



Influence of nutrient solution pH on N₂O and N₂ emissions from soilless culture system

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Abstract

The influence of nutrient solution pH on the emission of N₂O and N₂ was investigated during cultivation of cucumbers in a closed-loop rockwool system. Between pH 4 and 7 these gaseous nitrogen losses increased from 1.6 to 21.1% of the N fertilizer input. This was equivalent to average flux rates of 0.06 and 0.85 kg nitrogen per hectare greenhouse area and day, respectively. The N₂O/N₂ ratio was inversely related to the total gaseous nitrogen losses. At neutral pH dinitrogen was the main emission product, whereas more acidic conditions favoured the emission of nitrous oxide. The pH effects were probably not indirectly affected by root respiration or exudation as much as by a direct inhibition of the activity of denitrifying microorganisms due to high H⁺ concentrations since similar results were obtained in unplanted nutrient solution systems with the addition of glucose as carbon source. Despite the low microbial denitrification activity under acidic conditions, nitrogen balance deficits of up to one-fifth of the N input still occurred. It is suggested these losses were predominantly caused by chemodenitrification.