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RESEARCH ARTICLE

HEPATOPROTECTIVE EFFECT OF *PHYLLANTHUS NIRURI* AQUEOUS EXTRACT ON PARACETAMOL INDUCED STRESS IN THE FISH *ANABAS TESTUDINEUS*

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ABSTRACT

Present study clearly demonstrates the ameliorating effects of *Phyllanthus niruri* extract on hepatic injury caused by repeated paracetamol dosing in fishes. Activity of serum Alkaline phosphatase in the paracetamol treated group had a sharp and significant increase as compared to a healthy control group indicating successful induction of hepatotoxicity by repeated dosing of paracetamol. Histopathological studies also indicated significant alterations in liver architecture in paracetamol treated animals compared to the normal control group, further indicating liver damage. The healthy control group displayed normal liver histology while the paracetamol treated group showed swollen or occasionally apoptotic hepatocytes with coarse granular cytoplasm and compressed sinusoids. Severe lymphocytic infiltration was also noticed. *Phyllanthus niruri* treated groups exhibited strikingly normal liver histology without any anatomically detectable anomalies. In them the alkaline phosphatase activity also recorded normal range. When the paracetamol injected group was treated with *P. niruri* extract there was promisingly sharp decline in elevated ALP level. The hepatic tissue architecture also showed signs of cure as treated with *P. niruri*. When fishes pretreated with *P. niruri* extract was given paracetamol injection as in treated group there was little damage caused when compared with paracetamol alone treated group. All these results clearly shows that the aqueous extract of *P. niruri* proved to be capable of providing hepatoprotection against paracetamol induced hepatotoxicity.

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INTRODUCTION

Liver diseases are one of the important worldwide health problems. Liver is a unique organ in the body and performs a vital function of detoxification of endogenous and exogenous compounds. Liver toxicity or hepatotoxicity is the reason for many liver disorders and one of the most important worldwide health problems in recent years. Liver toxicity is one of the most studied liver disorders. Most of the hepatotoxic chemicals, including some drugs, damage liver cells mainly by inducing oxidative damage and lipid peroxidation in liver. Acetaminophen or paracetamol is one of such therapeutic chemical which otherwise has an excellent safety profile under prescribed dosage. Because of its common and wide usage it is used by large number of common people even without prescription by a medical practitioner. Acetaminophen is converted into N-acetyl p-benzoquinoneimine (NAPQI) which is an intermediate in the metabolism of acetaminophen. Accumulation of NAPQI in the liver leads to the depletion of glutathione, an important antioxidant in liver and causes direct damage to liver cells.

Due to scarcity of metabolically safe hepato-protective drugs, there is increasing interest in the alternative medicines for the treatment of liver diseases and associated metabolic ailments which include herbal remedies and dietary supplements.

Medicinal plant studied – *Phyllanthus niruri*

Phyllanthus niruri is a widespread tropical plant commonly found in coastal areas, best known by the common name stonebreaker. In Malayalam it is known as 'keezharnelli'. The plant grows 50 to 70 centimeters tall and bears ascending herbaceous branches. The bark is smooth and light green. It bears numerous pale green flowers which are often flushed with red. The fruits are tiny, smooth capsules containing seeds. *Phyllanthus niruri* is a plant possessing several pharmacological properties. It has a long history in traditional herbal medicine in every tropical country it is found in. It is prone to have beneficial effect on hepatic, cirrhosis, fatty liver etc. For hundreds of years *P. niruri* has been used as an herbal remedy to kidney stones, viral infections, liver disorders, bacterial infections, and many other ailments. In more recent years, however, *P. niruri* has been shown in modern medicine to cure or treat multiple disorders.

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Organ studied – Liver

Liver acts as the main biochemical synthesizer and detoxifying organ. It is responsible for cleaning toxins and wastes from the blood, and separating out the useful nutrients to synthesize hundreds of biochemicals that the body needs for daily functioning. Liver also activates and regulates important hormones. Liver toxicity or hepatotoxicity is the reason for many liver disorders and one of the most important worldwide health problems in recent years. It is one of the most studied liver disorders.

MATERIALS AND METHODS

Healthy, uninjured specimens of *Anabas testudineus* were collected from Kuttanad region of Kerala State. They were brought to the laboratory and were acclimatized to lab conditions for one week. From this stock adult specimen weighing 16-21 gms and having snout - vent length 11-12.5 mm were selected for experimental purposes. Acclimatized specimens alone were used. They were fed with pelleted artificial fish feed. Special care was taken to provide proper aeration and keeping the tank clean from excreta and other waste materials.

Stained sections were examined with research microscope for histopathological changes.

RESULTS AND DISCUSSION

The results obtained clearly revealed the hepatoprotective ability of *Phyllanthus niruri*. After receiving paracetamol injection for ten days, some behavioural abnormalities like reduced activity level and heavy secretion of mucus were noticed in the fishes. Upon treatment with *P. niruri* for fifteen days fishes returned to their normal behavioural patterns. Fishes pre-treated with *P. niruri* extract before getting paracetamol injection also showed no behavioural abnormalities.

Biochemical changes: Quantitative estimation of alkaline phosphatase activity in the blood of paracetamol treated fishes showed a sharp increase in levels of this enzyme when compared with the control fishes. In normal fishes the value was 75.5 ± 1.64 . In fishes those received paracetamol at a dose of 500mg/kg body weight this value increased up to 188.67 ± 7.58 . In fishes those received *Phyllanthus* extract for fifteen days increased alkaline phosphatase values showed a declining trend reaching up to 107 ± 3.16 .

