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Nephroprotective and Antioxidant Activities of *Cassia occidentalis* Leaves Extract against Gentamicin Induced Nephrotoxicity in Albino Rats

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Abstract

In the present study the methanolic extract of *C.occidentalis*leaves (COLM) was evaluated for its antioxidant and nephroprotective activities. The phytoconstituents of the leaves extract was also investigated. The antioxidant activity of the extract was measured using 1,1-diphenyl-2- picryl-hydrazyl (DPPH) radical scavenging assay.Nephroprotective activity of COLM was assessed using Wistar albino rats. Seventy rats were divided randomly into seven groups of ten rats each; untreated control group, nephrotoxic control group, rats were injected with gentamicin only at a dose of 80mg/kg intraperitoneally (IP) for 8 days.Standard drug group; were injected with gentamicin (80mg/kg IP), and at the same time they received standard drug silymarin at a dose of 100mg/kg orally for 8 days. Low and high doses of the plant groups; rats were injected with gentamicin (80mg/kg IP) with concurrent administration of *C. occidentalis* leaves methanolic extract at a dose of 200 or 400 mg/kg orally for 8 days. Toxicity groups; rats were given *C. occidentalis* leaves extract only at a dose of 200 or 400 mg/kg orally for 8 days. The levels of urea, creatinine, uric acid, and total protein in the blood were used to assess kidney function. Blood constituents, and relative kidney weight were also measured. Phytoconstituents of COLM comprise tannins, saponins, coumarins, and alkaloid as active components and devoid of flavonoids, and sterols. COLM exhibited moderate antioxidant activity (50 ± 0.04%) compared to a standard antioxidant agent propyl gallate(93 ± 0.01%) using DPPH radical scavenging assay.Administration of COLM at a dose of 200 and 400 mg/kg for 8 days exhibited significant ($P < 0.05$) lowering of the levels of urea compared to the gentamicin group. The levels of creatinine, uric acid and total protein were insignificantly ($P > 0.05$) changes at day 8 in treated groups compared with normal control. COLM showed no significant differences to that observed by standard drug

Silymarin. Relative weight of kidneys was significantly increased in treated groupexcept toxicity groups compared to control. The results concluded that the methanolic extract of *Cassia occidentalis* leaves might possess nephroprotective activity in rats. This effect may be due to antioxidant activity or the chemical constituents of the plant.

Keywords: Gentamicin, Antioxidant, Albino Rats**.**

Introduction

Nephrotoxicity is a common condition that occurs when the body is exposed to certain medications or chemicals. Nephroprotective agents are agents that protect the kidneys from nephrotoxicity. In traditional medicine, medicinal plants are thought to be the best treatment to cure nephrotoxicity (Adeneye and Benebo 2008).

Medicinal plants have been utilized as traditional therapies for several human and animal ailments for thousands of years. Plants have a variety of active chemicals that generates defined physiological activity on the human body and animal. These phytochemicals include alkaloids, tannins, glycoside, saponins, flavonoids and terpenes (Sadiq *et al.*, 2012). Because chemical substances can produce negative effects in many organs, including the kidney, using herbal plant extracts for nephroprotection is the ideal way in traditional medicine. Phytochemicals found in medicinal plants help to cure kidney damage without causing any negative side effects (Gaikwad*et al.*, 2012).

The kidney is the principal organ in the urinary system that eliminates waste materials from the blood and excretes them in urine. The kidney plays an important role in maintaining electrolyte balance, fluid homeostasis and blood pressure and regulating acid base balance and blood calcium level, and is involved in the process of gluconeogenesis. Acute and chronic renal failure, uremia, and anemia are all disorders that damage the kidneys(Ramesh *et al.*, 2014).Renal failure occurs when the kidney's excretory function fails to filter metabolic waste products like creatinine and blood urea nitrogen out of the body.Heavy metals, antineoplastics, and antimicrobials are all major nephrotoxic agents. (Chandavarkar*et al.*, 2017).

*Cassia Occidentalis*belongs to the Family: Fabaceae and locally known as "Sorib". Itis a spiny herb which grows in India and Africa under open condition .It is found in Himalaya, Burma and Srilanka.In Sudan it is found in south Darfur and Kurdufan area (Mendes and Carlini 2007*). C. occidentalis* is frequently used as a coffee substitute due to its various biological activity and therapeutic benefits. It is an ingredient in Himoliv, a poly herbal Ayurvedic formulation. (Manikandaselvi*et al.*, 2016).

