

improvement, which may require unique harvesting and treatment procedures, compared to regular plants.

Undoubtedly, white biotechnology will transform into an essential technology model for sustainable growth of exploiting renewable materials. Withal, the effectiveness of the methods for the manufacturing of the various chemicals is necessary to be improved. Withal, several white biotechnology drivers are distinctly associated with the global challenges of energy security, climate change, and the financial crisis, hitherto, there are still several barriers to its growth and best uptake across industry sectors [2]. In this article, we intend to discuss the challenges and prospects of white biotechnology application.

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BIOVALORIZATION OF INDUSTRIAL WASTES AND BYPRODUCTS INTO ASTAXANTHIN VIA YEAST FERMENTATION*

Keywords: carotenoid, optimization, xanthophyll, *X. dendrorhous*, yeast.

Over the years, the burgeoning world population coupled with massive industrialization has resulted the generation and accumulation of an alarming amount of organic wastes. The disposal of these waste is of huge environmental concern and thus, development of sustainable, environmentally sound and cost-efficient strategies to deal with such wastes is an area of increasing importance in our society today [1, 2]. At present, most of these wastes are either incinerated, dumped on landfills or used in composting. These methods are, however, ecologically destructive as they result in the

generation of toxic methane gas and bad odor, high energy consumption and slow reaction kinetics. Moreover, no valuable product is generated from these processes [2]. Bioconversion of waste/byproducts with microorganisms is a greener and sustainable alternative. In this regard, there is a rising interest in valorization of these wastes into value-added products such as astaxanthin. Astaxanthin is a renowned carotenoid antioxidant with huge industrial and economic value. One of the most promising natural sources of commercial astaxanthin is *Phaffia rhodozyma*. This yeast is able to utilize different carbon substrates including agro-food industrial wastes and as such it offers an opportunity to minimize environmental problems related to the disposal of these wastes while concomitantly reducing the production cost of natural astaxanthin.

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CURRENT STATE AND FUTURE PROSPECTS OF BIOTECHNOLOGY IN RUSSIAN FEDERATION*

Keywords: biotechnology, biotechnology market, trend, innovation.

According to Russian national standard GOST R 57095 [1], biotechnology is «the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services». This industry is a mixture of modern knowledge from genetics, molecular biology, biochemistry, microbiology, bioinformatics and its practical applications for creating innovative products.