal failure, chronic interstitial nephritis and nephritic syndrome, rapid decline in renal function resulting in abnormal retention of serum creatinine and blood urea, which must be excreted[2]. Many medicinal plants have been reported to exhibit protective effect of renal tissues against injuries. Nephroprotective effects were mediated via modulating the expression of inflammatory, oxidative stress and apoptotic mediators[3-4]. The current review was designed to highlight the medicinal plants possessed nephroprotective effects.

Table 1: Medicinal plants with nephro-protective effects

Plant	Extract or compounds	Model	Animal	Results	Ref
Bauhinia variegata	ethanolic and aqueous extracts of root of *Bauhinia variegata* , 200 and 400 mg/kg bw.	gentamicin-induced nephro-toxicity	Rats	Both extracts produced significant nephro-protective activity in gentamicin induced nephrotoxicity model as evident by decrease in elevated serum creatinine, serum urea, urine creatinine and blood urea nitrogen (BUN) levels, which was further confirmed by histopathology.	[5-6]
	ethanolic and aqueous extracts of root of *Bauhinia variegata*, 400 mg/kg bw	gentamicin and cisplatin induced nephrotoxicity	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.	
Benincasa hispida	hydro-alcoholic extract of *Benincasa hispida* whole fruit extract, 200 and 400 mg/kg bw.	paracetamol induced nephrotoxicity	Rats	Hydro-alcoholic extract significantly increased the tissue *glutathione* (GSH) levels and reduced lipid peroxidation levels. Histopathologically observed degenerative changes caused by paracetamol were also restored by treatment with hydro-alcoholic extract.	[8]
	total amino acids and cncurbitacine	mercury poisoning	Rats	It showed significant nephroprotective activity	[9-10]
Brassica nigra	methanol extract of *Brassica nigra* leaves, 200 and 400 mg/kg bw.	Dgalactosamine (D-GalN)-induced hepatic and nephrotoxicity.	Rats	It showed significant ($p < 0.001$) reduction in the DGalN-induced toxicity as obvious from biochemical parameters, which further confirmed by histology.	[11-12]
Brassica rapa	ethanol extract of the	cisplatin-induced	Rats	Rats given EBR showed lower	[13]

	roots of *Brassica rapa* (EBR)	nephrotoxicity		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.	
Bryophyllum calycinum	aqueous and hydroalcoholic extracts of the leaves	gentamycin-induced nephrotoxicity	Rats	Aqueous extract possessed potent nephroprotective activity, while, hydroalcoholic extract exerted significant diuretic and antiurolithitic activity.	[14-17]
Carum carvi	aqueous extract of *Carum carvi* seeds, 30 and 60 mg/kg bw and essential oil 10 mg/kg bw.	experimentally induced diabetic nephropathy	Rats	It significantly decreased the levels of the biochemical parameters. High dose of *Carum carvi* aqueous seeds extract (60 mg/kg) showed renoprotection against STZ induced diabetic nephropathy. The kidney of C*arum carvi* essential oil treated rats showed marked improvement with minor pathological changes.	[18-19]
Cassia occidentalis	70% hydroalcoholic extrac, 200 and 400 mg/kg bw.	gentamicin induced nephrotoxicity	Rats	Hydroalcoholic extract markedly reduced gentamicin induced elevation of urinary sodium, potassium electrolytes, urinary glucose, blood urea and creatinine levels. It also increased the body weights. The histopathological study of kidney exhibited almost normal architecture.	[20-22]
Casuarina equisetifolia	methanolic extract of *Casuarina equisetifolia* leaves, 300 mg/kg bw.	gentamicin induced nephrotoxicity	Rats	Administration of extract restored normal renal functions and attenuated oxidative stress. It ameliorates gentamicin-induced nephrotoxicity and oxidative damage by scavenging oxygen free radicals, decreasing lipid peroxidation and improving intracellular antioxidant defense.	[23-24]
Citrullus colocynthis	The extract of *Citrullus colocynthis* fruit, 50mg/kg bw/day.	streptozotocin induced diabetic nephropathy	Rats	*Citrullus colocynthis* fruits extract caused significant decrease in blood glucose, urea, creatinine, microalbuminuria and uric acid, while, GSH, GPx and SOD were significantly increased in	[25-26]

