Soil organic carbon of different decomposition rate and its relation to microbial activity in saline-alkali desert ecosystem

Fei FANG1,2, Yu-Kun HU3, Yan-Ming GONG3, Hai-Ping TANG1.2*  
1 State Key Laboratory of Earth Surface Processes and Resource Ecology, Beijing Normal University, Beijing, China  
2 College of Resources Science and Technology, Beijing Normal University, Beijing, China,  
*e-mail: tanghp@bnu.edu.cn (corresponding author)  
3 Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, China  

INTRODUCTION

Soil microbes play a crucial role in driving and regulating of nutrient cycles and interactions, which are involved in several important feedbacks of the climate system (Chapin et al. 2002, 2008, Singh et al. 2010, Xu et al. 2010, Fu et al. 2014). Soil microbial carbon (SMC) accounts for only small part (1–5%) of soil organic carbon (SOC), but it is the key factor in controlling of C, N and other nutrients flows in ecological systems (Jenkinson 1988, Niu et al. 2013). SMC that reflects the change of soil organic matter can be detected quickly in soil before changes, and it is used as a bioindicator of the soil quality and health in the environmental monitoring (Yu et al. 1999; Li et al. 2004).

Although significant amounts of organic carbon are found in soil, its decomposition rate is uneven in layers. The degradation process of SOC includes biodegradation, which is more vital, physical and chemical degradation (Fig. 1). In the process of soil microbial degradation different components of soil organic carbon play different role. It can be well combined with the biodegradation process of soil microorganisms by dividing the soil organic carbon pool into labile, inert, and stable carbon pools (Christensen 2001, Dalal and Chan 2001). The labile pool transforms quite rapidly (<5 years), as a result adding of the fresh residues such as plant roots and living organisms, while resistant residues which are physically or chemically protected transform slower (20–40 years). The humus and charcoal carbon components of the stable...