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A Review of Chemical Constituents from the roots of cassia auriculata Linn

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Abstract :- The ethanol extract of the roots of Cassia auriculata was studied for its nephroprotective activity in cisplatin- and gentamicin-induced renal injury in male albino rats. In the cisplatin model, the extract at doses of 300 and 600 mg/kg body wt. reduced elevated blood urea and serum creatinine and normalized the histopathological changes in the curative regimen. In the gentamicin model, the ethanol extract at a dose of 600 mg/kg body wt. reduced blood urea and serum creatinine effectively in both the curative and the preventive regimen. The extract had a marked nitric oxide free-radical-scavenging effect. The findings suggest that the probable mechanism of nephroprotection by C. auriculata against cisplatin- and gentamicin-induced renal injury could be due to its antioxidant and free-radical-scavenging property.

Keywords: Cassia auriculata; Cisplatin; Gentamicin; Nephrotoxicity; Nephroprotection

Introduction :-. The present study is an attempt to screen the ethanol extract of the root for its nephroprotective Cassia auriculata is a shrub with large bright yellow flowers found growing wild in central and western India and cultivated in other areas of the country. The tribal peoples of the Gaya, Nawada And Aurangabad district of Bihar. use this plant for the treatment of skin diseases, asthma, conjunctivitis and in renal disorders. A survey of the literature revealed that the roots of C. auriculata are reported to contain flavonoids, polysaccharides, tannins, and saponins, among other components which may contribute to its diverse uses in folklore medicine.Cisplatin is an anti-neoplastic agent that has a remarkably broad spectrum of clinical activity in the treatment of solid tumors while gentamicin, an aminoglycoside is used in a variety of infections caused by Gram-negative bacteria. The limiting side-effect of both these drugs is the nephrotoxicity associated with their use There is a continuous search for agents which provide nephroprotection against the renal impairment induced by drugs like cisplatin and gentamicin for which allopathy offers no remedial measures. It is thus imperative that we turn toward alternative systems of medicine for solutions. The roots of C. auriculata are used by tribals for the treatment of renal disorders, but no scientific studies have yet been undertaken to verify these claimsactivity.

Materials and methods

Plant material

The roots of the plant C. auriculata were collected from, Gaya, Nawada And Aurangabad district of Bihar India in the month of April 2013. The botanical identity of the sample was confirmed by Dr.B.K.Prasad, Professor of Botany, P.G. Department of Botany, Magadh University,Bodhgaya, Gaya,Bihar,India.

Preparation of ethanol extract The shade-dried, powdered roots (1 kg) were extracted exhaustively by Soxhlet apparatus (6 h) with 95% ethanol. The total ethanol extract was then concentrated in vacuo to a syrupy consistency (yield 328 g). Preliminary phytochemical screening, P.G. Department of Botany, Magadh University,Bodhgaya, Gaya,Bihar, India of the root extract revealed the presence of saponins, carbohydrates, flavonoids, steroids and tannins.

Animals

Healthy adult male albino Wistar rats (100-150 g each) aged 60-90 days were used for the study. The rats were housed in polypropylene cages and maintained under standard conditions (12h light/12 h dark cycle; 25 [+ or -] 3 [degrees]C; 35-60% humidity). Rat feed (Hindustan Lever Ltd.) and tap water were provided ad libitum. The study was conducted following local animal ethical committee clearance.

Acute toxicity studies

The rats, in groups of six each, were fed with ethanol extract of C. auriculata suspended in acacia (2% w/v) at increasing dose levels of 10, 30, 100, 300, 600, 1000 and 3000 mg/kg body wt. The animals were observed continuously for 2 h for gross behavioral changes and then intermittently once every 2 h and finally at 24 and 72 h.

Cisplatin-induced renal injury

Seven groups of eight rats each were used for the study. The 1st group was administered gum acacia solution (2% w/v) for 15 days. The 2nd group was treated with C. auriculata extract alone (600 mg/kg body wt., p.o.) for 10 days. On the 16th day, blood was withdrawn from the 1st group and on the 11th day from the 2nd group for estimation of renal function tests.The remaining groups were treated with a single dose of cisplatin (5 mg/kg body wt., i.p) . Blood was withdrawn from the animal through the retro-orbital vein on the 6th day in 3rd group and on the 16th day in 4th group to assess renal function. The 5th and 6th groups were studied for curative activity of the ethanol extract. They were treated with the extract (300 and 600 mg/kg body wt., p.o.), respectively, from the 6th day onwards. Blood was withdrawn on the 16th day to estimate the blood urea and serum creatinine levels. The 7th group was studied for the preventive activity of the extract. This group was treated with the extract (600 mg/kg body wt., p.o.) from the day of administration of cisplatin for 5 days. Blood was withdrawn on the 6th day to assess blood urea and serum creatinine levels.

