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Pharmacological Study

Comparative toxicity profiles of *Plumbago zeylanica* L. root petroleum ether, acetone and hydroalcoholic extracts in Wistar rats

Dushyant Kumar, Paragouda A. Patil[1], Subarna Roy, Sanjiv D. Kholkute, Harsha V. Hegde, Vinod Nair[2]

Regional Medical Research Centre (ICMR), Belgaum, [1]Department of Pharmacology, USM-KLE, Belgaum, Karnataka, [2]IPR Division-05, Evalueserve SEZ (Gurgaon) Pvt. Ltd., Gurgaon, New Delhi, India

Abstract

Introduction: The root of *Plumbago zeylanica* Linn. is used in traditional medicine for the treatment of chronic inflammatory diseases and various disorders. The toxicity of this plant has not yet been extensively evaluated. **Aim:** To evaluate and compare the toxicity of *P. zeylanica* root petroleum ether (PZPE), acetone (PZAC), and the hydroalcoholic (PZHY) extracts. **Materials and Methods:** The acute and sub-acute toxicities of extracts were evaluated according to OECD guidelines 425 and 407, respectively in female rats. **Results:** PZPE was more toxic than PZAC and PZHA, based on LD50 values of 93.45, 928.4, and 928.4 mg/kg, respectively. This potency difference directly correlates with the plumbagin content of extracts. With regard to sub-acute toxicity, a significant increase in organ weights (liver, adrenal glands, and/or heart) was observed in PZPE and PZAC treated groups. All extracts produced a significant increase in serum aspartate aminotransferase and urea, and PZAC produced a significant increase in serum creatinine as compared to control. A decrease in hematocrit was observed in the highest dose PZPE group, and a decrease in leukocytes was observed in all PZAC groups. Hepatic and renal changes were observed in all extract treated groups. **Conclusion:** The findings of our study, thus demonstrate that liver and kidney are the primary organs being adversely affected following sub-acute administration of *P. zeylanica* root extract in rats.

Key words: Acute toxicity, nephrotoxicity, plumbagin, *Plumbago zeylanica*, sub-acute toxicity

Introduction

Conventional drugs used in the management of debilitating diseases such as rheumatoid arthritis, irritable bowel syndrome (IBS), and asthma are often associated with a plethora of adverse effects which adds to the morbidity associated with the disease. Owing to the chronic nature of these diseases, patients often gravitate toward complementary and alternative forms of medicine.[1,2] This gravitation toward folklore and herbal medicine is also fuelled by the misconceptions that these agents are safer and less toxic as compared to their counterparts in modern medicine.

Address for correspondence: Dr. Vinod Nair,
IPR Division-05, Evalueserve SEZ (Gurgaon) Pvt. Ltd.,
Gurgaon - 122 001, Haryana, India.
E-mail: vinodnair1979@hotmail.com

Dr. Harsha V. Hegde,
Regional Medical Research Centre (ICMR),
Belgaum - 590 010, Karnataka, India.
E-mail: harshavh@rediffmail.com

The plant *Plumbago zeylanica* Linn. known as *Chitraka* in Ayurveda has been used in alternative systems of medicine as a component of formulations for the treatment of multiple disorders such as arthritis, anemia, cardiovascular disorders, metabolic disorders, chronic rhinitis, sinusitis, dyspnoea, anorexia, and dyspepsia.[3-5] The crude paste made from the root of this plant is also used by local healers for the management of arthritis and other inflammatory disorders. However, the plant *P. zeylanica* contains plumbagin, which is considered to be toxic with an oral LD50 of 65 mg/kg.[6] This active moiety has also been reported to possess significant cytotoxic

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activity, as demonstrated in *in vitro* experiments conducted with keratinocytes[7] and pancreatic cancer cells.[8] This raises concerns about the overzealous use of preparations containing *P. zeylanica* extract.

Although many reports have evaluated the pharmacological activity of this plant in various *in vivo* models, information regarding its safety is lacking. The present study was therefore carried out to evaluate the toxicity potential of the petroleum ether (PZPE), acetone (PZAC) and hydroalcoholic (PZHY) extracts of PZ roots in rodents. The three solvents were chosen on the basis of their different polarities that would ensure a different phytochemical profile, especially with respect to the concentration of plumbagin.

