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Hepatoprotective effects of *Cynara scolymus* L. extract on CCl_4 induced liver injury in broiler chickens

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ABSTRACT
An investigation was done on to evaluate the effect of *Cynara scolymus L*. (artichoke) on protection against carbon tetrachloride (CCl_4) induced hepatotoxicity in broiler chickens. Tests for liver injury were done on broiler chicks arranged in to four experimental groups, each containing 10 chicks (Ross, 308); no artichoke aqueous extract (control group), 0.5g/kg/day of artichoke aqueous extract (AE group), 1ml/kg/bwt of CCl_4 (CCl_4 group), and 0.5g/kg/bwt of artichoke aqueous extract plus 1ml/kg/bwt of CCl_4 (AE+ CCl_4 group). Blood samples were analyzed for the liver enzymes; Alanine aminotransferase (ALT), Aspartate aminotransferase (AST) and alkaline phosphates (ALP). Liver samples were processed for histological evaluations. The aqueous extract of *Cynara scolymus L*. at a dose of 0.5g/kg body weight exhibited a moderate hepatoprotective effect by reducing levels of AST ($P<0.05$) in serum. Amounts of ALT and ALP in blood serum were increased non-significantly in the CCl_4 group compared to the AE group. In addition, biochemical studies on blood samples of carbon tetrachloride treated birds showed a significant increase in AST, a result that reflected liver injury caused by CCl_4, while blood samples from the group of birds treated with aqueous extract of artichoke showed decreased levels of AST, ALT and ALP in serum indicating that the extract had a hepatoprotective effect. Histopathologic evaluations of liver tissue samples showed that birds treated with aqueous extract of artichoke had a better status in liver parenchyma, central veins and sinusoids compared to birds in the group treated with CCl_4. Therefore, the use of aqueous extract of Cynara *scolymus L*. can be applied with significant effect to protect against hepatotoxicity that can induce serious hepatocellular injury in birds.

***Keywords*:** CCl_4, *Cynara scolymus* L., hepatoprotection, broilers

INTRODUCTION
Artichoke *(Cynara scolymus* L.*)* is a member of the Compositae (daisy) family, native to the Mediterranean area. Artichoke extract has been used since ancient times as a remedy for indigestion and liver problems. The major bioactive components of artichoke leaves are cynarin, flavonoids, phenolic acids, and caffeic acid (Wang et al., 2003; Joy and Haber, 2007). The hypolipidemic properties of artichoke have been known about for many years (Wojcicki et al., 1981). The hypolipidemic properties in artichoke have been attributed to flavonoids, chlorogenic acid and cynarin (caffeoylquinic acid derivative), the