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Microbiological quantitative assessment on soil health in a degraded grassland

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Key words: Degraded grassland; Soil health; Biological quality; Microbiological index; Quantitative assessment

Introduction Soil is a vital and finite resource that can maintain to the function of terrestrial ecosystem and represents a unique balance between physical, chemical and biological factors. The phenomenon of soil degradation and soil pollution has becoming more serious, and structure and function of soil ecosystem are disorderly, jeopardize human health and existence. Soil quality and soil health determine the sustainable productivity of biology and quality of environment in future.

Methods The microbiological quality of soil health in different degree degraded typical grassland in Xilin river basin of Inner Mongolia was analyzed by simple microbial biomass and respiration measurements in the soil. Control sites for comparison of results are the best solution for evaluation of soil health, the plant original community by fencing reserve for 23 years that is chosen as an ideal control site of non-contaminated and background soil in the steppe.

Results The results showed that 4 basic parameters: microbial biomass-C (C_{bio}), available organic-C (C_{ext}), basal respiration-C (C_{BR}), potential respiration-C (C_{PR}), and 5 derived parameters: metabolic quotient (C_{BR}/C_{bio} ; or qCO_2), respiratory activation quotient (C_{BR}/C_{PR}), potential respiration quotient (C_{PR}/C_{bio}), mineralization quotient (C_{ext}/C_{bio}), and Humic Efficiency (C_{ext}/C_{BR}) could provide enough information for evaluation of the status of soil biological quality. The derived parameters could be used as eco-physiological quotients for assessing soil biological quality. Using these indexes showed the control sites Y2 and Y1 (fencing reserve 23 years) as an ideal control site displayed very high content of the microbial biomass and the lowest metabolic quotient of all soils, and higher respiration and available organic carbon, it was health soil. Light grazing site Y3 (fencing reserve only 5 years) was in an average level. Moderate grazing site Y4 (nature grazing out of fencing) displayed below-average microbial biomass with rather lower basal mineralization activity and the humic efficiency was lower for lacking of the appropriate substrate in the soil. The microbes were clearly exposed to the stress effect. Because the energetic requirements are higher; excessive grazing Y5 site (out of fencing) displayed lower microbial biomass carbon and available organic carbon and was no better than Y4 and not healthy. Therefore, microbial parameters have showed great potential to become the early warning and quantity indicators for monitoring the stresses or perturbations in soils ecosystems.

Table 1 Soil health index-standard of eco-fertility indicator.

Standard level of eco-fertility	I (best)	II (better)	III (normal)	IV (bad)	V (worse)	VI (worst)
Microbial biomass-C (mg/kg)	>550	550~401	400~271	270~141	140~80	<80
Sites	Marsh	Y2	Y1, Y3	Y4, Y5		Sands

Conclusions Assessing system of soil biological quality is proposed firstly, key indexes of for assessing soil health contain the eco-fertility, eco-physiology, and eco-resilience parameters has selected. The preliminary graded standard of soil health in steppe has set up. This research has offered the biological basis of land management and soil degradation, and offers the scientific method for studying on toxicology of the contaminated soil, and gets the foundation for the formulation of "Health standard of agricultural soil".

References

- Hofman J, Bezchllebova J, Dusek L et al (2003) Novel approach to monitoring of the soil biological quality [J]. *Environment International*, 28: 771-778.
- Anderson TH (2003). Microbial eco-physiological indicators to assess soil quality [J]. *Agriculture, Ecosystems and Environment*, 98: 285-293.