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HORIZONTAL SUBSURFACE FLOW PHYTOTREATMENT FOR DOMESTIC WASTEWATER TREATMENT: NITRIFICATION-DENITRIFICATION EFFICIENCY TESTED ON BERTALIA-UNIBO PILOT PLANT

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Abstract

Climate change and environmental crises have a very big impact on water cycle in terms of water availability. The scarcity of water impacts agricultural production, while its quality influences the safety of agricultural products and consequently public health. A sustainable way to supplement agricultural production and industrial water needs stands in the reuse of wastewater. Moreover, it is so necessary to develop smart, sustainable and efficient wastewater treatment technologies in terms of construction and management cost for small communities. Natural wastewater treatment systems represent a cost-effective treatment, already tested and implemented all around the world.
In this context, this study focuses on horizontal sub-surface flow phytotreatment systems implementation with the aim to understand the processes and features involved to optimize both design and technical management phases. This work is a continuation and extension of previous studies conducted by the authors and focuses on nitrification and denitrification processes.
To this aim, a pilot plant located on Bertalia-UNIBO campus in Bologna was monitored to evaluate the nitrification-denitrification efficiencies related to seasonal variation of Temperature, dissolved oxygen at different hydraulic retention time. The pilot plant was charged with a domestic wastewater and the emergent macrophytes were *Phragmites australis*. The tests show good nitrification efficiencies in summer (from 78% to 91%) at HRT more than 12 h and the resulting data were stable at 30h. Winter nitrification efficiencies are lower than summer (44%, 66%) at HRT more than 12 h. As expected, dissolved oxygen was greater in winter than summer. Denitrification efficiency were in the range 40% - 75%, increasing with HRT. Results also show that full scale implementations need HRT equal 30h in order to reach significant nitrification rates.

Key words: denitrification, nitrification, small plants, SFS-H phytotreatment, wastewater reuse

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