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SYNERGISTIC ACTION ON MICROORGANISMS OF THE MIXTURE OF *RHODOCOCCUS ERYTHROPOLIS* IMV AC-5017 SURFACTANTS WITH OTHER COMPOUNDS

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Relevance. Nowadays antibiotic therapy remains the main method of treatment of a wide range of infectious diseases in humans and animals. However, its effectiveness is rapidly declining against the background of the rapid spread of resistant forms of microorganisms. Back in 2016, the World Health Organization published a list of priority areas for improving the effectiveness of antibiotics, including the possibility of their use in combination with other natural compounds. Among such substances of natural origin, the most promising are essential oils, which due to the presence in their composition of a large number of terpenes and aromatic compounds are characterized by antibacterial and antifungal activity. However, the use of essential oils as antimicrobial monopreparations is limited by the high values of their minimum inhibitory concentrations (500-1600 μg / ml) relative to most bacterial and yeast test cultures. Additionally, promising natural compounds that can be used in combination with antibiotics are microbial surfactants (surfactants). Previously was established the possibility of synthesis surfactants Rhodococcus erythropolis IMV Ac-5017 on hydrophilic (glucose, ethanol), hydrophobic (liquid paraffins, hexadecane) substrates. Later it was shown that the surfactant R. erythropolis IMV Ac-5017 has antimicrobial and antiadhesive activity.

The aim: to investigate the antimicrobial activity of a mixture of surfactants Rhodococcus erythropolis IMV Ac-5017 with antibiotics and tea tree essential oil.

Materials and methods. *R. erythropolis* IMV Ac-5017 were grown in a liquid nutrient medium. As a carbon source were used biodiesel waste and spent sunflower oil at a concentration of 6 and 2% (v/v), respectively. The amount of synthesized extracellular surfactants (g/l) was determined by weighting method after extraction from a supernatant of culture fluid with a modified Folch mixture. The antimicrobial activity of antibiotics, essential oil, surfactants and their mixtures was analyzed by index of the minimum inhibitory concentration (MIC). To assess the synergistic effect of surfactants with antibiotics and essential oil is used fractional inhibitory concentration (FIC) - the sum of the ratio of the concentration of each substance in the mixture to their minimum inhibitory concentration.

Results. It was found, in spite of the nature of the substrate used, surfactants of *R. erythropolis* IMB Ac-5017 showed synergism of antimicrobial action with both studied antibiotics. For example, MIC surfactants synthesized on biodiesel production waste against *Escherichia coli* IEM-1 and *Pseudomonas sp.* MI-2 was 3.2 and 6.8 μg/ml, ciprofloxacin was 500 μg/ml, and mixtures were 7.8 and 15.6 μg / ml, respectively. The use of surfactants synthesized on spent sunflower oil in combination with this antibiotic allowed to reduce the MIC against *E. coli* IEM-1, *Pseudomonas sp* MI-2 and *Staphylococcus aureus* BMS-1 from 500 and 2000 μg/ml to 3.4 and 1.7 μg/ml, respectively. Similar patterns were observed in case of using a compex of strain IMV Ac-5071 surfactant and ofloxacin. In this exsample, the value of the MIC of the antibiotic against to the studied bacterial test cultures was reduced by 8-16 times.Experimentally was determined, that surfactants synthesized by *R. erythropolis* IMB Ac-5017 on industrial waste, is developed a synergism of antimicrobial activity with the tea tree essential oil. For example, using of a mixture of surfactants from biodiesel waste and essential oil has reduced the MIC of relative to *E. coli* IEM-1 from 625 μg/ml to 2.4 μg/ml. The value of the fractional inhibitory concentration did not exceed 0.5, which indicates their synergism

Conclusions. Our results confirm the data on the synergism of the antimicrobial activity of surfactants of microbial origin with antibiotics and essential oils.