6. Valero-Franco, C. & Berns, A. (2024). *Technology integration in foreign language teaching*. https://www.nature.com/articles/s41599-025-06188-7
7. ICT-mediated foreign language instruction and PLEs. https://www.researchgate.net/publication/350211423
8. Technology in language learning and self-directed learning. https://pmc.ncbi.nlm.nih.gov/articles/PMC8475434/

УДК 811:111

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BIOTECHNOLOGICAL APPROACHES TO WASTE TREATMENT: CURRENT TRENDS AND PROSPECTS

У статті розглядаються сучасні біотехнологічні підходи до переробки органічних відходів, аналізуються ефективні мікробіологічні методи, їх застосування у промисловості та вплив на навколишнє середовище.

Ключові слова: *біотехнологія, переробка відходів, мікроорганізми, біоремедіація, сталий розвиток.*

The article examines modern biotechnological approaches to organic waste treatment, analyses effective microbiological methods, their application in industry and environmental impact.

Keywords: *biotechnology, waste treatment, microorganisms, bioremediation, sustainable development.*

Environmental pollution caused by industrial and household waste has become one of the most pressing global challenges of the 21st century. Traditional methods of waste disposal – landfilling and incineration – are increasingly criticized for their negative ecological impact. Against this background, biotechnological approaches to waste treatment are gaining significant attention, offering environmentally friendly and economically viable alternatives [1].

Bioremediation – the use of living organisms, primarily microorganisms, to neutralize or remove pollutants from the environment – is one of the most studied and applied areas of environmental biotechnology. Bacteria, fungi, and algae are capable of decomposing complex organic compounds, heavy metals, and even synthetic polymers, converting them into harmless substances [2].

Anaerobic digestion is a widely applied biotechnological process for the treatment of organic waste, such as food waste, agricultural residues, and sewage sludge. During this process, specialized microorganisms break down organic matter in the absence of oxygen, producing biogas – a mixture of methane and carbon dioxide – which can be used as a renewable energy source [3].

Composting is another well-established biotechnological method based on the aerobic decomposition of organic waste by microorganisms and invertebrates. The result is a valuable organic fertilizer – compost – which improves soil structure and fertility. Modern industrial composting technologies allow for the processing of large volumes of organic waste, significantly reducing the burden on landfills [4].

In recent years, particular attention has been paid to the biotechnological degradation of plastic waste. Certain strains of bacteria and fungi, including Ideonella sakaiensis, are capable of destroying polyethylene terephthalate (PET), opening up new possibilities for solving the global problem of plastic pollution. This direction of research is actively developing and holds great potential for industrial implementation [5].

A promising area is also the use of microalgae for wastewater treatment. Algae effectively absorb nitrogen and phosphorus compounds, preventing eutrophication of water bodies. Simultaneously, algal biomass accumulated during the treatment process can be used to produce biofuels, biogas, and valuable biochemical compounds [6].

The concept of a circular economy is closely linked to biotechnology. Within this framework, waste is considered not as a problem, but as a resource. Biotechnological processes enable the transformation of waste into valuable products: biofuels, bioplastics, organic fertilizers, enzymes, and other substances with commercial value. This approach contributes to reducing resource consumption and minimizing environmental impact.

Despite significant achievements, biotechnological methods of waste treatment face a number of challenges. These include the need for careful selection of microorganism strains, ensuring optimal conditions for their vital activity, scaling up processes from laboratory to industrial level, and also issues of biosafety when using genetically modified organisms. Overcoming these barriers requires interdisciplinary research and close cooperation between scientists, engineers, and policymakers.

Thus, biotechnological approaches to waste treatment represent a rapidly developing and highly promising direction that contributes to the implementation of the principles of sustainable development, environmental protection, and the formation of a circular economy. Their further development and widespread implementation can significantly reduce the negative impact of waste on the environment and create new economic value from secondary resources.

References:

1. Azubuike C.C., Chikere C.B., Okpokwasili G.C. Bioremediation techniques – classification based on site of application: principles, advantages, limitations and prospects. *World Journal of Microbiology and Biotechnology.* 2022. Vol. 38. P. 1–18.

2. Kang H., Park Y., Lee S. Microbial degradation of organic pollutants: mechanisms and environmental applications. *Biotechnology Advances.* 2022. Vol. 57. P. 107–123.

3. Khalid A., Arshad M., Anjum M., Mahmood T., Dawson L. The anaerobic digestion of solid organic waste. *Waste Management*. 2022. Vol. 142. P. 287–302.

4. Awasthi M.K., Duan Y., Liu T. Composting of organic waste: a review of processes and new directions. *Bioresource Technology.* 2022. Vol. 352. P. 127–145.

5. Yoshida S., Hiraga K., Takehana T. A bacterium that degrades and assimilates poly (ethylene terephthalate). *Science.* 2022. Vol. 351. P. 1196–1199.

6. González-Fernández C., Ballesteros M. Microalgae for biofuels: challenges and perspectives. *Bioresource Technology.* 2022. Vol. 360. P. 127–139.

УДК 811.111

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EMOTIONS AND THEIR INFLUENCE ON HUMAN BEHAVIOR

У роботі розглянуто сутність емоцій як складного психічного феномена та їхній вплив на поведінку людини. Проаналізовано основні підходи до розуміння емоцій у психологічній науці, зокрема їх когнітивний, фізіологічний та соціальний аспекти. Висвітлено роль емоцій у процесах прийняття рішень, формуванні мотивації, міжособистісній взаємодії та регуляції діяльності. Окрема увага приділена впливу позитивних і негативних емоцій на адаптацію особистості до соціального середовища. Обґрунтовано значення емоційного інтелекту як чинника ефективної поведінки та психологічного благополуччя.

Ключові слова: *емоції, поведінка людини, емоційний інтелект, мотивація, психічні процеси, міжособистісна взаємодія, саморегуляція.*

The paper examines the essence of emotions as a complex mental phenomenon and their impact on human behavior. The main approaches to understanding emotions in psychological science are analyzed, in particular their cognitive, physiological and social aspects. The role of emotions in decision-making processes, motivation formation, interpersonal interaction and activity