Materials and Methods

Animals

Healthy, adult, female Wistar albino rats weighing between 150 and 180 g were procured from a licensed breeder (Shree Venkateshwara Traders, Bengaluru, India). The animals were acclimatized for a period of 10 days to the laboratory conditions with normal 14 h light and 10 h dark cycle and free access to food (standard rodent pellet feed; Amrut rat feed) and clean tap water. The study protocol was approved by the Institutional Animal Ethics Committee of RMRC Belgaum (1388/c/10/CPCSEA) and all experiments were carried out in accordance with the "Guidelines for care and use of animals in scientific research (Indian National Science Academy 1998, Revised 2000)."

Drugs and chemicals

Diagnostic kits for the estimation of serum aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphates (ALP), creatinine, and urea were procured from Erba Diagnostic (Mannheim GmbH Labs Germany); hematoxylene and eosin Y for histopathology were procured from Fisher Scientific (Hampton, NH).

Plant material

The roots of *P. zeylnica* were collected from the surrounding areas of Khanapur and Jamboti in Northern Karnataka, India. The plant material was authenticated by a taxonomist, and a voucher specimen (RMRC-524) was deposited at Regional Medical Research Centre, Belgaum, Karnataka, India for future reference.

Extraction

The roots were shade dried and ground into a coarse powder. The plant material was then packed into a thimble and subjected to successive continuous Soxhlet extraction with petroleum ether, acetone, and 70% ethanol. The solvents were evaporated under vacuum, using a rotary evaporator to get respective semisolid extracts.

High-performance thin layer chromatography analysis

High-performance thin layer chromatography (HPTLC) analysis of the extracts was carried out on a Camag instrument using silica gel 60 F254 precoated TLC plate (Merck Darmstadt Germany). The separation was carried out by using a mobile phase consisting of toluene:ethyl acetate:formic acid:methanol in a proportion of 3:3:0.8:0.2. The developed plates were scanned at 254 nm in a TLC scanner 3 using win CATS software. Analytical grade plumbagin (Sigma-Aldrich) was used as the reference standard.

Acute toxicity studies

The acute oral toxicity of the three *P. zeylenica* extracts was evaluated in a limit test and main test, conducted in female rats in line with OECD Guideline for testing of chemicals – 425.[9] For the limit test, the extracts were dissolved in dimethyl sulfoxide (DMSO), and a single oral dose of 2000 mg/kg was administered in overnight fasted animals. After dosing, the animals were monitored continuously for the first 6 h. Thereafter, observation for morbidity and mortality were made at 12 h intervals till day 14. For the main test, the doses were selected from the default progression factors. From the data generated in the main test, the LD50 was calculated by using AOT software.

Sub-acute toxicity studies

Sub-acute toxicity studies were carried out in line with OECD guideline for testing of chemicals – 407.[10] Female rats were divided into 10 groups of six animals each. Group I received the vehicle (DMSO) and served as the control; Groups II, III, and IV received 2.75, 5.5, and 11.0 mg/kg of petroleum ether extract (PZPE), respectively; Groups V, VI, and VII received 27.5, 55, and 110 mg/kg of acetone extract (PZAC), respectively; Groups VIII, IX, and X received 27.5, 55, and 110 mg/kg of hydroalcoholic extract (PZHY), respectively. The dose levels of the extract corresponded to 1/20th, 1/10th, and 1/5th of the dose at which no mortality was observed. The animals were dosed daily by gavage for the period of 28 days. Body weight of all the drug/vehicle-treated animals was recorded before initiation of treatment and at weekly intervals thereafter. 24 h after the last dose, the animals were anesthetized, and blood was collected from the retro-orbital sinus into tubes with or without ethylene diamine tetra acetic acid (EDTA). The animals were then sacrificed with an overdose of anesthetic. A necropsy was carried out, and organs were collected for macroscopic and/or microscopic evaluation.

Biochemical assessment

Clotted blood samples were centrifuged at 3000 ×*g* for 10 min, and the separated serum was subjected to biochemical estimation for AST, ALT, ALP, creatinine, urea, and total protein by using specific kits.

Hematological assessment

Anticoagulated (EDTA) blood samples were used for the determination of red blood cell count (RBC), total white blood cell (WBC) count, platelet count, and hemoglobin (Hb) estimation by an autoanalyzer (Accurex CBC 360).

