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研究论文

间甲酚及施磷对小麦间作蚕豆土壤微生物和酶活性的影响

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摘要 通过盆栽试验，研究了不同磷水平下化感物质间甲酚对小麦间作蚕豆和单作小麦、单作蚕豆土壤微生物和酶活性的影响。结果表明，间甲酚对不同模式生长盛期细菌和微生物总数表现为化感促进作用，对真菌表现为化感抑制作用，随施磷量的增加间甲酚对土壤微生物的化感促进作用降低；不同模式生长盛期土壤微生物数量在施磷量为100mg/kg土的处理中最高，但成熟期施磷量为200mg/kg土的处理最高；间作较单作具有保持较高土壤细菌和微生物总数的作用，施磷水平越高间作增大微生物数量的效果越大；间甲酚对土壤微生物多样性具有明显降低作用，间作土壤的微生物多样性低于单作。间作具有较高的弱化间甲酚对土壤过氧化氢酶化感负效应的作用，施磷可增强土壤过氧化氢酶活性；磷素作用下土壤脲酶活性增强，间甲酚对单作蚕豆和间作土壤脲酶活性具有促进作用，但弱化了施磷对脲酶活性的增强作用；增施磷肥可弱化间甲酚对单作蚕豆和间作土壤酸性磷酸酶的化感负效应，对单作小麦土壤酸性磷酸酶活性的影响相反。间甲酚对不同模式土壤微生物和酶活性的影响在作物成熟期显著下降，说明随时间的推移土壤中间甲酚的作用力在不断弱化。

关键词 间作；施磷；酚；化感作用；土壤微生物；土壤酶

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Effect of 3-methy-phenol and phosphorous on soil microbes and enzyme activity in wheat faba-bean intercropping systems

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Abstract A pot experiment was carried out to investigate the effect of 3-methyl-phenol and phosphorous on soil microbes and enzyme activity in three cropping ystems: wheat faba-bean intercropping, wheat sole cropping and faba-bean sole cropping. Results show that at wheat flowering stage, treatments with 3-methy-phenol at a concentration of 300×10-6mol/kg of soil had significantly higher numbers of bacteria and total microbes, but had lower numbers of fungi.

Application of phosphorous fertilizer weakened the allelopathic effect of 3-methy-phenol on bacterial and total microbes. The average number of bacteria, fungi and actinomyces in the three treatments with 100mg/kg of soil phosphorous was 57.27%, 21.35%, 60.89%. This was higher than that of the treatments with no phosphorous application at wheat flowering stage. As the phosphorous rate was increased to 200mg/kg of soil, the numbers of microbes decreased. At crop maturity, the average numbers of bacteria, fungi and actinomyces were highest in treatments with 200mg/kg of soil phosphorous, 59.93%, 9.05% and 20.8% respectively.

The numbers of bacteria, fungi and actinomyces in the wheat faba-bean intercropping system were higher than those of sole cropping systems (calculated as half the sum of the two sole cropping systems' microbe counts). At wheat flowering stage the intercropping system had 18.46%～150.02% of bacteria, -22.41%～5.44% of fungi and -17.06%～16.64% of actinomyces, and at maturity had -6.94%～145.81% of bacteria, 0.76%～25.36% of fungi and -17.31%～32.79% of actinomyces.

With higher phosphorous application rates, the difference in microbe numbers between intercropping and sole cropping systems increased. Application of 3-methy-phenol decreased the soil microbial diversity in all treatments at wheat flowering stage. The diversity in sole cropping systems wa

s higher than that of intercropping systems at the same phosphorous application rate. Intercroppin g weakened the negative allelopathic effect of 3-methy-phenol on soil catalase activity, while phos phorous application increased the activity of soil catalase and urase. The 3-methy-phenol enhance d the urase activity of sole cropping faba-bean and wheat faba-bean intercropping systems, but i t weakened the effect of phosphorous on urase. The allelopathic effect of 3-methy-phenol reduce d soil acid phosphatase activity in sole faba-bean and intercropping treatments. As the phosphoro us application rate was increased, this negative effect was weakened. However, the effects of 3-methy-phenol and phosphorous on acid phosphatase activity were different in the sole wheat syst em.At crop maturity of all treatments, the effect of 3-methy-phenol on soil microbes and enzym e activity decreased significantly, indicating that the effect of 3-methy-phenol on all treatments we akened continuously through crop growth stages.

Key words intercropping _ _ phosphorous application _ _ phenol _ _ allelopathy effect _ _ soil microbe _ _ soil enzyme activity

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