

THE EFFECT OF MULTIFOLD LYOPHILIZATION ON THE PROBIOTIC PROPERTIES OF LACTOBACILLUS

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Summary. In order to improve physiological properties of domestic animals forage supplements – probiotic preparations, containing microorganisms, which obtain probiotic activity, are often applied. The most common application of probiotic preparations is in lyophilized form, where strains exist in the state of anabiosis. The effect of multifold lyophilization on the properties of *Lactobacillus plantarum* U-14 and *Lactobacillus fermentum* U-5 was investigated. The following properties were studied: antagonistic activity (against *Salmonella enteritidis*, *Staphylococcus aureus*, *Escherichia coli*, *Enterococcus faecalis*, *Candida albicans*, *Proteus mirabilis* and *Pseudomonas aeruginosa*), the activity of acid production (for the 6 day period), lysozymic activity, resistance to antibiotics (erythromycin, linkomycin, gentamycin, neomycin, kanamycin, vancomycin, colistin, oxytetracycline, imipenem, ampicillin, nitrofurantoin), resistance to NaCl (2, 4 and 6%), bile (20, 30 and 40%), alkaline medium (pH 8.3), phenol (0.4%), long lasting temperature effect (60°C 30, 60 and 90 min.).

It can be concluded that lyophilization of *L. plantarum* caused higher resistance to phenol, alkaline medium, NaCl 6% concentration, increased antagonistic activity against *S. enteritidis* ($p < 0.05$), and decreased against – *E. faecalis* ($p < 0.001$). Antagonistic activity of *L. plantarum* against other microorganisms remained unchanged ($p > 0.05$). Lyophilization of *L. plantarum* has no effect on the intensity of acid production, resistance to 20, 30 and 40% bile, to studied antibiotics but it is not resistant to long lasting temperature effect.

After lyophilization *L. fermentum* sustain lysozymic activity, resistance to 20, 30 and 40% bile, 2 and 4% NaCl, all antibiotics, it has no resistance to 0.4% phenol, alkaline medium and long lasting temperature effect. Lyophilization also cause weaker antagonistic properties to all studied cultures, but we failed to determine any statistical reliability ($p > 0.05$). During first days after lyophilization the intensity of acid production fluctuated at the same ranges, but on the 5th–6th days acid production decreased in 29.7% ($p < 0.05$).

The changes of properties in studied *Lactobacillus* strains occurred after the first lyophilization, between the following lyophilizations considerable changes were not determined. These changes in properties were not very significant, so it can be concluded that *Lactobacilli* strains are applicable for normalization of the physiological functions in digestive system not only in liquid but in lyophilised form as well.

Keywords: *L. fermentum*, *L. plantarum*, lyophilization, antagonistic activity, lysozymic activity, antibiotics, NaCl, bile, alkaline medium, phenol.