Macroscopic and microscopic evaluation of organs

After necropsy, liver, kidney, heart, lungs, adrenals, and spleen were debrided of attached connective tissue and weighed on an analytical balance. The organ weights were expressed in terms of relative weight (percentage organ weight - body weight ratio). Subsequently, the livers and kidneys from the highest dose

treated groups were preserved in 10% formalin and processed for histopathological evaluation.

Statistical analysis

Comparison of means was carried out by one-way ANOVA followed by Dunnett's Multiple Comparison test (GraphPad InStat; Version 3.05, GraphPad Software Inc). $P \leq 0.05$ was considered to be statistically significant.

Results

High-performance thin layer chromatography (HPTLC) analysis of the plant extract

HPTLC chromatogram of plumbagin (analytical standard) showed a retention factor of 0.73. The presence of plumbagin was confirmed only in the acetone and petroleum ether extracts. No plumbagin could be identified in the hydroalcoholic extract. The plumbagin content in the petroleum ether extract was determined to be 80% w/w, and in the acetone extract it was determined to be 4% w/w.

Acute toxicity

All three tested extracts were found to be toxic at the limit dose of 2000 mg/kg. In the acetone and hydroalcoholic extract treated groups, mortality was observed within 24 h of dosing, whereas, in the petroleum ether extract treated group, mortality was observed within 4 h of dosing. A main test was therefore carried out for all the three extracts. The LD50 for the hydroalcoholic and acetone extracts were calculated to be 928.4 mg/kg (550–1750 mg/kg), and the LD50 for the petroleum ether extract was calculated at 93.45 mg/kg (55–175 mg/kg).

Sub-acute toxicity

There was no mortality, morbidity or other clinical sign of toxicity in any of the extract treated groups. None of the extract treated groups showed a difference in terminal body weights as compared to vehicle control animals [Figure 1].

PZ petroleum extract (PZPE) produced a statistically significant and treatment-related increase in relative liver, heart, and adrenal gland weights as compared to control animals [Table 1]. PZAC produced a statistically significant and treatment-related increase in the relative weights of liver and adrenal glands [Table 1]. Although, there was a statistically significant increase in the relative heart weight at the mid-level dose, this effect was not observed at the lower and higher dose levels [Table 1]. This effect was therefore not considered to be treatment-related. With regards to the PZHY, no treatment-related increase in relative organ weight was observed [Table 1].

All the three tested extracts produced a statistically significant and treatment-related increase in serum AST and urea levels as compared to control, whereas only PZAC treatment produced a statistically significant increase in serum creatinine levels as compared to vehicle control [Table 2]. No treatment-related effects were observed on other serum parameters such as ALT, ALP, and total protein as compared to vehicle control animals.

Although, a decrease in RBCs were observed in all treated groups as compared to the vehicle control, the decrease was significant only in the highest dose PZPE treated group [Table 3]. This decrease in RBC count also corresponded with a decrease in blood Hb levels in the highest dose PZPE treated the group as compared to vehicle control. A treatment-related increase in platelet count and a decrease in packed volume as compared

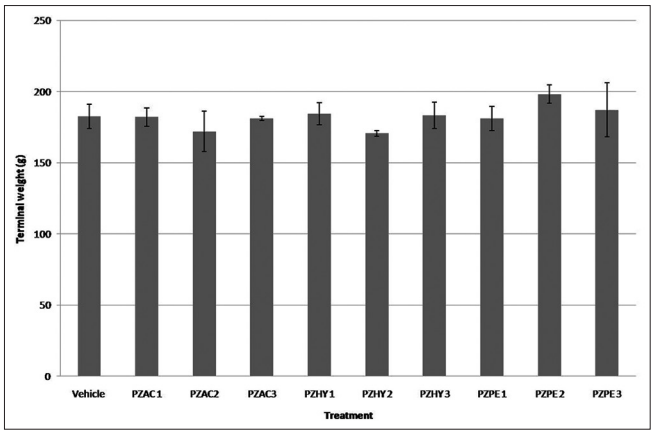

Figure 1: Effect of *Plumbago zeylanica* extract treatment on terminal body weight of rats. All values are mean ± standard deviation. *$P \leq 0.05$, **$P \leq 0.01$. PZAC: *P. zeylanica* acetone extract, PZHY: *P. zeylanica* hydroalcoholic extract, PZPE: *P. zeylanica* petroleum ether extract

Table 1: Effect of *Plumbago zeylanica* extract treatment on relative organ weight (percentage organ weight - organ body ratio) in rats

