BIOCIDAL POTENTIAL OF YEASTS FROM PASTURE ENVIRONMENTS AGAINST OTHER YEASTS AND BACTERIA

Deividas Paliovkinas[1,2], Živilė Strazdaitė-Žielienė[1], Elena Servienė[1,2]

[1]State Scientific Research Institute Nature Research Centre, Vilnius, Lithuania
[2]Vilnius Tech, Faculty of Fundamental Sciences, Vilnius, Lithuania
deividaspaliovkinas@gmail.com

Microorganisms engage in intense competition within natural environments, leading many bacteria and yeasts to produce biocidal compounds that inhibit the growth of neighboring organisms. These naturally occurring antimicrobial agents are receiving increasing attention as potential alternatives to conventional antimicrobials, particularly in the context of rising resistance and the demand for environmentally sustainable biocontrol strategies. This study aimed to isolate microorganisms from environmental samples and evaluate their biocidal activity against selected microbial targets, followed by morphological and molecular identification of active strains. The study further sought to characterize the spectrum and potential genetic basis of the observed biocidal effects, with a particular focus on yeast-derived antimicrobial activity against both yeast and bacteria.

Water, feed, and soil samples were collected from pasture environments across Lithuania, and yeast isolates were obtained using standard cultivation techniques. Isolates were characterized morphologically and identified molecularly through PCR, RFLP, and PCR fragment sequencing. The biocidal activity of yeast strains was assessed on methylene blue agar at pH 4.0, 4.8, and 5.6 by embedding potentially sensitive yeasts from environmental samples or laboratory bacterial strains into the medium, followed by applying the putative biocidal yeast biomass onto the surface. Biocidal effects were evaluated based on the formation of growth inhibition zones. A total of 25 yeast strains were isolated, with the highest diversity observed in feed samples (16 isolates), followed by soil (6) and water (3). The predominant genera of isolated yeasts were *Wickerhamomyces* (36%) and *Debaryomyces* (20%). Twelve yeast strains exhibited biocidal activity, inhibiting the growth of 13 yeast strains and 3 laboratory bacterial strains. Biocidal yeast isolates belonged to the genera *Wickerhamomyces*, *Debaryomyces* and *Barnettozyma*. The strongest biocidal activity against yeasts was observed at pH 4.8, while activity against bacteria was highest at pH 5.6.

These findings indicate that pasture yeasts represent a promising source of pH-dependent biocidal activity against both yeasts and bacteria. Further characterization of the active compounds and their genetic determinants may facilitate the development of environmentally friendly antimicrobial or biocontrol applications.