Gentamicin-induced renal injury

Five groups of eight rats each were used for the study. The 1st group was orally administered with gum acacia solution (2% w/v) for 23 days. The remaining groups were administered with gentamicin for 13 days (40 mg/kg body wt., s.c.) . Blood was withdrawn on the 14th day in the 2nd and 5th groups and on the 24th day in the 1st, 2nd and 4th groups. The 4th group was studied for the curative activity of the alcoholic extract. This group was treated with ethanol extract (600 mg/kg body wt., p.o.) from the 14th day onward, for 10 days. Blood was withdrawn on the 24th day to assess renal function. The 5th group was studied for the preventive activity of the extract. This group was treated with extract (600 mg/kg body wt., p.o.) from the 1st day onward, along with gentamicin (40 mg/kg body wt., s.c.) daily for 13 days. On the 14th day, the blood was withdrawn to assess renal function.

Parameters assessed for renal function

Body weight

The weight of the animals was measured before and after treatment.

Blood urea

Urea concentration in the blood was estimated by the enzymatic method using a Urease enzyme kit (Varley and Alan, 1984). Absorbance was read from a UV-240 vis spectrophotometer (Shimadzu Corporation, Japan).

Serum creatinine

Creatinine level in serum was estimated by the alkaline picrate method, using a creatinine kit. Absorbance was read from a UV-240 vis spectrophotometer..

Histopathological examination

Two animals from each group were sacrificed on the day of blood withdrawal. Kidneys were isolated, processed and embedded in paraffin wax. The sections were stained with hematoxylin and eosin and observed under light microscopy.

In vitro antioxidant study

Antioxidant studies were carried out by the nitric oxide scavenging method. Sodium nitroprusside in methanol was incubated with different concentrations of C. auriculata dissolved in methanol at 25[degrees]C for 5 h. A control experiment was conducted in an identical manner.After 5 h, 0.5 ml of the incubation solution was removed and diluted with 0.5 ml of Greiss reagent. The absorbance of chromophore formed during diazotization of nitrite with sulfanilamide and subsequent coupling with naphthalene diamine was read at 546 nm.

Results

Acute toxicity studies

The alcoholic extract of C. auriculata roots, when orally administered in the dose range of 10-3000 mg/kg body wt. did not produce any significant changes in the autonomic or behavioral responses, including death during the observation period.

Cisplatin-induced renal damage

The cisplatin-treated group (Table 1) showed a significant reduction in weight on the 6th day, and an increase in blood urea and serum creatinine levels as compared to the control. Histopathological sections of the kidneys showed marked congestion of glomeruli. Degeneration of the tubular epithelial cells with casts and inflammatory cells was also observed.In the curative regimen, treatment with extract (300 and 600 mg/kg body wt., p.o.) showed no reduction in weight, but a significant decline was observed in blood urea levels. Significant reduction of serum creatinine was observed only in the 600 mg/kg body wt. treated group as compared group treated with cisplatin alone, on the 16th day. Histopathological examination revealed reduced congestion of the glomeruli with the presence of occasional casts.In the preventive regimen, the root extract produced a reduction in weight as well as in the serum creatinine levels, but no changes were observed in blood urea level as compared to control. In histopathological examination, the features of tubular necrosis persisted.The group treated with the extract alone did not show any changes in weight, serum creatinine or blood urea levels as compared to control.

Gentamicin-induced renal damage

Gentamicin treated groups showed decreased body weight on the 14th day. On the 24th day, however, an increase in weight was observed, as compared to gentamicin on the 14th day. There was also an increase in blood urea and serum creatinine levels on the 14th day and these changes persisted up to the 24th day following gentamicin treatment. Histopathological sections showed mild congestion of glomeruli and glomerular epithelial cells with granular degeneration on the 24th day of treatment. This was not seen on the 14th day of gentamicin treatment. The tubular cells were disquamated with casts in tubular lumen.In the curative regimen, the extract at 600 mg/kg body wt. reduced the gained weight significantly as compared to gentamicin on the 24th day. There was also a significant reduction in blood urea and serum creatinine levels as compared to gentamicin on the 24th day. Histopathological examination revealed occasional casts with slight tubular epithelial degeneration. In the preventive regimen, the root extract prevented the gentamicin-induced reduction in weight as compared to gentamicin on the 14th day. Blood urea and serum creatinine levels also declined significantly, as compared to the gentamicin-treated group on the 14th day.

Antioxidant studies

In vitro evaluation of C. auriculata for its antioxidant property revealed a nitric oxide free-radical-scavenging effect. Percentage inhibition of free radicals increased with the concentration of the root.