Treatment groups	Liver	Kidneys	Lungs	Heart	Adrenal gland	Spleen
Vehicle	2.37±0.14	0.73±0.03	0.72±0.02	0.35±0.007	0.03±0.001	0.43±0.01
PZPE 2.75	2.72±0.03	0.76±0.04	0.75±0.02	0.38±0.009*	0.03±0.002	0.47±0.03
PZPE 5.5	3.16±0.40**	0.72±0.06	0.73±0.02	0.35±0.01	0.03±0.004	0.46±0.05
PZPE 11.0	3.15±0.18**	0.79±0.10	0.84±0.19	0.38±0.026**	0.04±0.006*	0.52±0.06
PZAC 27.5	2.77±0.07	0.72±0.03	0.72±0.02	0.36±0.01	0.03±0.001	0.44±0.02
PZAC 55	3.07±0.16*	0.74±0.02	0.75±0.01	0.38±0.029*	0.04±0.007*	0.45±0.10
PZAC 110	3.07±0.09*	0.69±0.01	0.73±0.05	0.36±0.006	0.04±0.005**	0.43±0.02
PZHY 27.5	2.72±0.04	0.71±0.03	0.71±0.02	0.34±0.006	0.03±0.001	0.43±0.01
PZHY 55	2.99±0.21	0.71±0.03	0.82±0.18	0.37±0.029	0.03±0.001	0.47±0.04
PZHY 110	2.92±0.05	0.73±0.09	0.84±0.10	0.35±0.01	0.03±0.004	0.43±0.05

**P*≤0.05, ***P*≤0.01, All values are mean±SD (*n*=6). PZAC: *P. zeylanica* acetone extract, PZHY: *P. zeylanica* hydroalcoholic extract, PZPE: *P. zeylanica* petroleum ether extract, SD: Standard deviation

Table 2: Effect of treatment with *Plumbago zeylanica* extracts on markers of liver and kidney function

Treatment groups	ALP (IU/L)	ALT (IU/L)	AST (IU/L)	Total protein (mg/mL)	Urea (mg/dL)	Creatinine (mg/dL)
Vehicle	49.23±12.40	69.11±12.09	99.94±17.79	89.50±9.22	12.8±1.3	1.17±0.18
PZPE 2.75	47.43±5.61	67.92±4.27	109.03±1.83	89.00±5.06	15.57±0.5*	1.22±0.02
PZPE 5.5	50.77±5.25	71.51±2.72	129.42±10.36**	91.67±4.23	16.9±2.2**	1.26±0.10
PZPE 11.0	51.25±7.78	72.94±2.73	160.29±6.39**	91.00±4.73	23.7±0.4**	1.31±0.25
PZAC 27.5	46.88±1.52	64.24±14.69	111.05±3.87	87.33±6.25	13.6±0.8	1.24±0.05
PZAC 55	48.36±4.03	74.22±3.88	123.76±11.07**	86.67±8.31	14.5±2.2	1.37±0.26
PZAC 110	50.64±1.40	94.88±21.05	140.73±2.65**	87.50±7.56	31.0±2.2**	1.48±0.17**
PZHY 27.5	46.66±5.14	69.04±5.21	100.19±9.27	89.83±5.85	14.5±0.6	1.15±0.05
PZHY 55	49.53±6.89	71.41±4.24	117.28±15.99*	91.33±2.94	15.8±1.5*	1.16±0.03
PZHY 110	51.13±4.65	72.49±38.64	123.89±6.61**	91.67±4.13	16.3±0.9**	1.25±0.02

*$P \leq 0.05$, **$P \leq 0.01$, All values are mean±SD (n=6). PZAC: *P. zeylanica* acetone extract, PZHY: *P. zeylanica* hydroalcoholic extract, PZPE: *P. zeylanica* petroleum ether extract, SD: Standard deviation, AST: Aspartate Aminotransferase, ALT: Alanine aminotransferase, ALP: Alkaline phosphates

Table 3: Effect of treatment with *Plumbago zeylanica* extracts on hematological parameters in rats