Various parts of *C.occidentalis* (seeds, roots, leaves, and stems) have been widely used in traditional medicine as a laxative, analgesic, febrifuge, diuretic, hepatoprotective, and vermifuge, as well as for the treatment of tuberculosis, gonorrhea, dysmenorrhea, anemia, cough, convulsion, throat inflammation, fever, asthma, malria,,filariasis,flu,skin, liver and urinary tract disorders (Silva*et al.*, 2011, Manikandaselvi*et al.*, 2016).

Saponins, alkaloids, sterols, triterpenes, quinines, tannins, and flavonoids are among the chemical constituents of *C.occidentalis*(Mendes and Carlini 2007). Also it contains dianthrone and an antharquinone compounds. The toxicological effects on animals are ataxia, muscle weakness, stumbling, and body weight loss, eventually leading to death. Mechanism of *C. occidentalis* toxicity has been described as impairment of the mitochondrial functions (Silva*et al.*, 2011).

Gentamicinis is aminoglycoside antibiotic used mostly for Gram-negative bacterial infections. Prolonged use of gentamicin lead to nephrotoxicity characterized by slow rises in serum creatinine, tubular necrosis and marked decreases in glomerular filtration rate and in the ultrafiltration coefficient. (Martinez-Salgado*et al.*, 2007, Gaikwad *et al.*, 2012, Salgueiro and Núñez 2016).

The objective of this study was to investigate the Nephroprotective and antioxidant activities of *C. occidentals*leaves methanolic extract against gentamicin induced nephrotoxicity in rats.

Fig.1. *Cassia occidentalis* leaves

Materials and Methods

Plant material

Cassia occidentalis leaves were collected from Nyala city in Southern Darfur, Sudan in October, 2018. The plant material was taxonomically identified and authenticated by the botanists at Herbarium Unit, Department of Medicinal and Aromatic Plants, Traditional Medicine and Research Institute (MAPTMRI), National Center of Research (NCR), Khartoum, Sudan. A voucher of the plant specimen was prepared and also deposited in the herbarium. The leaves was cleaned and washed with distilled water and air dried at room temperature and then powdered using blender.

Plants extracts

Six hundred gram (600g) of the dried powder of *C. occidentalis* leaves was extracted using methanol 98%. The methanolic extract was prepared using soxhlet apparatus. The extract was then distilled to dryness under reduced pressure using Buchirota evaporator. The yield of the extract was measured and calculated (Harborne 1984).

Phytochemical analysis

Methanolic extract of *C. occidentalis* leaves was subjected to preliminary phytochemical screening for the presence or absence of active phytochemical constituents. The screening include detection for the presence of alkaloids, flavonoids, tannins, saponins, sterols and triterpenes, cumarins and anthraquinones(Harborne 1984). The analysis is based on the application of specific reagents to particular amounts of *C. occidentalis* leaves methanolic extract and the identification of changes in solution colour.

Antioxidant activity

The 2.2Di (4-tert-octylphenyl)-1-picryl-hydrazyl stable free radical (DPPH) radical scavenging assay was performed according to the method of (Shimada*et al.*, 1992) with some modification. In 96-wells plate, the test samples were allowed to react with DPPH for half an hour at 37ºC. The concentration of DPPH was kept as (300µM). The test samples were dissolved in dimethyl sulphoxide (DMSO) while DPPH was prepared in methanol. After incubation, the decrease in absorbance was measured at 517nm using multiplate reader spectrophotometer. The percentage of radical scavenging activity by samples was determined in comparison with a DMSO treated control group. The analysis were run in triplicate**.**

Experimental animals

Adult male Wistar albino rats (2 months age) weighting between 82 – 123g were obtained from the Medicinal and Aromatic

Plants, Traditional Medicine and Research Institute (MAPTMRI), National Center of Research (NCR), Khartoum, Sudan. The rats were kept in plastic cages in the Laboratory Animal House, Department of Pharmacology and Toxicology, Medicinal and Aromatic Plants, Traditional Medicine and Research Institute (MAPTMRI), National Center of Research (NCR), Khartoum, Sudan. They were fed with standard feed pellets and tap water *ad libitum*. The animals were acclimatized for one weeks before experimentation. The research was carried out in compliance with the Guide for the Care and Use of Laboratory Animals, Sudan University of Science and Technology, College of Veterinary Medicine.

