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PROCEEDINGS ABSTRACT

Protective effects of a *Tephrosia purpurea* extract, alone and in combination with *N*-acetylcysteine, on the hepatic injury and critical liver function markers of rats exposed to carbon tetrachloride

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The carbon tetrachloride (CCl_4)-induced hepatotoxicity is widely used as an *in vivo* experimental model for simulating liver injuries that are associated with oxidative stress, hepatocellular degeneration, and impaired hepatic function. *Tephrosia purpurea* is a flowering plant species that possesses antioxidant and hepatoprotective properties, whereas *N*-acetylcysteine (NAC) is a well-established antioxidant that can replenish intracellular glutathione stores and limit oxidative tissue damage. This study evaluated the protective effects of a *Tephrosia purpurea* extract, administered alone or in combination with NAC, against CCl_4-induced liver injury in Wistar rats. To this end, 48 adult male Wistar rats were randomly allocated into eight groups (n=6 per group): (i) a normal control group, (ii) a negative control (olive oil) group, (iii) a positive control (CCl_4-treated) group, (iv) a group receiving NAC (at 150 mg/kg) prior to the CCl_4 administration, (v–vii) three groups receiving *Tephrosia purpurea* extract (at doses of 100, 200, and 400 mg/kg, respectively) prior to CCl_4 administration, and (viii) a combination group receiving NAC (at 150 mg/kg) together with a *Tephrosia purpurea* extract (at 200 mg/kg) before the CCl_4 administration. Treatments were administered orally, once daily, for 28 days, while hepatotoxicity was induced by the intraperitoneal administration of CCl_4 (1 mL/kg; 1:1 in olive oil) twice weekly. Hepatoprotection was assessed through histopathological examination of the liver and through the measurement of liver function biomarkers. The undertaken histopathological examination demonstrated normal hepatic architecture in both the normal and negative control groups, whereas the CCl_4-treated (positive control) group exhibited marked hepatocellular degeneration, necrosis, inflammatory cell infiltration, and architectural distortion. Pretreatment with NAC and *Tephrosia purpurea* extract significantly reduced the histological injury score when compared with that of the CCl_4-treated (positive control) group ($p<0.001$). The extract of *Tephrosia purpurea* exerted a dose-dependent improvement, reducing the histological injury score by 45.3%, 54.1%, and 88.8% at doses of 100, 200, and 400 mg/kg, respectively ($p<0.001$). The combination of NAC with the *Tephrosia purpurea* extract has produced the greatest hepatoprotective effect, reducing the histological injury score by 91.2% when compared with that of the CCl_4-treated (positive control) group ($p<0.001$). The undertaken biochemical analysis demonstrated no significant differences between the normal and negative control

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groups (p>0.05). In contrast, the CCl_4-treated (positive control) group exhibited significant liver dysfunction, characterized by increased serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), and total bilirubin levels, along with decreased serum albumin and total protein concentrations (p<0.001). The NAC pretreatment significantly attenuated these alterations (p<0.001). Similarly, the administration of the *Tephrosia purpurea* extract improved all biochemical parameters in a dose-dependent manner. At 400 mg/kg, the extract significantly reduced the serum ALT, AST, ALP, and total bilirubin levels by 57.8%, 34.9%, 31.7%, and 82.0%, respectively, while it also significantly increased the albumin and total protein levels by 64.0% and 33.9%, respectively, compared with those of the CCl_4-treated (positive control) group (all p<0.001). The combination of NAC with the *Tephrosia purpurea* extract exerted the strongest effect, significantly reducing ALT, AST, ALP, and total bilirubin serum levels by 65.2%, 38.5%, 35.1%, and 87.6%, respectively, and significantly increasing the serum albumin and total protein levels by 81.5% and 40.7%, respectively, compared with those of the CCl_4-treated (positive control) group (all p<0.001). In conclusion, the *Tephrosia purpurea* extract can exert a significant, dose-dependent protection against CCl_4-induced hepatotoxicity, as evidenced by marked improvements in rat liver histology and hepatic function markers. The co-administration of this extract with NAC can further enhance these effects and provide a greater preservation of hepatic structure and function than either treatment alone.

Keywords

CCl_4; hepatoprotection; histopathology; NAC; *Tephrosia purpurea*

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Conflicts of interest statement

None to declare.

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