Research Article

Preventive effect of hydroalcoholic extract of *Vetiveria zizanoides* roots on paracetamol induced hepatotoxicity in Wistar albino rats

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Abstract

Objective: Paracetamol is commonly used drug for fever. Long term use of low dose or high dose can produce the liver toxicity. In India paracetamol is used widely leads to development of liver disorders. The present study aimed to evaluate the hepatoprotective effect of hydroalcoholic extract of *Vetiveria zizanoides* (VZ) roots in paracetamaol induced liver toxicity in Wistar albino rats. **Materials:** Wistar albino rats weighted 220-250 g was selected for the study. A total of 30 rats were divided into six groups each of six rats. G-I Control (2% gum acacia), G-II Paracetamol (3 g/kg), G-III-Silymarin (200 mg/kg) + Paracetamol (3 gm/kg), G-IV-Hydroalcoholic extract of VZ root (150 mg/kg) + Paracetamol (3 g/kg) and G-V-Hydroalcoholic extract of VZ root (300 mg/kg) + Paracetamol (3 g/kg). Standard and test drugs were administered 1-7 days to their respective groups. On 8th day except control group all the rats were administered 3g/kg paracetamol. After 48 h blood was collected and used for biochemical estimations. **Results:** Group-II showed significant increase in liver enzymes compared to control group. Pre-administration of standard and test drugs significantly reduced the paracetamol induced hepatotoxicity. Standard drug showed significant reduction in liver enzymes compared to test drug. **Conclusion:** Pre-administration of hydroalcoholic extract of VZ root powder prevented the paracetamol induced hepatotoxicity in rats. Further studies required to evaluate the causative molecule for hepatoprotective effect.

Keywords: *Vetiveria zizanoides*, Paracetamol, hepatotoxicity, hydroalcoholic, liver enzymes

Introduction

Liver is a major organ which metabolizes the endogenous and exogenous agents. It plays the major role in the metabolism of various products and detoxifies the toxins. It has a microsomal system which involves the metabolism and activation of various compounds in the body. It metabolize the products and make into water soluble (Mroueh et al., 2004; Aian et al., 2012). Paracetamol is NSAIDs. It widely used in the treatment of various conditions. It has antipyretic and analgesic activity. It has high therapeutic index. Paracetamol used long term or high dose produce hepatotoxicity as a common adverse effect. Paracetamol metabolite (n-acetyl parabenzoquineimine) is the cause for toxicity. Due to wide usage of paracetamol significant number of liver disease patients recorded in India (Akindele et al., 2010). Synthetic drugs have limitation in the treatment of liver toxicity. Many natural products showed hepatoprotective action (Mitra et al., 2000). According to Ayurveda *Vetiveria zizanoides* (VZ) roots have hepatoprotective, antioxidant, anti-inflammatory, anti-septic, aphrodisiac, cictrisant, nervine, sedative, health tonic and wound healing property (Chomchalow et al., 2000; Singh et al., 1984; Balasankar et al., 2013). On the basis of review of literature the present study was conducted to evaluate the hepatoprotective activity of hydroalcoholic extract of *Vetiveria zizanoides*, roots in paracetamol induced liver toxicity in Wistar albino rats.

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Materials and methods

Animals

Wistar Albino rats weighed 200-230g was used in this study. Animals kept in the Central Animal House at room temperature. Animal were free access to water and food (Mahmood et al., 2014). The study was ethically cleared

from Institutional Animal Ethics Committee (Registration number SMIMS/IAEC/2014/A/05).

Collection of *Vetiveria zizanoides* roots

VZ roots were collected from local area of Nagercoil, Tamil Nadu. Roots were dried and made into fine powder by domestic grinder. The powder was stored and used for extraction. The roots were identified and authenticated by botanist.

Preparation of hydroalcoholic extract of VZ root extract

Hydroalcoholic extract was prepared by using 50:50 (Ethanol: Water) solvent. The extract was prepared by Soxhlet extraction procedure. At the end of the procedure the solvent was evaporated. Dark brown extract was obtained and used for further study (Aleem et al., 2014).

Animal protocol

Group-I: Control (Normal saline)

Group-II: Gum acacia (2%) + (Paracetamol 3 g/kg)

Group-III: Silymarin (200 mg/kg) +Paracetamol (3 g/kg),

Group-IV: Hydroalcoholic extract of VZ root (150 mg/kg) + Paracetamol (3 g/kg) and

Group-V: Hydroalcoholic extract of VZ root (300 mg/kg)+ Paracetamol (3 g/kg).

Hepatoprotective activity

All groups except control 1-7 days drugs was administered to their respective groups. On 8th day G-II, III, IV and V received paracetamol (3 gm/kg). After 2 days 2 ml of blood was collected from each rat by retro orbital procedure. The blood was centrifuged and serum was collected and stored. The stored serum was used for the estimation of liver enzymes (Vivek et al., 2015).

Statistical analysis

The data was expressed in Mean and Standard deviation. Statistical Package for Social Sciences (SPSS 16.0 version) used for analysis. One way ANOVA (Post hoc) followed by Dunnet t test applied to find the statistical significant between the groups. P value less than 0.05 ($p<0.05$) considered statically significant at 95% confidence interval.

