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Effects of orchard green cover on accumulation and emission of soil organic carbon

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Key words : orchard green cover , soil , organic carbon , soil respiration

Introduction Agriculture is an important emission source of greenhouse gases (GHG) . The emission amount of GHG from the land use changes reached 1.6×10^{15} g every year , which was the secondary important source of GHG (Houghton ,1995) . How to effectively control the agricultural emission amount of GHG has become an urgent problem . This paper preliminarily studied the effects of orchard green cover on characteristics of soil organic carbon to provide a reference for exploring the technology of GHG mitigation .

Materials and methods Two treatments were imposed in split-block experimental design with 3 replicates . Treatments were intercropping *Chamaecrasta rotundifolia* in orchards and weed-cleaning orchards . Plots were arranged randomly with the area in size of $4m \times 25m$.

Results Compared with the control group , the total content of soil organic carbon (in 0~20 cm soil layer) , humic acid content and fulvic acid content in intercropped herbage orchards increased 37.25% , 153.78% and 6.76% , respectively (Figure 1) . Daily change regularity of soil respiration rate in intercropped herbage orchards was similar to that in the control group . The respiration rate of soil reached the lowest at 8 : 00 am , then increased gradually , subsequently reached the maximum value at 20 : 00 pm , then decreased gradually . However , the soil respiration rate in intercropped herbage orchards was 1.15% ~ 44.23% higher than the control group (Figure 2) .

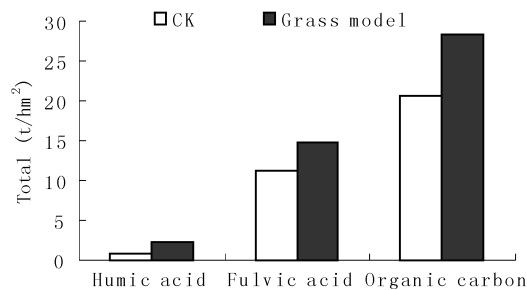


Figure 1 The changes of organic carbon and compositions of soil .

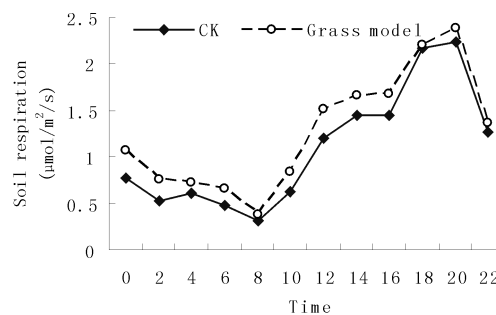


Figure 2 The changes of soil respiration rate .

Conclusions Planting herbage in orchards is an advanced and high efficiency soil management means , which has been widely applied in Europe , USA and Japan in recent years , and has a remarkable effect in preventing soil erosion especially . Orchard green cover could enhance the N-fixing ability of soil and improve the stability of soil organic carbon . The released rate of CO₂ in intercropped herbage orchards was higher than in weed-cleaning orchards , which could be explained by root respiration . The effects of orchard green cover on soil heterotrophic respiration will be continued further .

Reference

Houghton R . A 1995 . Land-use change and the carbon cycle . *Global Change Biology* , 1 : 275- 287 .