

施氮量和蚕豆/玉米间作对土壤无机氮时空分布的影响

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Effects of nitrogen fertilization application and faba bean/maize intercropping on the spatial and temporal distribution of soil inorganic nitrogen

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摘要

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摘要

在田间条件下于2006—2007年研究了不同氮水平下(N 0、75、150、225、300 kg/hm²)蚕豆/玉米间作体系与其相应单作体系土壤无机氮的时空分布规律,旨在为河西走廊灌区蚕豆/玉米间作体系的氮素管理提供理论依据。用土钻法采集土壤剖面样品, CaCl₂浸提,流动分析仪测定土壤无机氮的方法研究了施氮量和蚕豆/玉米间作对土壤无机氮时间和空间变化特点。结果表明:灌漠土无机氮以NO₃⁻-N为主。蚕豆和玉米无机氮含量在蚕豆收获前种植方式间均无显著性差异,蚕豆收获后至玉米收获,间作显著降低了两种作物各层无机氮含量;无机氮含量随着施氮量增加而显著增加。蚕豆收获后间作体系0—100 cm土层无机氮累积量略高于单作体系,且0—100 cm 土层无机氮累积量高于100—160 cm土层;玉米收获后,间作蚕豆和玉米土壤无机氮累积量在0—100 cm土层分别平均降低了51.7%和16.6%,在100—160 cm土层分别降低了42.1%和6.1%;与不施氮相比,施氮蚕豆和玉米无机氮累积量在0—100 cm土层分别平均增加了40.1%和81.5%,在100—160 cm土层分别增加了69.6%和40.6%;与单作体系相比,间作体系0—100 和100—160 cm土层土壤无机氮分别降低43.4%和34.1%。因此,施氮肥显著增加土壤无机氮的累积,而豆科/禾本科间作减少了土壤无机氮的残留。

关键词: 蚕豆/玉米间作 施氮 无机氮 灌漠土 蚕豆/玉米间作 施氮 无机氮 灌漠土

Abstract:

A two-year field experiment was conducted to determine the spatial and temporal distribution of soil Nmin in orthic anthrosol soil under faba bean/maize intercropping at different N application rates (0, 75, 150, 225, 300 kg N/hm²), in Hexi Corridor of Gansu Province in 2006-2007. Soil samples were collected in 0-20, 20-40, 40-60, 60-80, 80-100, 100-120, 120-140, 140-160 cm soil layers by soil drill and Nmin concentrations in the soil were measured by flow analysis after CaCl₂ extraction. The results showed that NO₃⁻-N is the major inorganic nitrogen form in orthic anthrosol soil, and there are no significant differences in soil Nmin accumulation between sole cropping and faba bean/maize intercropping at the co-growth stage. Soil Nmin accumulation in different soil layers was significantly reduced in the intercropping after faba bean harvest, compared to sole cropping. Soil Nmin was increased with nitrogen fertilization increasing. Soil Nmin accumulation in the intercropping in 0-100 cm soil layer is slightly greater than that of sole crop system at faba bean harvest, and greater than that in 100-160 cm soil layer. Soil Nmin accumulation in 0-100 cm soil layer was less by average 51.7% and 16.6% under faba bean/maize intercropping than corresponding sole crops, respectively, and by 42.1% and 6.1%, respectively, in 100-160 cm soil layer. Soil Nmin accumulations of faba bean and maize with nitrogen fertilization in 0-100 cm soil layer were increased by 40.1% and 81.5%, over those without N fertilization, respectively, and were increased by 69.6% and 40.6% in 100-160 cm soil layer, respectively. Compared with the corresponding sole cropping system, Soil Nmin accumulations of faba bean/maize intercropping were decreased by 43.4% and 34.1% in 0-100 and 100-160 cm soil layer, respectively, after maize harvest. Therefore, soil inorganic nitrogen accumulation was increased significantly by N application, but was significantly reduced by legume/cereal intercropping.

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