

Impact of dairy wastewater on the soil properties and groundwater quality after irrigation on Pangolagrass pasture ⁽¹⁾

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Abstract

Livestock wastewater after anaerobic treatment still contains some nutrients needed for plants and can be used as a source of fertilizers. However, this nutrients containing copper, zinc, and nitrogen, while the substances unabsorbed by the plants could pollute the soil and groundwater. Therefore, the purpose of this study aimed to explore the impact of cow wastewater after anaerobic treatment (irrigation water) on the soil properties and groundwater quality after irrigation on the Pangolagrass pasture. The present study was carried out between 2015 and 2017. The dairy wastewater was irrigated on the Pangolagrass pasture in the area of 34.88 hectares. The irrigation areas were divided into three areas (A10, A13, and A14) by the type of topography, and each of the areas was irrigated once by the irrigation tank truck monthly in turn, namely each area was irrigated once every three months. The irrigation volume was determined by the nitrogen requirement of Pangolagrass and the concentration of total nitrogen in irrigation water. During the experimental period, the change of composition in irrigation water was analyzed with the collection of soils in each area and groundwater in upstream and downstream collected monthly. The data of soil and groundwater in 2014 were adopted as the background values to comprehend the changes in all compositions. The results showed that the total nitrogen of the irrigation water was about 721 mg/L during the irrigation period. In soil, the electrical conductivity (EC) in A10, A13, and A14 during the irrigation period were about 135, 117, and 206 $\mu\text{S}/\text{cm}$, respectively (background values were 152, 171, and 192 $\mu\text{S}/\text{cm}$, respectively). The contents of total copper in three areas were 6.86, 5.92, and 8.25 mg/kg, respectively (background values were 6.16, 5.59, and 5.11 mg/kg, respectively). The contents of total zinc in three areas were 38.1, 25.4, and 38.8 mg/kg, respectively (background values were 25.0, 24.0, and 21.9 mg/kg, respectively). With regards to groundwater, the concentrations of ammonium nitrogen ($\text{NH}_4^+\text{-N}$) and nitrate nitrogen ($\text{NO}_3^-\text{-N}$) were 0.61 mg/L (background value was 0.68 mg/L) and 0.12 mg/L (background value was 0.14 mg/L), respectively. In summary, the results showed that after three years of monitoring, the irrigation of cow wastewater after anaerobic treatment in this study did not significantly change the soil properties and groundwater quality on Pangolagrass pasture. However, the impact by long-term irrigation merits further monitoring and evaluation.

Key words: Dairy wastewater, Anaerobic fermentation, Soil, Groundwater.

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