Treatment groups	Hematological parameters				
	RBC (millions/mm³)	WBC (thousands/mm³)	Platelet (thousands/mm³)	Hb (g/dl)	Packed cell volume
Vehicle	8.14±0.39	16.00±0.96	687.60±88.23	15.51±0.79	50.95±7.51
PZPE 2.75	8.04±0.09	16.93±1.09	735.16±13.49	14.91±0.19	47.52±0.80
PZPE 5.5	7.87±0.22	16.83±0.77	758.00±19.75	15.33±0.27	45.7±1.05*
PZPE 11.0	7.08±0.45**	16.93±3.75	822.00±16.42**	13.98±0.30**	41.87±2.50**
PZAC 27.5	7.92±0.56	14.76±0.58	733.83±13.90	14.88±0.23	48.47±1.66
PZAC 55	7.74±1.17	14.46±1.07	780.66±68.01**	14.87±0.34	47.90±1.82
PZAC 110	7.49±0.449	12.56±0.59**	859.00±56.75**	15.45±0.37	44.27±4.64**
PZHY 27.5	8.06±0.06	15.9±0.829	710.33±13.44	14.87±0.47	49.02±0.30
PZHY 55	8.06±0.10	16.91±1.13	799.66±8.68**	14.73±0.71	48.33±0.63
PZHY 110	7.75±0.72	14.36±2.12	869.33±73.39**	15.31±0.12	46.26±3.45

*$P \leq 0.05$, **$P \leq 0.01$, All values are mean±SD (n=6). PZAC: *P. zeylanica* acetone extract, PZHY: *P. zeylanica* hydroalcoholic extract, PZPE: *P. zeylanica* petroleum ether extract, SD: Standard deviation, RBC: Red blood cell, WBC: White blood cell, Hb: Hemoglobin

to vehicle control were also observed in the PZPE treated group [Table 3]. PZAC treatment produced a significant decrease in WBC count and packed cell volume but produced a significant increase in platelet count as compared to vehicle control [Table 3]. With regard to PZHY treatment, the only observed effect was an increase in the platelet count as compared to the vehicle control.

Histopathology evaluation demonstrated mild damage to the liver (central vein and sinus congestion, ballooning hepatocytes) in all the extract treated groups [Figure 2]. However, the finding in the PZHY treated group was less remarkable as compared to the PZPE and PZAC treated groups. With regards to the effect of extract treatment on kidneys, mild tubular, and glomerular congestion was observed in all the extract treated groups [Figure 3].

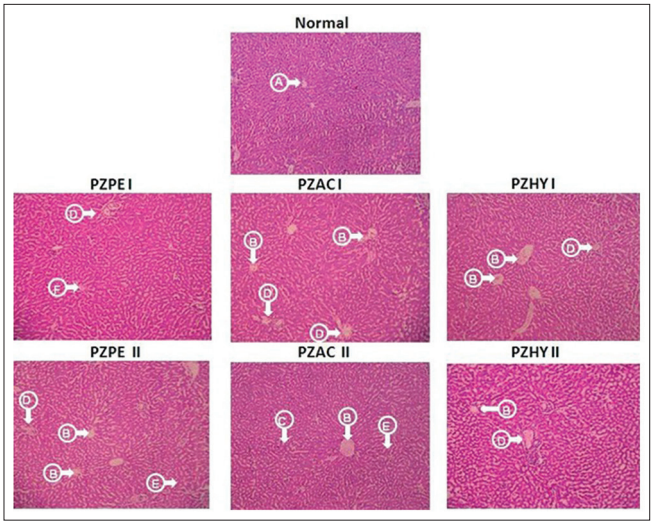

Figure 2: Photomicrographs of liver section (stained with H and E and viewed at ×20) from highest dose *Plumbago zeylanica* extract treated groups. PZAC: *P. zeylanica* acetone extract, PZHY: *P. zeylanica* hydroalcoholic extract, PZPE: *P. zeylanica* petroleum ether extract, A: Central vein, B: Central vein congestion, C: Inflammatory cells, D: Portal triaditis, E: Sinus congestion, F: Spotty necrosis

Discussion

One of the misconceptions associated with the rampant use of herbal formulations as stand-alone or adjunct therapy in the management of chronic disorders is that these agents are safer and less toxic as compared to their counterparts in modern medicine. The present study was therefore carried out to

