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Short-term response of soil N_2O and CO_2 emissions and their global warming potentials to irrigation salinity

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Irrigation of brackish water (2-5 g L^{-1}) instead of fresh water, modify soil microbial activities such as carbon and nitrogen cycle, and thus affect soil emissions of nitrous oxide (N_2O) and carbon dioxide (CO_2). However, the effects of irrigation salinity on global warming potentials (GWPs) caused by N_2O and CO_2 emissions are rarely investigated. Pot experiments with three irrigation salinity levels (2, 5 and 8 g L^{-1}) were designed to study the responses of GWPs and the contribution of N_2O and CO_2 to various salinity levels. Results indicated that soil CO_2 flux reduced with the increase of irrigation salinity and was obviously lower than that from fresh water irrigated soil (CK). By comparison, for N_2O, 2 and 8 g L^{-1} saline water decreased the cumulative fluxes by 22.6% and 39.6% compare to CK *($p<0.05$),* respectively, whereas 5 g L^{-1} saline water enhanced it by 87.7%. Overall, the cumulative GWPs of N_2O and CO_2 from irrigated soils using saline water (2-8 g L^{-1}) were 3.2%-51.1% lower than that from CK, with the relative change to CK at 2 g L^{-1} salinity level significantly higher than those at 5 g L^{-1} salinity level. These results suggested that the degree to which soil Ec affected soil microbial processes might vary significantly among irrigation salinity ranges. Reducing the salinity of irrigated brackish water can mitigate soil GHGs and provides a potential strategy for solving water resources scarcity and reducing soil salt accumulation.

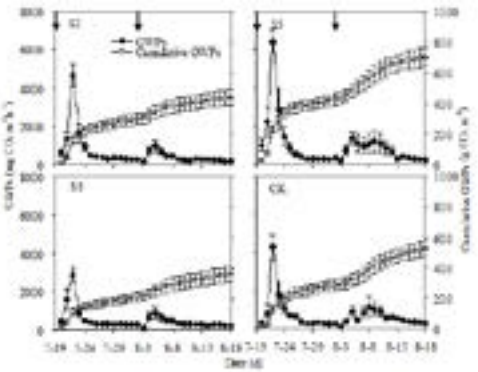

Fig. 1. The GWPs of N_2O and CO_2 under different treatments (arrows represent irrigation events, vertical bars indicate standard deviation, n=3). S2, S5 and S8 represent 2, 5 and 8 g L^{-1} saline water irrigated treatment, CK represent fresh water irrigated treatment).

Recent Publications

1. Wei Qi, Xu Junzeng*, Yang Shihong, Qi Zhiming, Wang Yanhua, Liao Linxian (2017). Partial wetting irrigation resulted in non-uniformly low nitrous oxide emissions from soil. Atmospheric Environment.161:2 00-209.
2. Wei Qi, Xu Junzeng*, Yang Shihong, Liao Linxian , Jin Guangqiu, Li Yawei, Fazli Hameed (2018). Subsurface watering resulted in reduced soil N_2O and CO_2 emissions and their global warming potentials than surface watering. Atmospheric Environment. 173: 248-255.

3. Wei Qi, Xu Junzeng*, Li Yawei, Liao Linxian, Liu Boyi, Jin Guangqiu, Fazli hameed (2018). Reducing surface wetting proportion of soils irrigated by subsurface drip irrigation can mitigate soil N_2O emission. International Journal of Environmental Research and Public Health. 15 (12), 2747.
4. Wei Qi, Xu Junzeng*, Liao Linxian, Jin Guangqiu, Li Yawei, Wang Haiyu, Shah Fahad Rahim (2018). Water salinity should be reduced for irrigation to minimize its risk of increased soil N_2O emissions. International Journal of Environmental Research and Public Health.15(10), 2114.
5. Xu Junzeng, Wei Qi*, Yang Shihong, Liao Linxian, Qi Zhiming, Wang Weiguang (2018). Soil degassing during watering: an overlooked soil N_2O emission process. Environmental Pollution. 242: 257-263.

Biography

Qi Wei, Male, Postdoctor in Hohai Univeraity. Mainly focused on High efficiency local irrigation and its greenhouse gas emissions so on, and published more than 30 papers in the last 5 years.

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