SYNTHESIS AND BIOLOGICAL ACTIVITY OF IMINO DERIVATIVES BASED ON CINNAMALDEHYDE

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Introduction. In recent years, in-depth investigation of naturally occurring compounds and the development of new biologically active substances based on them have become one of the leading directions of scientific research. In particular, cinnamaldehyde (CA), belonging to the phenylpropanoid class, is distinguished by its high biological activity. It possesses antibacterial, antifungal, antioxidant, and anti-inflammatory properties and is widely studied as a promising starting compound.

Relevance. The increasing prevalence of liver diseases and the insufficient effectiveness of existing hepatoprotective agents necessitate the search for new compounds with low toxicity and high efficacy. Imino derivatives (Schiff bases) formed by the condensation of cinnamaldehyde with aromatic and heterocyclic amines are considered important due to their potential wide range of biological activities. At the same time, evaluation of the acute toxicity of newly synthesized compounds is an essential step for their practical application.

Research Objective. To synthesize imino derivatives based on cinnamaldehyde,

determine their chemical structures, and investigate their acute toxicity and hepatoprotective activity.

Research Methods. Condensation reactions of cinnamaldehyde (CA) with certain aromatic (4-amino-m-cresol) and heterocyclic (4-amino-4H-1,2,4-triazole) amines were carried out in ethanol medium at the boiling temperature of the solvent (78–80°C). The progress of the reaction was monitored by thin-layer chromatography (TLC). After completion of the reaction, the solvent was removed using a rotary evaporator, and the resulting product was purified by washing with hexane. The obtained compounds were dried at room temperature under vacuum.

The IR spectral analysis of the synthesized Schiff bases demonstrated the vibration frequencies of several important functional groups confirming their structures. One of the most significant features was the intense absorption band observed at 1621 cm^{-1}, corresponding to the stretching vibrations of the azomethine group (–C=N–), which confirmed the formation of Schiff bases. At the same time, the disappearance of the characteristic carbonyl group (C=O, usually around 1670–1680 cm^{-1}) absorption band of the initial cinnamaldehyde indicated the completion of the reaction. According to mass spectrometric analysis, m/z values corresponding to the Schiff bases of cinnamaldehyde were recorded. UV spectroscopy results additionally confirmed the structures of the synthesized Schiff bases. The absorption bands observed in the range of 200–280 nm corresponded to $\pi \rightarrow \pi^*$ electronic transitions in aromatic rings. Furthermore, relatively weaker but significant absorption maxima recorded in the range of 300–350 nm were attributed to $n \rightarrow \pi^*$ electronic transitions of the azomethine group (–C=N–) and the conjugated system. The obtained compounds were purified, and their chemical structures were confirmed by IR, UV spectroscopy, and mass spectrometry methods.

Biological Activity. Acute toxicity studies of the synthesized compounds on laboratory animals showed that oral administration at a dose of 2000 mg/kg caused no mortality in mice (Class V – "practically non-toxic" substances). The observed changes were short-term and reversible in nature. Under CCl_4-induced experimental conditions, the synthesized compounds demonstrated optimal and promising hepatoprotective activity, indicating their ability to protect liver cells.

Conclusion. As a result of the study, new imino derivatives based on cinnamaldehyde were synthesized, and their structures were confirmed using modern physicochemical methods. The obtained compounds exhibited low toxicity and significant hepatoprotective activity. These results suggest that cinnamaldehyde-based Schiff bases can be considered promising biologically active compounds.