				comparison with diabetic untreated group. The histopathological findings were coincided with biochemical findings.	
	extract of *Citrullus colocynthis*, 25 mg/kg bw /day	gentamicin induced nephrotoxicity	Rats	Co-therapy of *Citrullus colocynthis* with gentamicin inhibited changes in the body weight, blood urea nitrogen, creatinine clearance, proteins and lactate dehydrogenase excretions.	[27]
Crocus sativus	saffron extract and crocin, 3o mg/kg bw of each	chronic - stress induced oxidative stress damage of kidneys	Rats	Saffron and its active constituent crocin can prevent chronic stress-induced oxidative stress damage of kidneys.	[28-29]
	saffron 40 or 80 mg/kg bw/day	gentamicin induced nephrotoxicity	Rats	Saffron at 40 mg/kg/day significantly reduced gentamicin-induced increases in BUN and histological scores ($p<0.05$). Gentamicin-induced increases in BUN, SCr and MDA and histological injury were significantly reduced by treatment with saffron 80 mg/k/d ($p<0.05$, $p<0.001$, $p<0.05$, and $p<0.001$ respectively).	[30]
Cuminum cyminum	Cumin fruit extracts	Profenofos exposed kidney	Mice	Cumin was effective in normalizing the uric acid and creatinine level.	[31-32]
	6% *Cuminum cyminum* fruit	Paracetamol induced nephrotoxicity	Rats	It caused significant improvement of serum biochemical and hematological parameters.	[33-34]
Cymbopogon schoenanthus	*Cuminum cyminum* fruit extracts	experimental oxalate stone formation	Rats	It significantly corrected the incidence of nephrotoxicity (BUN, creatinine and calcium level differences). Moreover, a highly potent diuretic activity was recorded for *Cymbopogon schoenanthus*.	[35-36]
Cynodon dactylon	hydroalcoholic extract of *Cynodon dactylon*	ethylene glycol-induced nephrolithiasis	Rats	*Cynodon dactylon* extract reduced the levels of calcium oxalate deposition especially in medullary and papillary sections of kidney.	[37]
	different fractions of *Cynodon dactylon*, 12.8 mg/kg bw.	ethylene glycol-induced kidney calculi	Rats	*Cynodon dactylon* n-butanol fraction, significantly reduced the number of the kidney CaOx deposits compared to ethylene glycol group. In preventive protocol, treatment of rats with *Cynodon dactylon* ethyl	[38-40]

				acetate fraction significantly decreased the number of CaOx deposits compared to ethylene glycol group.	
Daucus carota	*Daucus carota* root extract, 250 & 500 mg/kg bw.	renal ischemia reperfusion injury	Rats	The biochemical changes were significantly less in the group treated with petroleum ether, fractional methanolic and direct methanolic extract of *Daucus carota* root compared with those in ischemia reperfusion group.	[41-42]
	ethanolic root extract of *Daucus carota*, 200 and 400 mg/kg bw	gentamicin-induced nephrotoxicity	Rats	Gentamicin intoxication induced elevated serum urea, BUN, uric acid, and creatinine levels which was found to be significantly ($P < 0.01$) decreased in a dose-dependent manner in groups received *Daucus carota.* The nephroprotective effects were further confirmed by histological observations.	[43]
Foeniculum vulgare	aqueous extract of *Foeniculum vulgare* seeds, 250 mg/kg bw.	gentamicin induced nephrotoxicity	Rabbits	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 nephro-protective and antioxidant activities.	[44]
	aqueous extract of *Foeniculum vulgare* , 150 mg/kg bw.	experimental PCOS	Rats	The mean values of blood urea nitrogen in PCOS rats treated with low dose of extract of *Foeniculum vulgare* and estradiol valerate 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*.	[45]
	fennel essential oil (250, 500, and 1000 mg/kg bw)	cisplatin -induced nephrotoxicity	Rats	Fennel essential oil did not reduce the levels of BUN and Cr, KTDS, and KW and body weight changes. Also, the serum and tissue levels of nitrite were not altered significantly by fennel essential oil.	[46]
Glycyrrhiza glabra	Glycyrrhizin, 200 mg/kg bw /day	gentamicin-induced acute renal failure	Rats	The changes in renal functional parameters (creatinine clearance, urinary osmolality, and solute-free	[47]

				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.	
	Glycyrrhizic acid	sepsis-induced acute kidney injury	Rats	It alleviated sepsis-induced acute kidney injury by improving the pathological changes, decreasing the levels of blood urea nitrogen, creatinine, and increasing the survival rate of rats significantly.	[48]
Juglans regia	walnut extracts	Cyclophosphamide - induced nephrotoxicity		It caused significant reduction in the content of CYP, significant increase in the level of GSH and in the activities of GP in the kidneys.	[49]

CONCLUSION

Nephrotoxicity is one of the most common kidney problems and occurs when body is exposed to a drug or toxin**.** Many medicinal plants have been reported to exhibit protective effect of renal tissues against injuries. The current review will highlight the medicinal plants possessed nephroprotective effects as possible future drugs because of effectiveness and safety.

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