Experimental design

Seventy Wistar albino rats were divided into 7 groups of 10 rats each. Group 1: Kept untreated as normal control for 8 days. Group 2: Nephrotoxic control; rats were injected with gentamicinat a dose of 80mg/kg intraperitoneally (IP) for induction of nephrotoxacity for 8 days.Group 3: standard drug; animals were injected with gentamicin at a dose of 80mg/kg IP for induction of nephrotoxicity, and at the same time they received standard drug silymarin at a dose of 100mg/kg orally for 8 days.Group 4: Low dose of the plant; rats were injected with gentamicin at a dose of 80mg/kg IP with concurrent administration of *C. occidentalis* leaves methanolic extract at a dose of 200 mg/kg orally for 8 days.Group 5: high dose of the plant; rats were injected with gentamicin at a dose of 80mg/kg IP with simultaneous administration of *C. occidentalis* leaves methanolic extract at a dose of 400 mg/kg orally for 8 days.Group 6: Toxicity of low dose; rats were given *C. occidentalis* leaves extract at a dose of 200 mg/kg orally for 8 days.Group 7: Toxicity of high dose; animals administered *C. occidentalis* leaves extract at a dose of 200 mg/kg orally for 8 days.

Blood sample collection

Blood for serum extraction was collected in plain containers from the retro-orbital plexus under anaesthesia. Samples were collected at day 0 and day 8. They kept in a refrigerator at -20°C until for biochemical studies. Another blood samples were collected in EDTA tube for haematological studies.

Haematological methods.

Packed cell volume (PCV), haemoglobin concentration (Hb), red blood cells count (RBC), white blood cells count (WBC), Mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were analyzed using automatic analyser (Humacount plus- Human GmbH Max- Planck-Ring21, D-65205 Wlesbaden, Germany).

Biochemical analysis

Parameters such as urea, creatinine, uric acid and total protein were measured using biochemical auto-analyzer (Mandary-autoanalyzer) using commercial kit.

Body weight of rats

Body weight of animal were recorded at day 0 and 8.

Postmortem

At the end of the experiment, rats were sacrificed and the kidneys were examined and removed.

Calculate relative kidney weight

The kidneys were isolated, weighed and relative weight of the kidneys were calculated from the ratio of organ weight to body weight (Piao*et al.*, 2013).

Relative weight = (The organ wt. /Body wt.) × 100

Data Analysis

Statistical analysis was performed using software statistical package for science (SPSS) version 22. The data were analyzed using one way analysis of variance (ANOVA) and compared by t. student test. The results obtained were considered significant at $p < 0.05$. The

data were expressed as mean ±SEM (Mendenhall, 1971).

Results

Plant extraction

Cassia occidentalis leaves were extracted with methanol using soxhelt apparatus, the yield of the extract is presented in table 1.

Table 1. The yield of *C. occidentalis* leaves methanolic extract.

Plant	Weight /g	Solvent	Yield (g)	Yield %
***C. occidentalis* leaves**	600 g	Methanol	19.24 g	3.21

Phytochemical analysis

Preliminary phytochemical screening of *C. occidentalis* leaves methanolic extract(COLM) revealed the presence of tannins, saponins, coumarins, and alkaloid as active components and devoid of flavonoids and sterols. The phytochemical results of COLM are presented in table 2.

Table 2. Phytochemical screening of methanolic extracts of *C. occidentalis* leaves.

Plant material	FL	TA	TR	SA	CO	AL	ST
Leaves	-	+	-	+	+	+	-

Key words: FL= flavonoids, TA= tannins, TR= triterpenoids, SA= saponins, CO= coumarins, AL= alkaloid and ST= sterols. + found; - not found.

Antioxidant activity of methanolic extracts of *C. occidentalis* leaves.

COLM exhibited moderate antioxidant activity (50 ± 0.04%) using DPPH radical scavenging assay. The propyl gallate used as a standard antioxidant agent showed high antioxidant activity (93 ± 0.01%). The results are shown in table 3.

Table 3. Antioxidant activity of *C.occidentalis* leaves methanolic extract using DPPH radical scavenging assay.

No.	Sample	%RSA ±SD(DPPH)
1	Leaves	50 ± 0.04
2	Propyl Gallate	93 ±0.01

Haematological parameters

There were no significant differences (P > 0.05) between group 1 (normal control) and treated groups (group 2-7) on the haematological parameters during the period of experiment in day 0 and day 8. However, these values were fluctuated within the normal ranges in all groups. The results are presented in Table 4.