Discussion

In the present study, cisplatin-induced renal impairment was evidenced by an increase in blood urea, serum creatinine and acute tubular necrosis. These changes persisted up to the 16th day following administration of a single dose of cisplatin. The ethanol extract of C. auriculata normalized the raised blood urea and serum creatinine levels. The histopathological report supported the biochemical findings. The reduction in serum creatinine levels was observed only in the group treated with 600 mg/kg body wt. and not in that treated with 300 mg/kg body wt. of extract.Induction of nephrotoxicity by cisplatin is assumed to be a rapid process involving reaction with proteins in renal tubules. As renal damage occurs within an hour after administration of cisplatin, it is important that the protective agent be present in sufficient concentration in the renal tubules before injury occurs. This might explain why even the oral administration of the root extract in multiple doses failed to protect the rats of the protective regimen after cisplatin administration.In the gentamicin model of renal injury, nephrotoxicity manifested itself on the 24th day as evidenced by elevated blood urea and serum creatinine levels, along with acute tubular changes in the histopathology. On the 14th day of administration of gentamicin, however, alteration in biochemical changes was observed with no histopathological changes. C. auriculata at a dose of 600 mg/kg body wt. normalized all the above-mentioned parameters. Co-administration of C. auriculata, along with gentamicin, also prevented the renal impairment as evidenced by a decrease in blood urea and serum creatinine. Hence, the alcoholic extract of C. auriculata was found to afford nephroprotection in both the cisplatin and gentamicin models.A relationship between oxidative stress and nephrotoxicity has been well-demonstrated in many experimental animal models . Evidence points out that cisplatin and gentamicin induce nephrotoxicity partly via oxidative stress. One mechanism proposed is that cisplatin induces renal damage by free-radical generation, by altering arginine metabolism and by increasing the activity of calcium-independent nitric oxide synthase . Gentamicin activates phospholipases and alters the lysosomal membrane in addition to causing oxidative stress .In vitro studies of C. auriculata evaluated for its antioxidant property revealed a nitric oxide free-radical-scavenging effect. Nitric oxide has been shown to play a vital role in cisplatin-induced nephrotoxicity . The roots of C. auriculata have been found to be a rich source of flavanoids like quercetin and rutin . Flavonoids are potent antioxidants and are known to modulate the activities of enzyme systems, due to their interaction with various biomolecules . Hence the probable mechanism of nephroprotection by C. auriculata could be due to its antioxidant property and free-radical-scavenging property and thus this plant could play a promising role in the treatment of acute renal failure induced by nephrotoxins like cisplatin and gentamicin.

References

1.Akira, H., Toshiaki, N., Masahioo, Y., 1994. Role of vasoactive substances in gentamicin induced acute renal failure. In: Chugh, K.S. (Ed.), Asian Nephrology, vol. 395. Oxford University Press, New Delhi.
2.Barry, M.B., 2000. Toxic nephropathies. The Kidney, vol. 2. W.B. Saunders Company, Philadelphia, pp. 3-67.
3.Devipriya, S., Shyamaladevim, C.S., 1999. Protective effect of quercetin in cisplatin induced cell injury in the rat kidney. Indian J. Pharmacol. 31, 422.
4.Greggi Antunes, L.M., Darin, J.D., Bianchi, M., 2000. Protective effects of Vit C against cisplatin induced nephrotoxicity and lipid peroxidation in adult rats. A dose dependent study. Pharmacol. Res. 41, 405-411.
5.Harborne, J.B., 1984. Phytochemical Methods, vol. 123. Chapman & Hall, London.
6.Kokate, C.K., 1994. Practical Pharmacognosy, vols. 107-111. Vallabh Prakashan, New Delhi.
7.Lindquist, S., 1986. The heat shock response. Ann. Rev. Biochem. 55, 1151.
8.Rai, K.N., Dasundhi, R.A., 1990. A new flavone glycoside from the roots of Cassia auriculata. J. Bangladesh Acad. Sci. 14 (1), 57-61.
9.Rao, M., Rao, M.N.A., 1998. Protective effect of selenomethionine against cisplatin induced renal toxicity in mice and rats. J. Pharm. Pharmacol. 50, 687.
10.Rao, G.N., Kumar, P.M., Dhendapani, V.S., Ramakrishna, T., 2000. Constituents of C. auriculata. Fitoterapia 71 (1), 82-83.
11.Varley, H., Alan, H.G., 1984. Tests in renal disease. In: Practical Clinical Biochemistry, vol. 1123. William Heinemann Medical Book Ltd., London.
12.Vedavathi, S., Mrudula, V., Sudhakar, A., 1997. Tribal Medicine of Chittoor district, AndhraPradesh, India, vols. 48-49. Herbal Folklore Research Center, Tirupati