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不同状态高寒草原主要土壤活性有机碳组分的变化

Changes in major fractions of active soil organic carbon in alpine steppes different in states

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中文摘要:

对藏北高原正常、轻度和严重退化高寒草原表层（0~10 cm）、亚表层（10~20 cm）活性有机碳（Active soil organic carbon，ASOC）主要组分变化，以及土壤微生物对ASOC的影响进行了研究，结果表明：⑴易氧化有机碳（Readily oxidizable organic carbon，ROC）、微生物生物量碳（Microbial biomass carbon，MBC）、轻组有机碳（Light fraction organic carbon，LFOC）和水溶性有机碳（Water-soluble organic carbon，WSOC）对土壤环境变化的敏感度显著不同，平均分配比率分别为11.10%、0.57%、0.04%和0.03%，高原寒旱环境对WSOC、LFOC的形成与积累极为不利。⑵不同状态高寒草原亚表层ASOC各组分含量均显著高于表层；与正常草原ASOC各组分含量相比，退化草原表层、亚表层分呈小幅增加和大幅下降，但轻度退化草原变化幅度大于严重退化草原；因此，0~20 cm土层ASOC各组分含量均呈正常草原＞严重退化草原＞轻度退化草原。⑶不同状态草原中，纤维素分解酶活性对ASOC组分的形成均具极显著（ R^2：0.731~0.960）的促进作用，土壤放线菌、真菌对纤维素分解酶活性（Cellulolytic enzyme activity，CEA）则具有较大影响。⑷草原严重退化阶段，土壤微生物可能已完成向抗逆能力、纤维素分解酶分泌能力更强生理种群的演替，其相对较高的SOC、ASOC含量表征着土壤有机残体的较大消耗。

Abstract:

Changes in major fractions of active soil organic carbon (ASOC) and effects of soil microbes on ASOC in the surface layer (0~10 cm) and the subsurface layer (10~20 cm) of alpine steppes different in state (normal, lightly and severely degenerated) in the north Tibetan Plateau. Results show that significant differences were found between readily oxidation carbon (ROC), microbial biomass carbon (MBC), light fraction of organic carbon (LFOC) and water soluble organic carbon (WSOC) in response to changes in soil environment. Their respective mean distribution ratio was11.10%, 0.57%, 0.04% and 0.03%. The cold dry environment of the plateau was not favorable to formation and accumulation of WSOC and LFOC. Regardless of state of the steppes, contents of the various fractions of organic carbon were higher in the surface layer than in the subsurface layer. Compared with the contents of the various fractions of organic carbon in normal steppes, those in degraded steppes were slightly higher in the surface layer, but significantly lower in the subsurface layer, and the changes were greater in mildly degraded steppes, showing a decreasing order of normal steppes > severely degraded steppes > lightly degraded steppes in terms of content of organic carbon in the 0~20 cm soil layer. In steppes of all states, cellulolytic enzymes played a significant promotive role in formation of the fractions of ASOC (R^2: 0.731~0.960), whereas activity of the cellulolytic enzymes was much affected by soil actinomycetes and fungi. In seriously degraded steppes, soil microbes may have completed their succession into microbial populations that were much higher in stress resistance and cellulolytic enzyme secretion ability. And the relatively higher SOC and ASOC contents in the steppes characterized greater consumption of organic residues in the soil.

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