Table 4. Haematological changes of rats administered methanolic extracts of *C.occidentalis* leaves, gentamicin **and silymarin.**

Groups	WBCs ($\times 10^3$µl)		RBCs ($\times 10^6$ cells/µl)		Hb (g/dl)	
	Day 0	Day8	Day 0	Day8	Day 0	Day8
Group 1	6.60± 0.59	7.81± 1.25[a]	7.22±0.39	7.24± 0.28[a]	16.00± 0.55	15.36± 0.29[a]

Group 2	7.11± 0.67	6.99± 1.18[a]	6.81±0.14	6.63± 0.17[a]	14.89± 0.55	14.66± 0.68[a]
Group 3	7.13±0.78	7.02± 1.14[a]	7.26 ±0.29	7.11± 0.38[a]	15.92± 0.82	14.86± 0.49[a]
Group 4	7.73±0.60	7.01± 1.53[a]	6.79±0.53	7.27± 0.19[a]	15.47± 0.65	15.63± 0.49[a]
Group 5	7.73± 0.96	7.69± 1.58[a]	7.52±0.24	7.16± 0.21[a]	15.62± 0.40	15.46± 0.33[a]
Group 6	8.13± 0.10	8.87± 1.22[a]	7.46±0.18	7.31± 0.08[a]	14.43± 0.22	15.00± 0.53[a]
Group 7	7.73± 0.86	9.54± 1.97[a]	7.31±0.12	6.63± 0.26[a]	15.43± 0.76	14.62± 0.78[a]

Groups	PCV%		MCV (fl)		MCH (pg)	
	Day 0	**Day8**	**Day 0**	**Day8**	**Day 0**	**Day8**
Group 1	39.10± 0.87	44.04± 1.52[a]	56.10± 4.25	61.06± 1.13[a]	23.19± 2.43	21.46± 1.05[a]
Group 2	35.11± 1.23	39.01± 1.10[a]	51.64± 1.30	58.99± 1.36[a]	21.84± 0.72	22.09± 0.94[a]
Group 3	38.56± 2.37	44.64± 2.02[a]	52.60± 1.77	63.08± 1.66[a]	22.32± 1.06	21.10± 1.32[a]
Group 4	41.31± 1.44	44.90± 0.67[a]	57.87± 3.82	61.02± 0.90[a]	21.94± 1.45	21.21± 0.79[a]
Group 5	40.94± 1.06	43.41± 1.33[a]	54.64± 0.74	60.79± 0.96[a]	20.88± 0.78	21.66± 0.69[a]
Group 6	39.77± 1.32	45.08± 0.72[a]	53.33± 0.73	61.80± 1.01[a]	19.37± 0.65	20.48± 0.72[a]
Group 7	39.96± 1.18	42.34± 0.64[a]	54.67± 0.93	61.92± 0.90[a]	21.00± 0.78	22.00± 0.80[a]

Groups	MCHC (g/dl)		PLT	
	Day 0	**Day8**	**Day 0**	**Day8**
Group 1	41.02± 1.61	35.26± 1.66[a]	540.00 ± 40.59	603.44± 32.18[a]
Group 2	42.45± 1.13	37.60 ± 1.77[a]	576.63± 31.89	632.57± 22.23[a]
Group 3	42.16 ± 1.47	33.52 ± 1.84[a]	569.40 ± 40.47	609.60 ± 18.49[a]
Group 4	38.08± 1.35	34.82 ± 1.18[a]	529.25 ± 57.62	561.00± 44.43[a]
Group 5	38.23 ± 1.16	35.76± 0.96[a]	536.89± 37.04	607.56± 39.97[a]
Group 6	36.48 ± 1.53	33.28 ± 1.41[a]	667.33 ± 43.78	706.17± 42.53[a]
Group 7	38.46± 1.06	35.58± 1.05[a]	641.56± 92.89	628.89± 65.11[a]

Not significant when compared with control P>0.05. Data are expressed as mean ±SEM (N =10).

