Title: Community response of arbuscular mycorrhizal fungi between subsoil and topsoil layers to 15-year long-term fertilizer amendments in an intensively managed arable purple soil

Limited words for abstract: 300

Abstract

Crop growth and productivity are generally enhanced by arbuscular mycorrhizal fungi (AMF) through improved soil nutrient uptake. Nonetheless, how changes in AMF communities at different soil depths in managed farmlands can actively respond to long-term contrasting fertilization regimes or treatments are rarely known. Next generation sequencing was employed to shape AMF communities in 0-15cm topsoil and 15-30cm subsoil from a typical arable purple soil (Eutric Regosol) in Yanting County, southwest China. Soils were collected during after harvest of wheat (*Triticum aestivum* cv. Chungmai 44) and maize (*Zea mays* cv. Zhenghong 505) after five 15-year long-term fertilizations at an equal nitrogen (N) rate: no-N-fertilization control (CT), chemical N+phosphorus+potassium fertilization (NPK), crop straw return (CR), NPK+biochar (NPKBC), and NPK+CR (NPKCR). Compared to CT, under NPK, CR, NPKCR and NPKBC, AMF's Shannon-Wiener indices, not Sobs and Chao, significantly decreased at topsoil, but increased at subsoil, beneath wheat and maize. AMF community composition shifted between contrasting fertilizations at topsoil and subsoil. Structural equation modeling analysis showed that AMF communities at both topsoil and subsoil were positively significantly affected by climate variable beneath wheat, but no significant effect beneath maize; while negatively or positively affected by fertilization beneath wheat or maize. Fertilization treatments and soil organic carbon were the important factors in shaping AMF community composition and diversity at topsoil and subsoil of wheat, but soil available phosphorus significantly affected AMF community at topsoil and subsoil of maize. Stochastic processes dominated AMF community assembly under different fertilization regimes, with dispersal limitation and undominated processes being the main process. These findings revealed that there was a rapidly local scale dispersal, which could allow plants to establish effective AMF associations under environmental change and human intervention. Our results promote better understandings of changes in AMF communities for maintaining long-term managed agroecosystems.

Keywords: Eutric Regosol, mantel analyses, next generation sequencing, straw carbon input, biochar

Note: This abstract has been now rewritten from the previous sciforum-082911 (oral accepted but withdrawn by the editor due to > 50 % repetition mostly from the background and experiment design information)