

Change in soil NH_4^+ -N and NO_3^- -N under different land use types in the Longzhong part of Loess plateau

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Introduction Nitrogen is a limiting element for plant growth in many ecosystems. Inorganic N (NH_4^+ -N and NO_3^- -N), in soil is the primary N pool available for plants. The availability of these different N forms can change depending on types of land use (Antonio Gallardo et al, 2005). The purpose of this study was to research the effect of different land use types on soil N.

Materials and methods This study was conducted at the Semi-Arid Climate and Environment Observatory of Lanzhou University (35°57'N, 104°09'E). Elevation is 1966 m, which means annual air temperature is 6.7°C and means annual precipitation is about 382 mm. Soil type is Sierozem, Four sites [fenced grassland (FG), grazing grasslands (GG), millet field (MF) and fallow cropland (FC)], each 1 hm² and adjacent to one another, were selected for the study. Three sample plots (50×50 m²) were randomly located within each site. In May 2007, ten soil samples at five soil depths (0–60cm) were taken in each plot using soil cores and each five soil samples from same depth were mixed together. The fresh soil sample passed through 2 mm sieve prior to analysis. Data were analyzed using General ANOVA model.

Results Soil NH_4^+ -N content at the same soil layer did not differ significantly between different study sites. Soil NH_4^+ -N content within a site did not differ significantly between soil layers in May and July (Figure 1). The content of NH_4^+ -N was significantly higher in May compared to that of July ($p < 0.05$) (Figure 1). Soil NO_3^- -N content was ranked according to MF > FC > GG > FG ($p < 0.05$). There were some differences between May and July. In May, soil NO_3^- -N content of the four study sites were highest in 0–10 cm soil layer and decreased with soil depth. In July, the trend of soil NO_3^- -N content of two grassland was same as that of May along the soil profile. While farmland appeared inflexion in the 10–20 cm layer, the trends of them were to reduce then increase. The highest point of MF was in 40–60 cm, and of FC, was in 30–40 cm (Figure 2).

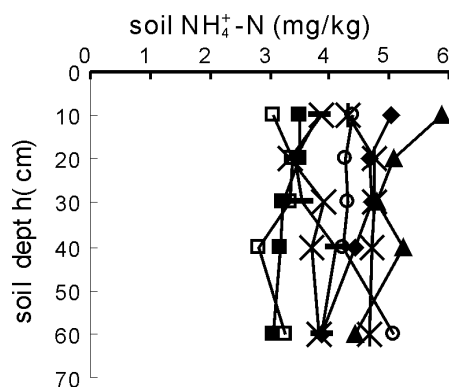


Figure 1 Soil NH_4^+ -N content

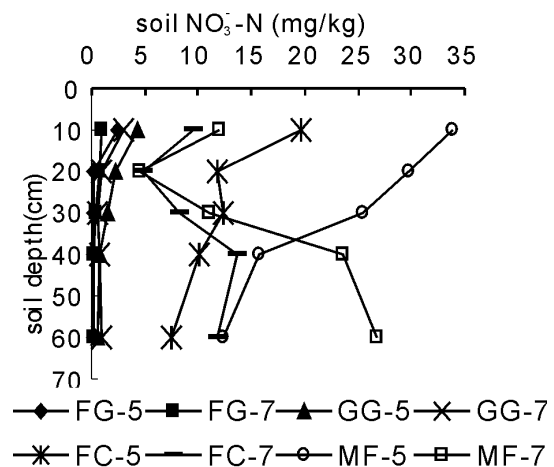


Figure 2 Soil NO_3^- -N content

Conclusions In the Loess plateau, because of alkaline soil, soil NH_4^+ -N content was not significantly different. Soil NO_3^- -N content was imported for plant growth. Soil NO_3^- -N content was different between May and July between farmland plot. Soil NO_3^- -N content decreased with soil depth in May, while NO_3^- -N content tended to increase in July. Cultivation destroys soil physical structure. In July 2007, because a great deal of rainfall, soil NO_3^- -N content was leached to the deeper soil layers. Compared to farmland, grassland has more cover and root biomass which aides in reducing soil N loss.

References

Antonio Gallardo, Rocio Parama / & Felisa Covelo (2005). Soil ammonium vs. Nitrate spatial pattern in six plant communities: simulated effect on plant populations. *Plant and Soil*, 227, 207-209.

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