Ammonia-oxidizing microbial communities respond differently to drought under long-term DOK field trial

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Environmental stresses, exacerbated by climate change, can alter the diversity and function of soil microbiomes. As a key driver of ecosystem function, shifts in the structure of soil functional communities involved in global N-cycling may have consequences on agroecosystem functioning. Ammonia-oxidizing communities, which are primary players in nitrification, have potential as predictors of ecosystem dysfunction due to environmental disturbances. Here, we investigated how ammonia-oxidizing communities respond to drought simulated by rain-out shelter experiment in a long-term DOK field trial comparing organic and conventional agricultural practices. This study is part of the MICROSERVICES (BiodivERsA) project to understand the effect of climate change on ecosystem functions in the European wheat cropping system. We assessed the structure and size of ammonia-oxidizing bacteria (AOB), archaea (AOA), and comammox communities by analyzing their *amoA* gene sequence data and quantifying the *amoA* gene abundances via quantitative real-time PCR. We found that among the three groups of ammonia-oxidizing communities, the AOA community structure was affected by drought the most. In contrast, the AOB community structure remained stable, suggesting that AOB may be more resilient to drought than the others. Analysis of *amoA* gene abundances indicated that the size of ammonia-oxidizing communities was also affected by drought, with the greatest effect on the comammox Clade B community. Furthermore, the effect of drought on the community structure was more prominent in the organic (biodynamic) system, while the effect of drought on the community size was observed in biodynamic and conventional systems. Additionally, we detected strong effect of farming system indicated by distinct community structures with higher richness and diversity in the biodynamic than conventional system. Our data suggest organic farming potentially increases the diversity of ammonia-oxidizing communities, even though there were no evidences that organic farming improves the community's resistance and resilience to drought events.