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THE EFFECT OF PLANT EXTRACT ON BIOCHEMICAL CHANGES IN THE BLOOD PLASMA OF HEPATITIS MODEL RATS

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Abstract: This experimental study evaluated the hepatoprotective properties of aqueous and alcoholic extracts prepared from cabbage leaves (Brassica L.) in a model of hepatitis induced by carbon tetrachloride (CCl_4). During the study, the levels of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), albumin in blood plasma, and malondialdehyde (MDA) in liver homogenate were measured. The results demonstrated the effectiveness of cabbage leaf extracts in reducing liver damage and enhancing antioxidant protection.
Keywords: *Brassica L.*, hepatoprotection, carbon tetrachloride, antioxidant, ALT, AST, MDA

Introduction. Hepatitis is a disease characterized by inflammation of liver tissue and can be caused by viruses, toxic substances (such as carbon tetrachloride), pharmaceutical agents, or autoimmune factors. Toxic forms of hepatitis are studied using experimental models to evaluate the efficacy of novel protective agents. Carbon tetrachloride (CCl_4) is widely used for modeling

toxic hepatitis, as it enhances lipid peroxidation by generating free radicals in liver cells and causes damage to cellular membranes [7].

In recent years, plant-based preparations have attracted significant interest as hepatoprotective agents. The cabbage plant (Brassica L.), belonging to the Brassica genus, contains bioactive compounds with antioxidant, anti-inflammatory, and cytoprotective properties [1, 2].

Materials and Methods

The experimental animals were divided into five groups:

1. Healthy Control (HC) – no substances were administered.
2. Hepatitis Model (HM) – only CCl_4 was administered.
3. HM + Aqueous Extract – hepatitis model + aqueous extract of cabbage leaves (30 mg/kg, orally).
4. HM + Alcoholic Extract – hepatitis model + alcoholic extract of cabbage leaves (30 mg/kg, orally).
5. HM + Karsil – hepatitis model + standard hepatoprotector Karsil (30 mg/kg, orally) [5].

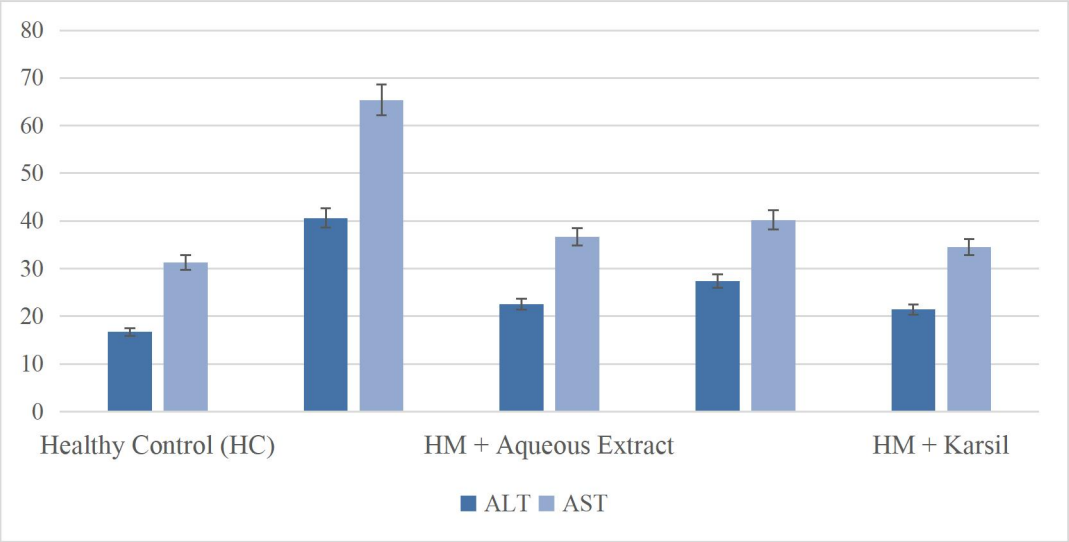
Biochemical analysis. After a 10-day experiment, the levels of ALT (alanine aminotransferase) and AST (aspartate aminotransferase) were evaluated in the blood samples of the animals [6].

Results

ALT and AST enzymes are key intracellular liver enzymes, and their elevation in plasma indicates damage to hepatic parenchymal cells. ALT, in particular, has high specificity for liver tissue. In healthy rats, the ALT and AST levels remained within physiological limits, measuring 16.7 and 31.3 U/L, respectively. This indicates intact liver cell membranes and good functional status. In the model group administered carbon tetrachloride (CCl_4), ALT and AST levels were significantly elevated (ALT – 40.6; AST – 65.4 U/L), suggesting that CCl_4 damaged hepatocyte membranes, leading to the leakage of these enzymes into the bloodstream. This increase is associated with enhanced lipid peroxidation and hepatocellular necrosis caused by CCl_4. Similar findings were reported by Ilbey et al. (2019), who observed a 2–3-fold increase in ALT and AST levels in CCl_4-treated rats [3].

In rats treated with the aqueous plant extract, ALT and AST levels decreased compared to the hepatitis model group (ALT – 22.5; AST – 36.7 U/L), indicating a partial hepatoprotective effect of the extract. Polyphenols and flavonoids present in the plant may have mitigated liver damage by neutralizing free radicals. In the group receiving the alcoholic extract, ALT and AST levels were 27.4 and 40.2 U/L, respectively, which suggests the aqueous extract was relatively more effective. This may be due to more efficient extraction of bioactive compounds in water. Glucosinolates and flavonoids are particularly more extractable in aqueous media. Kwon et al. (2014) demonstrated the hepatoprotective effect of cabbage extract against CCl_4-induced liver injury and confirmed its efficacy in reducing enzyme levels [4].

In the group treated with the standard hepatoprotector Karsil, ALT and AST levels were the lowest (ALT – 21.4; AST – 34.5 U/L), reaffirming the drug's high efficacy. However, the fact that the aqueous extract showed comparable results indicates that cabbage extract may have potential as a hepatoprotective agent. The dynamics of ALT and AST enzymes confirm that the CCl_4-induced liver injury model was successfully established.



The activity levels of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) enzymes in rat blood serum (M±m, n=5)

The aqueous extract of cabbage (Brassica L.), in particular, demonstrated hepatoprotective properties by restoring the levels of liver enzymes to values close to those in the control group. These findings suggest that cabbage extract may be a potential protective agent in the treatment of hepatitis.

Conclusion. Experimental studies have demonstrated that both aqueous and alcoholic extracts of cabbage (Brassica L.) leaves have a positive effect on liver function in a hepatitis model. In rats with induced hepatitis, levels of ALT (40.6 U/L) and AST (65.4 U/L) were significantly elevated compared to healthy animals, indicating serious hepatic dysfunction. The administration of cabbage extracts significantly normalized these biochemical indicators, supporting their potential as effective hepatoprotective agents.

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