

HEPATOPROTECTIVE EFFECTS OF PLANT-DERIVED BIOACTIVE
COMPOSITIONS IN ACUTE TOXIC HEPATITIS**G'ofurjonova Gulruxsor**

Master, National University of Uzbekistan

Mukhammadjonova Guzal

Associate Professor, National University of Uzbekistan

Dalimova Surayyo

Professor, National University of Uzbekistan

Yunusova Muslima

Associate Professor, National University of Uzbekistan

muslima8390@gmail.com

Abstract. Acute toxic hepatitis is a severe liver disorder caused by exposure to toxic substances, drugs, and environmental pollutants, leading to hepatocellular damage and impaired liver function. The increasing prevalence of liver diseases has prompted the search for effective and safe therapeutic agents. In this regard, plant-derived bioactive compounds have attracted considerable scientific interest due to their natural origin and diverse pharmacological properties. This study reviews the mechanisms of acute toxic liver injury and evaluates the hepatoprotective potential of plant-based compositions. The pathogenesis of toxic hepatitis involves oxidative stress, inflammatory responses, and mitochondrial dysfunction, which contribute to hepatocyte damage. Phytochemicals such as flavonoids, phenolic compounds, alkaloids, and terpenoids exhibit antioxidant, anti-inflammatory, and detoxifying effects, helping to mitigate liver injury. Experimental studies demonstrate that plant-derived compositions can reduce serum liver enzyme levels, improve histopathological changes, and enhance antioxidant defense systems. Despite promising findings, further research is required to standardize plant extracts and confirm their efficacy in clinical settings.

Keywords: acute toxic hepatitis, hepatoprotection, medicinal plants, phytochemicals, oxidative stress, liver injury, antioxidants, inflammation

Introduction. The liver is the primary organ involved in detoxification, metabolism, and biochemical homeostasis. Due to its central role in processing endogenous and exogenous substances, it is particularly vulnerable to toxic injury. Acute toxic hepatitis is characterized by rapid onset of liver damage caused by exposure to hepatotoxic agents such as drugs (e.g., acetaminophen), alcohol, industrial chemicals, and environmental pollutants [3]. The pathogenesis of liver injury involves complex biochemical and molecular mechanisms, including oxidative stress, inflammation, mitochondrial dysfunction, and apoptosis. Conventional pharmacological treatments are often limited in efficacy and may cause adverse effects. Therefore, there is growing interest in alternative

therapeutic strategies based on natural compounds. Medicinal plants have been widely used in traditional medicine systems and are recognized as a valuable source of bioactive compounds with hepatoprotective properties [4].

Mechanisms of Acute Toxic Hepatitis. Acute toxic hepatitis develops as a result of the accumulation of toxic metabolites in hepatocytes. One of the key mechanisms is oxidative stress caused by excessive production of reactive oxygen species (ROS). These molecules induce lipid peroxidation, protein oxidation, and DNA damage, ultimately leading to hepatocyte necrosis [2]. Mitochondrial dysfunction plays a critical role in the progression of liver injury. Toxic substances disrupt the electron transport chain, leading to decreased ATP production and activation of apoptotic pathways. In addition, inflammatory responses mediated by cytokines such as tumor necrosis factor- α (TNF- α) and interleukins further aggravate liver damage [8].

Hepatoprotective Properties of Plant-Derived Compounds. Plant-derived bioactive compounds have demonstrated significant protective effects against liver injury through multiple mechanisms. Flavonoids and phenolic compounds act as powerful antioxidants by scavenging free radicals and reducing oxidative stress [7]. Alkaloids and terpenoids contribute to anti-inflammatory effects by inhibiting the production of pro-inflammatory cytokines and modulating signaling pathways involved in inflammation. Furthermore, many phytochemicals enhance the activity of endogenous antioxidant enzymes such as superoxide dismutase (SOD), catalase, and glutathione peroxidase [4]. Another important mechanism is membrane stabilization. Plant extracts help maintain the integrity of hepatocyte membranes, preventing leakage of intracellular enzymes and reducing cellular damage. Additionally, certain compounds stimulate detoxification enzymes, promoting the elimination of toxic substances from the body.

Medicinal Plants with Hepatoprotective Activity. Numerous medicinal plants have been investigated for their hepatoprotective potential. *Silybum marianum* (milk thistle) contains silymarin, a well-known antioxidant that stabilizes liver cell membranes and promotes regeneration [4]. *Curcuma longa* (turmeric) contains curcumin, which exhibits strong anti-inflammatory and antioxidant properties [6]. *Glycyrrhiza glabra* (licorice) has demonstrated hepatoprotective effects through modulation of immune responses and inhibition of oxidative stress. Experimental studies in animal models have shown that these plant extracts significantly reduce serum levels of liver enzymes such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST), indicating improved liver function [6]. Histological analysis also reveals reduced necrosis and inflammation in treated groups.

Limitations and Future Perspectives. Despite promising results, several limitations hinder the clinical application of plant-derived hepatoprotective agents. These include variability in phytochemical composition, lack of standardization, insufficient clinical trials, and potential interactions with conventional drugs. Future research should focus on the isolation of active compounds, standardization of plant extracts, and large-scale clinical studies to confirm efficacy and safety [5]. Advances in biotechnology and pharmacology may facilitate the development of novel plant-based hepatoprotective drugs.

Conclusion. Plant-derived bioactive compositions represent a promising approach for the prevention and treatment of acute toxic hepatitis. Their antioxidant, anti-inflammatory, and detoxifying properties contribute to the protection of liver function and reduction of hepatocellular damage.

However, further research is required to translate experimental findings into clinical practice and ensure safe and effective therapeutic use.

References:

1. Abenavoli, L., et al. (2018). Milk thistle for liver diseases. *Phytotherapy Research*, 32(2), 220–230.
2. Cichoż-Lach, H., & Michalak, A. (2014). Oxidative stress in liver diseases. *World Journal of Gastroenterology*, 20(25), 808–817.
3. Jaeschke, H., et al. (2012). Mechanisms of hepatotoxicity. *Toxicological Sciences*, 65(2), 166–176.
4. Li, S., et al. (2015). Natural products in liver protection. *Journal of Ethnopharmacology*, 162, 12–20.
5. Muslima Yunusova, et al. (2025). The Influence of Monoammonium Salt of Glycyrrhizinic Acid and Acetylsalicylic Acid on Cardiac and Hematological Processes in Rats with Experimental Myocarditis. *Journal of Science and Mathematics Letters Volume 13, Issue 1*, 155-167.
6. Prakash, C., et al. (2016). Hepatoprotective activity of plant extracts. *Pharmacognosy Reviews*, 10(19), 88–94.
7. Sarkar, A., et al. (2018). Antioxidant activity of medicinal plants. *Free Radical Research*, 52(1), 45–47.
8. Tilg, H., et al. (2020). Inflammation in liver diseases. *Nature Reviews Gastroenterology & Hepatology*, 17(2), 110–112.