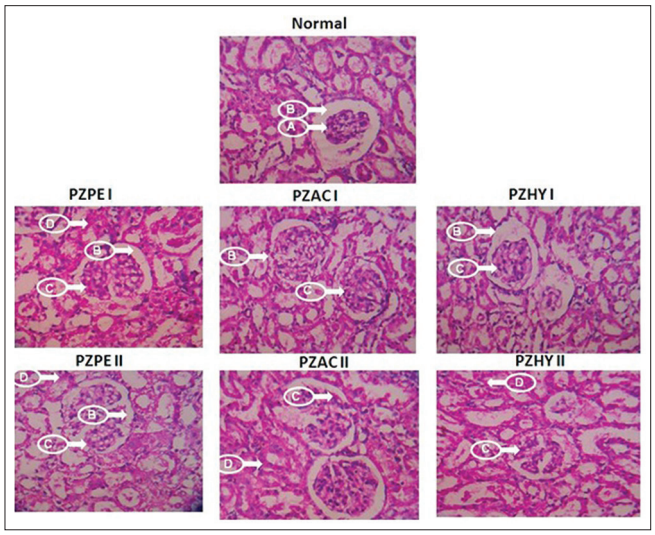

Figure 3: Photomicrographs of kidney section (stained with H and E and viewed at ×20) from highest dose *Plumbago zeylanica* extract treated groups. PZAC: *P. zeylanica* acetone extract, PZHY: *P. zeylanica* hydroalcoholic extract, PZPE: *P. zeylanica* petroleum ether extract, A: Glomerular, B: Bowmen space, C: Glomerular congestion, D: Tubular congestion

evaluate the toxicity potential of the petroleum ether, acetone and hydroalcoholic extracts of *P. zeylanica* roots in rodents. However, it should be noted that this plant is never used as a petroleum ether or acetone extract in traditional medicine. These extracts were only used in this study so as to assess the effect of different extraction methods on the toxicity profile of the plant.

The acute toxicity of the test extracts was evaluated using the limit test followed by the up and down method.[9] Results of the present study indicate that the hydroalcoholic and acetone extracts (PZHY and PZAC respectively) can be considered to be less toxic than the petroleum ether extract (PZPE) after administration by the oral route. On comparing the LD50 values with the phytochemical estimation, it becomes evident that the toxicity was mainly attributed to the presence of plumbagin. PZPE contained the highest concentration of plumbagin (80% w/w) when compared with PZHY and PZAC (4% w/w). This assessment is further supported by the fact that the LD50 of pure plumbagin has been reported to be 65 mg/kg[6] which is similar to the estimated LD50 of 93.45 mg/kg for PZPE.

Based on the observations from the acute toxicity study, the dose level at which no mortality was observed was considered to be the safe dose for acute exposure. This dose was the starting point for determination of dose levels for sub-acute toxicity studies. Following repeated oral exposure of the extracts for 28 days, only PZPE treatment produced a statistically significant increase in relative liver, heart, and adrenal gland weight as compared to vehicle control animals. A statistically significant increase in serum AST and urea levels was observed in all the extract treated animals, and creatinine levels were found to be significantly elevated in the highest dose PZAC treated group. These effects also correlated with histological findings as hepatic and renal congestion were observed in all extract treated groups. The liver effects observed in present study are in contradiction to the previously reported study[11] where the authors had demonstrated hepatoprotective effects in paracetamol induced toxicity. Further, PZPE treatment also altered the hematological profile as evidenced by a decrease in RBC count, Hb and hematocrit, while PZAC only produced a significant decrease in WBC count.