No of fish	Normal Control	Treated with paracetamol	Paracetamol+ <i>P.niruri</i>	Pre treated with <i>p.niruri</i> +paracetamol	<i>P.niruri</i> extract alone
1	76	183	103	82	76
2	78	194	111	80	78
3	75	198	105	78	75
4	76	178	108	78	74
5	75	193	105	81	76
6	73	186	110	76	78
Mean & SE	75.5±1.64	188.67±7.58	107±3.16	79.16±0.99	76.16±1.60
t value		t=35.73684, P<0.00001	t=21.65131, P<0.00001	t=3.24372, P=0.00881	t=0.711568, P=0.49299

Experimental protocol

Animals were divided into four groups of six fishes each and treated as below for 15 days.

Group-I: Served as normal control received distilled water injection for 15 days.

Group-II: Served as negative control received paracetamol injection 500mg/kg body weight for 15 days.

Group-III: Served as experimental group received paracetamol injection as in group-II and then *P. niruri* extract 500 mg/kg body weight administered orally for 15 days.

Group IV: Served as experimental group pre-treated with *P. niruri* extract orally for 15 days and then received paracetamol injection for 15 days.

Group V: Served as experimental control received *Phyllanthus* extract alone.

Animals were sacrificed under light ether anaesthesia 24 hour after the last dose. Blood was collected by cardiac puncture using a syringe and liver was removed, rinsed in cold saline and fixed in neutral buffered formalin for 48 hours. It was subsequently washed in distilled water and processed through graded series of alcohol, cleared in xylene and embedded in paraffin wax. Sections of 7 micron thickness were cut; stained with Harris haematoxylin and Eosin and mounted in DPX.

Fishes pre-treated with *Phyllanthus* extract before getting paracetamol injection also showed nearly normal values.

Histopathological changes: The normal histological architecture of liver, various histopathological changes produced by paracetamol and the hepatoprotective ability of *P. niruri* as evidenced from histopathological studies in this organ of the fish are explained below.

Histology of normal liver

The liver of *Anabas testudineus* is a solid glandular organ, made up of polyhedral hepatic units called hepatic lobules. The surface is covered by a serous membrane and the hepatic lobules are made up of hepatic cells which are roundish polygonal in shape containing a clear spherical nucleus. They are located among sinusoids forming cord like structures known as hepatic cell cords. There is a central vein which drains blood away from the lobules. The wall of sinusoids contains phagocytic Kupffer cells. Sandwiched between the lobules, there are strands of connective tissue called portal canals carrying branches of portal vein, hepatic artery, bile duct and lymphatics.

Gross pathology of the liver: When the liver samples of the treated fishes were examined grossly, they were found to be slightly enlarged but with severe congestion.

Histology of liver after *P. niruri* administration for 15 days

Treatment of *P. niruri* alone caused no alterations in structure. Liver appeared as normal as in control.

Histopathology of liver under paracetamol administration

Injection paracetamol 500gm / kg body weight of the fish for 15 days induced pronounced pathological changes in the liver tissue of *Anabas testudineus*. There were changes like swelling, loosening and clumping of hepatocytes and hemorrhage. Hyalinization and lymphocytic infiltration was also noticed.

Histopathology of liver under paracetamol administration and treatment with *P. niruri*.

After treating with *P. niruri* extract it was seen that hepatic lesions induced by paracetamol injection was markedly reduced.

Histopathology of liver under paracetamol administration with pre-treatment with *P. niruri*.

Pre-treatment with *P. niruri* caused little liver damage even after the administration of paracetamol for 15 days. Liver appeared almost normal except for some mild lymphocytic infiltration.

In the present study, activity of serum Alkaline phosphatase in the paracetamol treated group had a sharp and significant increase as compared to a healthy control group indicating successful induction of hepatotoxicity by repeated dosing of paracetamol. Histopathological studies also indicated significant alterations in liver architecture in paracetamol treated animals compared to the normal control group, further indicating liver damage. The healthy control group displayed normal liver histology while the paracetamol treated group showed swollen or occasionally apoptotic hepatocytes with coarse granular cytoplasm and compressed sinusoids.

Phyllanthus niruri treated groups exhibited strikingly normal liver histology without any anatomically detectable anomalies. In them the alkaline phosphatase activity also recorded normal range. When the paracetamol injected group was treated with *P. niruri* extract there was promisingly sharp decline in elevated ALP level. The hepatic tissue architecture also showed signs of cure as treated with *P. niruri*. Several studies have reported the medicinal properties of *P. niruri* (Chopra et al., 1986). *P. niruri* is used in folk medicine to treat hepatitis and other viral infections (Venkateswaran et al., 1987; Wang, 2000). Many bioactive molecules have been reported in *P. niruri*, showing various activities, such as antiviral, antinociceptive, and antispasmodic activities and inhibition of calcium oxalate formation in the kidney.

REFERENCES

- Chopra, R. N., Nayar, S. L. and Chopra, I. C. 1986. Glossary of Indian medicinal plants, CSIR, New Delhi. Ranchi, India: Catholic Press.
- Santos, A. R., Filho, V. C., Yunes, R. A. and Calixto, J. B. 1995. Analysis of the mechanisms underlying the antinociceptive effect of the extracts from plant genus *Phyllanthus*. *General Pharmacology*, 26(7), 1499–1506.
- Venkateswaran, S. P., Millman, I. and Blumberg, B. S. 1987. Effects of an extract from *Phyllanthus niruri* on hepatitis B and woodchuck hepatitis virus: in vitro and in vivo studies. *Proceedings of the National Academy of Sciences, USA*, 84(1), 274–288.
- Wang, B. E. 2000. Treatment of chronic liver diseases with traditional Chinese medicine. *Journal of Gastroenterology and Hepatology*, 15, E67–E70.
