Tobacco/garlic intercropping system improve chemical properties by changing C,N cycling and plant degradation pathway in rhizosphere soil, thus increase the tobacco plant biomass

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Abstract

As the mechanism of the microbe-soil-tobacco interaction remains unclear and the contribution of tobacco plant growth is still difficult to predict, the chemical propertie and microbes of soil in tobacco/garlic intercropping system, the relevance of the soil chemical properties and the genes involved in C, N cycling and plant degradation (organic matter turnover) were studied by metagenome sequencing. The results showed that the intercropping treatment (T)significantly enhanced the content of organic matter(OM) ,the available nitrogen (AN) , the available phosphorus(AP) ,the available potassium content(AK), microbe number and the microbial biomass nitrogen,as well as the activity of urease , phosphatase ,invertase compared to monocropping treatment (CK), Especially the content of OM ,AN,AP,AK increased significantly by 29.46%,19.75%, 10.37%,17.42% in rhizosphere of T treatment than CK treatment. The content of polyphenol oxidase activity and microbial biomass carbon significantly decreased in T treatment with by 22.61% and 9.03% relative to CK treatment. Metagenomic analysis showed that the relative abundances of genes related to C cycling (ACA,sdhA,sdhB, sucD, mdh) , N cycling (glnA)and plant degradation (bglX) were higher in the T treatment than the CK treatment. Compared to the CK treatmen, the relative abundance of ACA, sdhA, sdhB, sucD,mdh,glnA and bglX were espectively 26.06%, 39.37%, 48.27%, 32.44%, 57.55%,14.28% and 2.39% higher in the T treatment. The intercropping system changed the chemical properties as well as the abundance of microbes, and subsequently regulate genes involved in C, N cycling and plant degradation, these improved the soil environment and leaded to the increase of tobacco plant biomass.

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