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Antioxidant activity of compositions based on aminopyrazole derivatives of naphthoquinone and biosurfactants

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Today it is well known that there is an interrelation between free radical oxidation and the development of many important diseases such as atherosclerosis, hypertension, Alzheimer's disease, Parkinson's disease, cancer, arthritis, neurodegenerative disorders, diabetes, etc. Antioxidants are able to inhibit the development of free-radical reactions, preventing the formation of peroxides, which damage the cellular and subcellitic membranes,

which is essential for the development of the body, the normal functioning of the nervous and muscular systems. That is why an important task of scientists is to find new antioxidants that could increase resistance of human organism to active forms of acid and nitrogen and prevent oxidative stress processes.

For this purpose, we investigated antioxidant activity of new composite preparations based on aminopyrazole-containing naphthoquinone derivatives and rhamnolipid biosurfactant. The related 1,4-naphthoquinones play an important biologic role in the human body due to their redox properties, which makes them interesting for the search of new pharmaceuticals. Rhamnolipides are synthesized by *Pseudomonas* and are the most abundant among biogenic surface-active reagents of microbial origin. The main purpose of the simultaneous use of synthetic naphthoquinone and biosurfactants of microbial origin is to reduce therapeutic drug dosage, increase cell membrane penetration and enhance the action of aminopyrazole-based naphthoquinones.

Intensity of processes of lipid peroxidation (LPO) and oxidative modification of proteins (OMP) was investigated. For investigation of the influence of aminopirazol-containing naphthoquinones and their compositions on lipid peroxidation processes (LPO) and oxidative modification of protein (OMP) their alcoholic solutions (ethanol:water, 1:3) in concentration 10^{-6} M were used. The investigation was carried out on the homogenate of pikefish liver. Two indicators of oxidative stress were measured in one sample. The amount of secondary products of lipoperoxidation (TBA-active products) was determined by reaction of malondialdehyde (MDA) with thiobarbituric acid (TBA) in the selected samples. The principle of the method is based on the activation of LPO by divalent ferric ions to the level that can be detected spectrophotometrically. At high temperatures in the acidic environment MDA reacts with TBC, forming colored trimethine complex with maximum absorption at 532 nm. The amount of protein in the samples was determined by the Laurie method. The level of OMP was determined by the amount of formed additional carbonyl groups (CG) in amino acid chains, the amount of which was determined in the reaction with 2,4-dinitrophenylhydrazine.

The results of the study showed that antioxidant activity in LPO processes is exhibited by all the studied spores, since their action led to a decrease in the amount of TBA-active products: by 30±35%. The composite preparation was revealed to decrease the content of secondary lipoperoxidation products by 50%, and additional protein-carbonyl groups by 40%. The effect of rhamnolipid on the permeability of cell membranes and on solubilization of substances is proved by the increase of antioxidant activity of the com-

positions in comparison with aminopyrazol derivatives of 1,4-naphthoquinone. A study with the well-known antioxidant quercetin was carried out in which the rhamnolipid complex exhibited analogous antioxidant activity in OMP processes.

Therefore, the conducted studies of antioxidant activity of aminopyrazole formulations of naphthoquinone-biosurfactant indicate the further prospective of creation of new preparations that would be efficient and ecologically safe for use in modern technologies.