

# **The Protective Properties of the Strawberry (*Fragaria ananassa*) against Carbon Tetrachloride-Induced Hepatotoxicity in Rats Mediated by Anti-Apoptotic and Upregulation of Antioxidant Genes Expression Effects**

## ***Abstract:***

The strawberry (*Fragaria ananassa*) has been extensively used to treat a wide range of ailments in many cultures. The present study was aimed at evaluating the hepato-protective effect of strawberry juice on experimentally induced liver injury in rats. To this end, rats were intraperitoneally injected with carbon tetrachloride (CCl<sub>4</sub>) with or without strawberry juice supplementation for 12 weeks and the hepatoprotective effect of strawberry was assessed by measuring serum liver enzyme markers, hepatic tissue redox status and apoptotic markers with various techniques including biochemistry, ELISA, quantitative PCR assays and histochemistry. The hepato-protective effect of the strawberry was evident by preventing CCl<sub>4</sub>-induced increase in liver enzymes levels. Determination of oxidative balance showed that strawberry treatment significantly blunted CCl<sub>4</sub>-induced increase in oxidative stress markers and decrease in enzymatic and non-enzymatic molecules in hepatic tissue. Furthermore, strawberry supplementation enhanced the anti-apoptotic protein, Bcl-2, and restrained the pro-apoptotic proteins Bax and caspase-3 with a marked reduction in collagen areas in hepatic tissue. These findings demonstrated that strawberry (*F.ananassa*) juice possessed antioxidant, anti-apoptotic and anti-fibrotic properties, probably mediated by the presence of polyphenols and flavonoids compounds.

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