

Gaseous nitrogen losses from a soilless culture system in the greenhouse

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Abstract

Gaseous nitrogen losses from a closed-loop rockwool System were investigated during the vegetative growth and the stem fruit stage of cucumbers. On average 12.4% of the N input were released in form of N₂O and N₂. This was equivalent to a mean emission rate of 0.62 kg nitrogen per hectare greenhouse area and day. The highest emission rates occurred during the stem fruit development as an increased root decay and an intensive substrate respiration came on. The proportion of N₂O in the gaseous nitrogen losses decreased with increasing N₂O+N₂ evolution. On average it amounted to 9.6%.

A comparison of different cucumber crops during the season showed that the gaseous nitrogen losses were nearly twice as high in the summer as in the autumn. Thus it proceeded almost parallel to the plant growth which also doubled. Furthermore, an effect of the substrate temperature is conceivable, since it was 3 - 4 °C higher in the radiation-rich summer-time.

With increasing root density in the substrate gaseous nitrogen losses increased while the N₂O/N₂ ratio declined. Possible reasons for this were a greater rhizodeposition of easily decomposable organic substances, an accelerated oxygen consumption by root respiration and a high density of microorganisms in dose vicinity to the roots. The growth of green algae on the substrate surface stimulated the production of N₂O.