Biochemical analysis

The levels of urea, creatinine, uric acid and total protein in control and treated groups were on the normal ranges in day 0. The levels of creatinine, uric acid and total protein were insignificantly (P > 0.05) changes at day 8 in normal control (group 1) and other treated animals (group 2 – 7). However, the levels of urea were significantly changes (P < 0.05) in group 2 (nephrotoxic control) compared with normal control rats (group 1) and other treatedgroups. There were no significant differences (P > 0.05) in urea levels between group 1 (normal control) and group 3 (standard drug silymarin), group 4 (low dose of plant), group 6 and 7 (lowand high toxic dose). Urea level in group 7 was significantly higher (P < 0.05) compared with group 1 (normal control) but comparable with the levels of group 3, 4, 6 and 7. The results are shown in Table 5.

Table 5. Biochemical changes of rats administered methanolic extracts of *C. occidentalis* leaves, gentamicin and silymarin.

Groups	Urea (mg/dl)		Creatinine (mg/dl)	
	Day 0	**Day8**	**Day 0**	**Day8**
Group 1	20.71± 7.75[a]	43.88 ± 1.88[c]	0.89± 0.08[a]	1.16 ± 0.11[a]
Group 2	28.29± 7.44[a]	110.86 ± 22.18[a]	1.07± 0.20[a]	1.66 ± 0.55[a]
Group 3	27.40± 9.21[a]	66.40 ± 6.50[bc]	1.0667± 0.08[a]	1.0600 ± 0.12[a]
Group 4	30.89± 8.27[a]	58.13 ± 4.89[bc]	0.90± 0.14[a]	1.0375 ± 0.16[a]
Group 5	21.83± 8.50[a]	70.63 ± 8.24[b]	1.0200± 0.16[a]	1.2111 ± 0.09[a]
Group 6	14.67± 7.47[a]	51.50 ± 5.10[bc]	0.8875± 0.08[a]	1.1833 ± 0.06[a]
Group 7	16.00± 8.26[a]	55.67 ± 2.90[bc]	0.9623± 0.05[a]	1.0778 ± 0.06[a]
Groups	Uric acid(mg/dl)		Total Protein (g/dI)	
	Day 0	**Day8**	**Day 0**	**Day8**
Group 1	4.42± 0.48[a]	3.54 ± 0..37[a]	7.24 ± 0.43[a]	6.48 ±0.50[a]
Group 2	4.51± 0.38[a]	2.87 ± 0.40[a]	6.94 ± 0.73[a]	6.76 ± 0.52[a]
Group 3	6.38 ± 1.08[a]	3.70 ± 0.72[a]	6.38 ± 0.38[a]	6.30 ± 0.24[a]
Group 4	6.07± 1.04[a]	3.26 ± 0.49[a]	6.16 ± 0.36[a]	6.10 ± 0.31[a]
Group 5	5.88± 1.48[a]	3.16 ± 0.74[a]	5.87 ± 0.23[a]	5.56 ± 0.21[a]
Group 6	3.20 ± 1.19[a]	4.22 ± 0.88[a]	6.98± 0.63[a]	6.13± 0.24[a]
Group 7	2.65 ± 0.86[b]	4.14 ± 0.47[a]	6.80 ± 0.17[a]	6.66 ± 0.80[a]

Values are expressed as mean ± SEM, means within the same column with different superscripts are significantly different at *P*< 05 (N =10).

Body weight of rats

There were no significant differences (P > 0.05) in rats body weights between group 1 (normal control) and treated groups (group 2-7) during the period of experimentin day 0 and day 8. The results are presented in Table 6.

Postmortem

No significant pathological changes were seen in experimental rats of group 1, 6 and 7. However, group 3, 4 and 5 showed enlarged kidneys while group 2 showed enlarged pales kidneys.

Table (6). Change of body weight in rats administered methanolic extracts of *C. occidentalis* leaves, gentamicin and silymarin.

Groups	Body weight (g) Days	
	Day 0	**Day8**
Group 1	110.89 ± 5.14[a]	112.89±5.37[a]
Group 2	119.13 ±12.87[a]	107.57 ± 6.01[a]
Group 3	112.17 ±8.92[a]	113.33 ± 8.69[a]
Group 4	114.22 ± 5.98[a]	112.89±5.52[a]
Group 5	114.56±6.31[a]	113.22 ±5.76[a]
Group 6	121.67 ± 8.81[a]	119.50±9.22[a]
Group 7	110.56 ± 6.03[a]	109.56 ± 4.58[a]

Not significant when compared with control P>0.05. Data are expressed as mean ±SEM (N =10).