Conclusion

The finding of the present study raises concerns about the possible hepato- and nephrotoxicity potential of the test drug arising due to the long-term administration in the management of chronic disorders. Ayurveda advocates purification procedures for poisonous plants, and therefore when used according to the laid down principles, these adverse effects might not be of concern. However, these findings do question the validity of the general conception that herbal and plant derived drugs are devoid of adverse effects and/or are safer alternatives to modern medicine.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Cronan TA, Kaplan RM, Posner L, Blumberg E, Kozin F. Prevalence of the use of unconventional remedies for arthritis in a metropolitan community. Arthritis Rheum 1989;32:1604-7.
2. Eisenberg DM, Davis RB, Ettner SL, Appel S, Wilkey S, Van Rompay M, *et al.* Trends in alternative medicine use in the United States, 1990-1997: Results of a follow-up national survey. JAMA 1998;280:1569-75.
3. Anonymous. Ayurvedic Pharmacopoeia of India, Part-II (Formulations). Vol. I. New Delhi: Government of India, Ministry of H & FW, Department of AYUSH; 2007.
4. Patel RV, Kori VK, Patel KS. A clinical study of *Devadarvyadi-Vati* on *Grahani Dosha* in children. AYU 2011;32:187-91.
5. Sharma PC, Yelne MB, Dennis TJ. Database on Medicinal Plant Used in Ayurveda. New Delhi: Central Council for Research in Ayurveda and Siddha; 2001.
6. Premakumari P, Rathinam K, Santhakumari G. Antifertility activity of plumbagin. Indian J Med Res 1977;65:829-38.
7. Inbaraj JJ, Chignell CF. Cytotoxic action of juglone and plumbagin: A mechanistic study using HaCaT keratinocytes. Chem Res Toxicol 2004;17:55-62.
8. Chen CA, Chang HH, Kao CY, Tsai TH, Chen YJ. Plumbagin, isolated from *Plumbago zeylanica*, induces cell death through apoptosis in human pancreatic cancer cells. Pancreatology 2009;9:797-809.
9. OECD. 425: Acute Oral Toxicity: Up-and-Down Procedure. OECD Guidelines for the Testing of Chemicals. Paris: OECD Publishing; 2008.
10. OECD. 407: Repeated Dose 28-day Oral Toxicity Study in Rodents. OECD Guidelines for the Testing of Chemicals. Paris: OECD Publishing; 2008.
11. Kanchana N, Sadiq MA. Hepatoprotective effect of *Plumbago zeylanica* on paracetamol induced liver toxicity in rats. Int J Pharm Pharm Sci 2011;3:151-4.

हिन्दी सारांश

चित्रक मूल के पेट्रोलियम ईथर, एसीटोन और हाइड्रो अल्कोहोलिक अर्क के विषाक्तता का चूहों पर मूल्यांकन और तुलनात्मक अध्ययन

दुष्यंत कुमार, परगौडा ए. पाटील, सुबर्णा राय, संजीव डी. खोलकूटे, हर्ष व्ही. हेगडे, विनोद नायर

चित्रक (प्लम्बेगो जिलेनिका) मूल का प्रयोग जोड़ों के दर्द के उपचार के लिए पारंपरिक चिकित्सा में किया जाता है। इस अध्ययन में चित्रक मूल के पेट्रोलियम ईथर (पी.झेड.पी.ई.), एसीटोन (पी.झेड.ए.सी.) और हाइड्रोअल्कोहोलिक (पी.झेड.एच.वाय.) अर्क की विषाक्तता का मूल्यांकन और तुलनात्मक अध्ययन किया गया है। चित्रक मूल के सभी अर्कों को मादा चूहों में ओईसीडी के दिशा निर्देशों ४२५ और ४०७ के अनुसार क्रमशः एकल व अर्धजीर्ण विषाक्तता के लिये अध्ययन किया गया है। पी.झेड.ए.सी., पी.झेड.एच.वाय. की तुलना में पी.झेड. पी.ई. अर्क अधिक विषाक्त पाया गया। एलडी ५० क्रमशः ९२८.४, ९२८.४ और ९३.४५, मिलीग्राम/किग्रा गणना के अनुसार पायी गयी। इस PZPE अर्क की विषाक्त शक्ति का संबद्ध सीधे अर्क में उपस्थित प्लम्बेगीन की मात्रा के साथ है। अर्धजीर्ण विषाक्तता के संबंध में, पी.झेड. पी.ई. और पी.झेड.ए.सी. के अर्क दिये गये समूहों का अंग वजन (यकृत, अधिवृक्क ग्रंथि और हृदय) में एक उल्लेखनीय वृद्धि दर्शाता है। नियंत्रण समूह की तुलना में सभी अर्क सीरम एसपार्टेट और यूरिया में उल्लेखनीय वृद्धि, और पी.झेड.ए.सी. सीरम क्रिएटिनिन में उल्लेखनीय वृद्धि दर्शाता है। पी.झेड.पी.ई. की उच्चतम खुराक समूह में हिमेटोक्रिट की कमी पायी गयी और सभी पी.झेड.ए.सी. के सभी समूहों में ल्यूकोसाइट्स की कमी भी पायी गयी। सभी अर्कों के ईलाज से यकृत और वृक्कों में परिवर्तन भी पाया गया। हमारा अध्ययन दर्शाता है की चित्रक मूल के अर्क अर्धजीर्ण खुराक चूहों में यकृत और वृक्क प्राथमिक अंगों पर प्रतिकूल प्रभाव डालते हैं।