Abstract

Competition is a very important natural phenomenon, which causes the rivalry of organisms, in cases such as space limitation or lack of nutrients. It occurs mainly in situations where organisms, including microorganisms live in large populations. Multicellular yeast colonies represent an example of such a population. After the population of yeast cells spends nutrients from the environment, the cells in colonies are able to respond to these changes by production of ammonia functioning as a signaling molecule. Subsequently, the cells are able to change their morphology and metabolism and, dependently on their location within the colony, to create a subpopulation of cells with specific characteristics and functions.

It is likely that in the case of mixed colonies formed by the two different strains, a competition between the cells of these two strains could exist. Such rivalry can result in changes in the ratio of cells of the two strains within the colony population, so that the cells of one strain outweigh the other.

In this diploma thesis, I compared the growth and development of giant colonies and competition between the cells of selected pairs of strains forming mixed colonies. I focused on the parental strain *Saccharomyces cerevisiae* BY and its variants labeled with fluorescent proteins. For the study of competition between the parental strain and the strain deficient in Sok2p transcription factor (i.e., the factor that significantly influences the development and differentiation of colonies), new strains sok2Δ were prepared by *SOK2* gene deletion in labeled parental strains. As markers distinguishing two strains forming a mixed colony, I used different sensitivity of these strains to antibiotics kanamycin and nourseothricin. I confirmed that the inability of cells to synthesize Sok2p is a disadvantage for these cells when forming mixed giant colonies together with the parental strain producing Sok2p. As supposed, when mixed colony consisted of the two isogenic labeled variants of the parental strain, no competition occurred. Some of the results showed that competition of cells within populations can be affected by inhomogeneity of cell strains in stocks.

Key words: *Saccharomyces cerevisiae*, a yeast colony, ammonia signaling, cell differentiation and competition in the colony, growth, fluorescent protein, antibiotic resistance