Relative kidney weight

The relative weight of kidneys was significantly increased in group 2 and in rats receiving the standard drug and plant extracts compared to control as shown in Table 7. Rats that received low and high doses of the extract only showed insignificant change of kidney weights compared to control.

Table 7: Relative kidney weights after administration of methanolic extracts of *C. occidentalis* leaves, gentamicin and silymarin.

Groups	Relative kidney weight (g) (Mean ± SE)	
	Right	Left
Group 1	$0.43 \pm 0.01^{b\,c}$	0.46 ± 0.02^{b}
Group 2	0.54 ± 0.01^{a}	0.53 ± 0.01^{a}
Group 3	0.53 ± 0.03^{a}	0.54 ± 0.03^{a}
Group 4	0.56 ± 0.01^{a}	0.56 ± 0.01^{a}
Group 5	$0.51 \pm 0.03^{a\,b}$	0.54 ± 0.01^{a}
Group 6	0.40 ± 0.05^{c}	0.45 ± 0.03^{b}
Group 7	$0.44 \pm .02^{c}$	$0.44 \pm .02^{b}$

Values are expressed as mean ± SEM, means within the same column with different superscripts are significantly different at $P< 05$ (N =10).

Discussion

The methanolic extract of *C.occidentalis* (sorib) leaves was evaluated for its antioxidant and nephroprotective activities using DPPH radical scavenging assay and gentamicin induced nephrotoxicity in albino ratsrespectively.The plant *C.occidentalis*hasbeenwidely used in traditional medicine in the treatment ofliver and urinary tract ailments (Silva*et al.,* 2011, Manikandaselvi*et al.,* 2016).

Nephrotoxicity caused by drugs is increasingly recognized as a precursor to kidney disease, including acute kidney damage and chronic kidney disease(Aiswarya *et al.,* 2018). gentamicin is an extensively used aminoglycoside antibiotic. It has been reported to produce nephrotoxicity even at normal therapeutic dose level (Srivastava*et al.,* 2018).The injection of gentamicin leads to nephrotoxicity characterized by elevation of urea levels, serum creatinine, uric acid, with marked decreases in glomerular filtration rate, tubular necrosis, dilatation of tubules, degeneration of tubular epithelial cells with casts in the tubular lumen, cell infiltration in interstitium, marked congestion of the glomeruli and extensive necrosis(Lakshmi*et al.,* 2009, Hussain *et al.,*2012, Aiswarya *et al.,* 2018).

In this study, theadministrationof gentamicinat a dose of 80 mg/kg to nephrotoxic group rats led in a deterioration in renal function, as shown by an increase in blood urea.This suggested that the gentamicin group had a severe functional impairment of the kidney, which is consistent with prior results of (Aiswarya *et al.,* 2018). Creatinine and uric acid levels were not substantially higher in the present study.gentamicin is known to produce reactive oxygen species in the kidney, which is associated to an increase in lipid peroxidation and a reduction in antioxidant enzyme activity. It also acts as an iron chelator by generating an iron–gentamicin complex, which is a powerful radical-generator catalyst (Alarifi *et al.,* 2012).

Simultaneous treatment of aqueous extract of *C.occidentalis* leaves methanolic extract and gentamicin provided marked nephroprotection against gentamicin induced renal damage in rats as evidenced

by significant reduction in biochemical markers, particularly urea levels. The rate of urea generation exceeds the rate of clearance in renal diseases, causing an increase in serum urea. Creatinine is derived from endogenous sources on a regular basis through tissue creatinine breakdown. The rise in blood creatinine was associated to structural damage in the kidneys (Alarifi *et al.,* 2012). As a result, serum urea concentration is frequently regarded as a more accurate indicator of renal function than serum creatinine (Adeneye *et al.,* 2008, Palani*et al.,* 2009).When comparing the low dose of sorib(200 mg kg/kg) to the large dose (400 mg kg/kg), the low dose appears to provide superior nephroprotection effect. However, haematologicalparameters were not affected in all treated group. The relative kidney weights of the treatment groups were significantly higher than the normal control groups, with the exception of the rats that received only the extract.