Results

Group-II showed significant increase in SGOT, ALP, SGPT levels compared to Group-I. Group-III showed significant decrease compared to Group-II. Pre administration of VZ root extracts significantly prevented increase in SGOT, ALP and SGPT compared to G-II. High dose of plant extract showed significant effect compared low dose (Table 1). Paracetamol treated groups showed significant decrease in SOD, CAT, GPx and GSH compared to control group. Silymarin given rats showed significant increase in the enzymes compared to paracetamol group. High dose VZ

Table 1. Effect of hydroalcoholic extract of VZ root on liver enzymes in paracetamol induced toxicity

Groups	Serum Glutamic oxaloacetic transaminase (U/l) (SGOT) (MEAN±SD)	Alkaline phosphatase (U/l) (ALP) (MEAN±SD)	Serum glutamic pyruvic transaminase (U/l) (SGPT) (MEAN±SD)
Group-I	32.78±0.34	145.90±0.45	30.56±0.92
Group-II	147.02±0.89*	256.93±0.36*	128.03±0.34*
Group-III	56.90±0.13*,#	63.89±0.12*,#	47.90±0.12*,#
Group-IV	98.23±0.12*,#,$	178.34±0.11*,#,$	82.19±0.45*,#,$
Group-V	72.19±0.54*,#,$,!	119.23±0.76*,#,$,!	65.02±0.91*,#,$,!

(*$p<0.05$ significant compared G-I with other groups, #$p<0.05$ significant compared G-II with other groups, $$p<0.05$ significant compared G-III with other groups, !$p<0.05$ significant compared G-IV with other groups)

Table 2. Effect of hydroalcoholic extract of VZ root on antioxidant levels in paracetamol induced toxicity

Groups	Superoxide dismutase (SOD) (U/mg) (MEAN±SD)	Catalase (CAT) (µmol/mg) (MEAN±SD)	Glutathione peroxidase (GPx) (mg GSH/mg) (MEAN±SD)
Group-I	0.43±0.12	234.89±1.45	21.64±0.23
Group-II	0.18±0.34*	102.34±0.92*	11.92±0.56*
Group-III	0.52±0.12*,#	228.34±0.81*,#	20.23±0.34*,#
Group-IV	0.29±0.92*,#,$	152.03±0.19*,#,$	15.09±0.23*,#,$
Group-V	0.40±0.23*,#,$,!	198.23±0.82*,#,$,!	19.93±0.19*,#,$,!

(*$p<0.05$ significant compared G-I with other groups, #$p<0.05$ significant compared G-II with other groups, $$p<0.05$ significant compared G-III with other groups, !$p<0.05$ significant compared G-IV with other groups)

group showed similar results like standard drug (Table 2 and Figure 1).

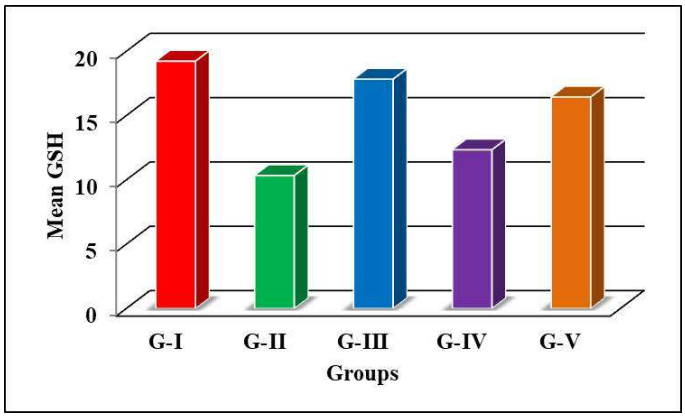

Figure 1. Effect of hydroalcoholic extract of VJ root on reduced glutathione (GSH) in paracetamol induced liver toxicity

Discussion

Paracetamol is the safe drug in the non-steroidal anti-inflammatory drugs. Long term use or high dose causes liver damage (Prescott et al., 1971; Wilkinson et al., 1977; Bonkoysky et al., 1977). Paracetamol metabolite causes the liver toxicity. In the present study rats treated with paractemol showed increase the liver enzymes. Madkour et al. (2013) study also showed increased in the liver enzyme levels in paracetamol treated group (Madkour et al., 2013). Administration of paracetamol increased the SGOT, SGPT and ALP levels it may be damage to the hepatic cells. (Oyedeji et al., 2013) observed that increased in liver enzymes rats treated with paracetamaol. Rats treated with paracetamol group showed reduced detoxifying enzymes levels. It indicates the paracetamol induced liver toxicity. Silymarin has anti-oxidant activity. Rats treated with silymarin showed increased in anti-oxidant enzyme levels. VZ root extract showed similar effect like standard drug. It indicate that root of VZ have phytochemicals can prevent the paracetamol induced liver toxicity.

Conclusion

Paracetamol is commonly used antipyretic drug. High dose caused hepatotoxicity. In this study pre administration of VZ root extract significantly prevented paracetamol induced hepatotoxicity in rats. From the results of present study it can be concluded that VZ roots can be useful in the treatment of liver disorders.

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