

DENITRIFYING WOODCHIP BIOREACTORS FOR NUTRIENT REMOVAL IN AGRICULTURAL DRAINAGE

Arvydas Povilaitis

Vytautas Magnus University Agriculture Academy, Lithuania

Tile drainage helps to effectively remove excess water and increase crop yields. However, this practice serves as a direct transport pathway for contaminants from agricultural land to streams. When entering drains, water leaches nutrients (mostly inorganic forms of N and P), whose elevated inflows into surface waters lead to environmental degradation. Therefore, as an emerging technology, woodchip-denitrifying bioreactors have been proposed to intercept tile drainage flow for nutrient removal.

Two parallel experiments, each using three pilot-scale woodchip-denitrifying bioreactors, were conducted to test whether activated carbon (C) and flaxseed cake (both 10% v/v) and biochar (10% v/v and 20% v/v made of deciduous wood) additives, respectively, can enhance the removal of nitrate-nitrogen (NO₃-N) and phosphate-phosphorus (PO₄-P) from tile drainage water and reduce C losses from bioreactors. The obtained results indicated the ability to enhance NO₃-N removal by the addition of activated C and biochar. Moreover, activated C has proven to be an effective additive capable of substantially reducing C losses and supporting the lowest C/N (i.e., carbon loss to N removal) ratios. These experiments also revealed that woodchips, alone or amended with flaxseed cake or activated C, are a suitable media that can allow PO₄-P removal.