

研究简报

麦棉套作棉花根际非根际土壤微生物和土壤养分

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摘要 在麦棉套作栽培模式下, 设置不隔根、纱网隔根和塑膜隔根3种麦棉套种方式, 研究麦棉套作对棉花根际和非根际土壤微生物数量、活性和土壤养分(全氮、有效磷和速效钾)含量的影响, 结果表明: 麦棉套作有利于棉花根际与非根际土壤细菌的增殖, 盛蕾期不隔根处理棉花根际土壤与非根际土壤细菌数量分别是塑膜隔根处理的2.57和2.81倍。但麦棉套作不利于土壤真菌和放线菌的增殖。细菌在土壤微生物区系中占99.9%。所以, 麦棉套作显著提高了棉花土壤微生物数量, 同时也增强了微生物活性。麦棉共处期纱网隔根处理棉花土壤全氮、有效磷、速效钾含量显著高于不隔根处理和塑膜隔根处理, 证明麦棉套作系统中小麦根系分泌物与脱落物的存在对棉花土壤养分含量的增加有明显的促进作用, 即存在种间营养补偿效应。而共处期不隔根处理套作棉土壤养分含量总体上显著低于隔根处理的现象则反映出小麦根系对棉花土壤养分的竞争作用大于其对棉花土壤养分的促进作用。小麦收获后, 小麦根系对棉花养分的竞争作用解除, 不隔根处理棉花土壤养分含量显著高于塑膜隔根和纱网隔根处理。

关键词 麦棉套作; 麦棉共处期; 棉花; 根际非根际土壤; 土壤微生物数量; 土壤养分

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Studies on the soil microorganism quality and soil nutrient content at the rhizosphere and non-rhizosphere region of cotton in wheat-cotton intercropping system

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Abstract Under the condition of cotton-wheat intercropping system, with the application of three root separating ways, i.e. in the wheat-cotton intercropping system, the wheat roots mixed with cotton roots naturally (WCRM), the wheat roots was separated from cotton roots by nylon net (WCRN) and the wheat roots was separated from cotton roots by plastic film(WCRP). Effect of different composite root on soil microorganism population, soil bacterial activity and soil nutrient content in the cotton rhizosphere and non-rhizosphere was studied. The results showed that: in the coexist period of wheat and cotton, soil bacteria number in the cotton rhizosphere and non-rhizosphere in WCRM was the highest, followed gradually by in WCRN and in WCRP. But fungi and actinomyces number in WCRM were the lowest. In a word, WCRM was in favor of increasing the microorganism population in the cotton rhizosphere and non-rhizosphere, and subsequently result in increasing of the vigor of the soil microorganism in WCRM, which leading to the increase of content on total nitrogen, available phosphorus and rapidly available potassium. As the nylon net and the plastic film can alleviate or interrupt the nutrient competition between wheat roots and cotton roots, the soil nutrient content in the cotton rhizosphere of WCRM was the lowest, and in WCRN that was the highest. In budding stage, as wheat had been harvested, the soil nutrient content in cotton rhizosphere and non-rhizosphere in WCRM was improved, that was the content of total nitrogen, available phosphorus and rapidly available potassium were higher in WCRM than in the two others. As a whole, in WCRM, there not only existed disadvantages as nutrition competition between belowground tissues of wheat and cotton, but also existed advantages in improving soil microorganism activity and soil nutrient content at the cotton rhizosphere and non-rhizosphere as affect by the wheat root.

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Key words cotton-wheat intercropping; coexist period of wheat and cotton; cotton; rhizosphere and non-rhizosphere soil; soil microorganism number; soil microorganism activity; soil nutrient content

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