Moreover, tannins, saponins, coumarins, and alkaloid were identified as active components in the methanolic extract of *C. occidentalis* leaves, however flavonoids and sterols were not found.(Nuhu and Aliyu 2008) reported that the leaves of *C. occidentalis*contain tannins, saponins, and flavonoids and devoid of alkaloids.Phytochemicals such as alkaloids have been shown to reduce lipid peroxidation in isolated tissues by acting as antioxidants(Palani *et al.,* 2009).
Some nephroprotective plants have been found to reduce the harmful effects of nephrotoxic drugs in experimental animal models due to their powerful anti-oxidant or free radical scavenging activities. Therefore, further studies to elucidate their mechanisms of action should be conducted to aid the discovery of new therapeutic agents for the treatment of renal diseases.

Conclusion

To conclude, this research displays that an orally taken methanolic extract of *C. occidentalis* leaves can protect against gentamicin-induced nephrotoxicity. It also suggests that the plant's phytoconstituents or antioxidant activity may responsible for the observed protective effects.

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النشاطات المضادة للأكسدة والواقية للكلى لمستخلص أوراق السوريب ضد السمية الكلوية للجنتا مايسين في الجرذان البيضاء

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المستخلص

في هذه الدراسة تم تقييم مستخلص الميثانول لأوراق السوريب (COLM) *C.occidentalis* لأنشطته المضادة للأكسدة والواقية للكلى. كما تم ايضا التقصى عن المكونات النباتية لمستخلص الأوراق. تم قياس النشاط المضاد للأكسدة للمستخلص باستخدام فحص الكسح الجذري 1،1- ثنائي فينيل -2 بيكريل-هيدراز (DPPH).قيم النشاط الكلوي لـ COLMباستخدام فئران ويستار البيضاء. تم تقسيم سبعين جرذا عشوائيا إلى سبع مجموعات كل منها تحتوى على عشرة فئران، مجموعة تحكمغير المعالجة ، مجموعة تحكمللتسمم الكلويتم فيها حقن الفئران بالجنتاميسين فقط بجرعة 80 مجم / كجم داخل الصفاق (IP) لمدة 8 أيام. مجموعة الدواء القياسى تم حقن الجرذان بالجنتامايسين (80مجم / كجم IP) وفي نفس الوقت أعطوا عقار سيليمارين القياسي بجرعة 100 مجم / كجم عن طريق الفم لمدة 8 أيام. الجرعات المنخفضة والعالية فى مجموعتى النبات ؛ تم حقن الجرذان بالجنتاميسين(80مجم/ كجمIP) مع الإعطاء المتزامن لمستخلص أوراق *C. occidentalis* الميثانولي بجرعة 200 أو 400 مجم / كجم عن طريق الفم لمدة 8 أيام. مجموعتى السمية، أعطيت الفئران مستخلص أوراق *C. occidentalis* فقط بجرعة 200 أو 400 مجم / كجم عن طريق الفم لمدة 8 أيام. تم قياس

مستويات اليوريا والكرياتينين وحمض البوليك والبروتين الكلي في الدم لتقييم وظائف الكلى .كما تم قياسمكونات الدم والوزن النسبي للكلية. تشتمل المكونات النباتية لـ COLM على التانينات ، والصابونين ، والكومارين ، والقلويدات كمكونات نشطة كما انها خالية من مركبات الفلافونويد والستيرولات. أظهر COLM نشاطًا معتدلًا مضادًا للأكسدة (50 ± 0.04 ٪) مقارنة بعامل قياسى مضاد للأكسدةpropyl gallate(93 ± 0.01 ٪) باستخدام مقياس الكسح الجذرىDPPH .أظهر إعطاء COLM بجرعة 200 و 400 مجم / كجم لمدة 8 أيام انخفاضًا ملحوظًا في مستويات اليوريا مقارنة بمجموعة الجنتاميسين. اظهرتمستوياتالكرياتينينوحمضالبوليكوالبروتينالكليتغيراتغيرمعنوية (P> 0.05) فياليومالثامنفي المجموعاتالمعالجة مقارنة بالمجموعةالضابطة.لم يظهر COLM فروقًا ذات دلالة إحصائية عن تلك التي لوحظت بواسطة عقار سيليمارين القياسي. زاد الوزن النسبي للكلى معنويا في المجموعة المعالجة ما عدا مجموعة السمية مقارنة مع مجموعة التحكم. خلصت النتائج إلى أن المستخلص الميثانولي لأوراق *C. occidentalis* قد يكون لهنشاط كلوى في الفئران. قد يكون هذا التأثير بسبب نشاط مضادات الأكسدة أو المكونات الكيميائية للنبات.