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MUTAGENESIS AND SELECTION STRATEGIES OF SCO AND CAROTENOID PRODUCING MICROORGANISMS

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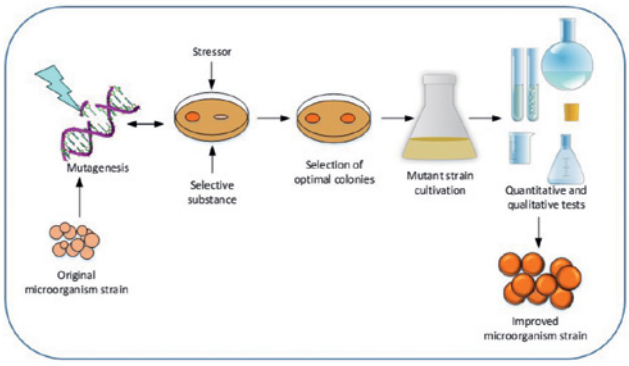
Abstract – Biotechnologies of microorganisms for producing various industrially important products, such as single-cell oil (SCO), single-cell protein (SCP), carotenoid, enzymes, etc., have been studied since the last century and are of current actuality to the present day. The SCO and carotenoids are an alternative to oil of plant and animal origin and to pigment of plant and synthetic origin, respectively. These cellular components of microorganisms can be used in the food, aquaculture and livestock feed, pharmaceutical, and cosmetic industries. However, microorganisms-based technologies have not found ubiquitous practice due to a number of limitations. One of them is the threshold of the oil and carotenoids content in the biomass of microorganisms due to their nature. Therefore, the development of the fast-growing strains with a high level of these product accumulation is required. Random mutagenesis, adaptive laboratory evolution (ALE), and genetic engineering are used for strain improvement. This paper reviews random mutagenesis as a simple, cost-effective tool for improving single-cell oil and carotenoid synthesis in microorganisms, followed by the selecting of mutants with preferable characteristics. Nevertheless, it should be considered that random mutagenesis accelerates naturally occurring nonspecific mutations by exposure to a physical or chemical mutagenic agent. Despite the result of a large variety of created mutants, the characteristics of the mutants can be unstable and reversible. Therefore, different cultivation strategies for developing traits of interest and testing their persistence are reviewed in this study. Choosing effective mutagenesis techniques, screening, and selection methods is essential for creating suitable mutant strains. Various strengths and drawbacks of such tools are discussed in this review, and the main directions for further development are highlighted.

Keywords – Antimycin A; carotenogenesis; cerulenin; diphenylamine; fatty acid inhibitors; isoniazid; mutagenesis; mutant; single-cell oil; triclosan; β-ionone



Creation of mutant strains with preferable properties.