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OPORABA OTPADA U UKLANJANJU NUTRIJENATA IZ OTPADNIH VODA

WASTE RECOVERY IN THE REMOVAL OF NUTRIENTS FROM WASTEWATER

Dijana Grgas[1], Nikola Karličić[2], Tea Štefanac[1], Tibela Landeka Dragičević[*1], Marko Obradović[2], Dušan Todorović[2]

[1]Sveučilište u Zagrebu, Prehrambeno-biotehnološki fakultet, Zagreb, Hrvatska,
[2]Univerzitet u Beogradu, Mašinski fakultet, Beograd

Biološko uklanjanje nutrijenata (N i P) iz otpadne vode je nužnost zbog eutrofikacije površinskih voda i sve strožih europskih direktiva. Biološko uklanjanje N i P provodi se procesima nitrifikacije, denitrifikacije i poboljšanim biološkim uklanjanjem fosfora (engl. Enhanced biological phosphorus removal, EBPR). Nitrifikacija je aeroban, autotrofan proces, a za procese denitrifikacije i EBPR nužno je osigurati izvor ugljika za učinkovito uklanjanje N i P iz otpadne vode.

Uobičajeno, kao izvori ugljika u tim procesima koriste se kemikalije poput acetata, glukoze i metanola, koji su učinkoviti, ali predstavljaju trošak na uređajima za biološku obradu otpadnih voda. Primjena alternativnih izvora ugljika može imati dvojaku korist: uklanjanje nutrijenata iz otpadne vode, i istovremeno zbrinjavanje-oporabu otpada/nusproizvoda.

Kao alternativni izvori ugljika mogu se koristiti razgradivi polimeri poput poly-β-hidroksibutirat (PHB) i poli(mliječna kiselina) (PLA), prirodni otpadni organski materijali poput kartonskih vlakana, ljuski voća, kore drveća, drvna sječka, pšenična slama, otpalo lišće, klipovi kukuruza, kukuruzovina i drugi materijali poput hidroliziranog mulja, tekućine iz otpada hrane, i drugi prerađeni organski materijali.

Vrsta izvora ugljika utječe na brzinu i učinkovitost uklanjanja hranjivih tvari, kao i na strukturu, raznolikost i brojnost mikrobne zajednice.

Ključne reči: *biološka obrada otpadnih voda; biološko uklanjanje nutrijenata; eutrofikacija površinskih voda; enhanced biological phosphorus removal (EBPR); izvori ugljenika*

Biological removal of nutrients (N and P) from wastewater is necessary due to eutrophication of water bodies and increasingly strict European directives. N and P removal is achieved by processes of nitrification, denitrification and enhanced biological phosphorus removal (EBPR).

Nitrification is an aerobic, autotrophic process, and for the processes of denitrification and EBPR it is necessary to provide a carbon source in order to achieve effective N and P removal. Chemicals such as acetate, glucose and methanol are commonly used as carbon sources in these processes. Such carbon sources are efficient, but represent a cost in the biological wastewater treatment plants.

* Corresponding author:
tibela.landeka.dragicevic@pbf.unizg.hr
https://orcid.org/0000-0001-6389-824X

Dijana Grgas: https://orcid.org/0000-0003-0687-6524
Nikola Karličić: https://orcid.org/0000-0002-5510-9500
Tea Štefanac: https://orcid.org/0000-0002-0491-469X
Marko Obradović: https://orcid.org/0000-0002-4467-5777
Dušan Todorović: https://orcid.org/0000-0003-3119-1324

The use of alternative carbon sources can have a dual benefit: removal of nutrients from wastewater, and simultaneous disposal-recovery of waste/by-products. As alternative carbon sources can be used degradable polymers such as poly-β-hydroxybutyrate (PHB) and poly (lactic acid) (PLA), natural waste organic materials such as cardboard fibers, fruit shells, tree bark, wood chips, wheat straw, leaf litter, corn cobs, corn stover, and other materials such as hydrolyzed sludge, liquids from food waste, and other reprocessed organic materials.

The type of carbon source affects the nutrient removal rate and efficiency, as well as microbial community structure, diversity, and number.

Key words: *wastewater biological treatment; biological removal of nutrients; surface waters eutrophication; enhanced biological phosphorus removal (EBPR); carbon sources*