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研究论文

间种牧草对枣园捕食性天敌与害虫群落动态的影响

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摘要 为了有效地管理枣树害虫，2004年在太谷地区对不同处理枣园的捕食性天敌与害虫群落动态进行了系统的调查研究，结果表明：间种牧草枣园捕食性天敌种类明显多于(p<0.05)未间种牧草的枣园，种草综合防治园捕食性天敌种类明显多于(p<0.05)种草常规防治园；在枣树不同发育阶段，种草不防治区害虫物种数、多样性和均匀度明显大于(p<0.05)未间种牧草的枣园；优势度则是未间种牧草的枣园明显(p<0.05)大于间种牧草枣园；捕食性天敌个体数与害虫个体数的比值是间种牧草枣园明显(p<0.05)大于未间种牧草的枣园，种草综合防治区明显大于(p<0.05)种草常规防治区。就捕食性天敌与害虫的时空二维生态位宽度和重叠而言，不同发育阶段的枣园害虫的时空二维生态位平均宽度之间没有明显差异（p>0.05），捕食性天敌的时空二维生态位平均宽度是种草枣园明显（p<0.05）大于未种草枣园；不同发育阶段种草枣园捕食性天敌与害虫的时空二维生态位平均重叠程度明显（p<0.05）大于未种草枣园；不同处理枣园捕食性天敌群落中主要种类的前二个主分量负荷值，间种牧草枣区明显(p<0.05)大于未间种牧草的枣区，而枣园害虫群落中主要种类前二个主分量的负荷值是未间种牧草枣区明显(p<0.05)大于间种牧草的枣区。相关性分析结果表明,枣园捕食性天敌与害虫参数相关性的变化趋势较为一致，可见用捕食性天敌功能团和按枣树生育期划分害虫发生阶段以替代物种进行枣园捕食性天敌与害虫群落学研究是切实可行的。总之，枣园种草不仅提高了捕食性天敌的种群数量，同时也增加了捕食性天敌控制害虫的稳定性和可持续性

关键词 枣草间作；捕食性天敌；害虫；多样性；生态位；动态

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Effect of intercropped herbage in jujube plantation on th e community dynamics of natural predators and pests

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Abstract To understand the ecological impact of intercropped herbages in jujube plantation on natural enemies and pests, during March 10 to September 30 in 2004 a systematic survey was conducted under four treatments toward the jujube trees that were all in 10-years old and in full fruit production in a jujube plantation that is located 2.5 km west of Taigu (111°32′E, 37°26′N, 781.9 m elevation) in Shanxi Province, China. Among the four different treatments, three of them applied intercropped herbage treatment (Lotus comiculotus), and one without herbage treatment. In each treatment, five trees chosen by the chessboard sampling method were used to monitor and record the population dynamics of natural predators and pests in every 10 days. Each treatment was performed in triplicate. The natural enemies and pests were distinguished based on their tro

phic relationships and taxonomy. Abundance and dominance of species, diversity indices of com munity, and breadth and overlap of two-dimensional temporal-spatial niches were used to analyz e and compare the successions of natural enemies and pests in the four different treatments.Our re sult showed that the natural predators in the jujube plantations intercropped with herbage were sig nificantly larger than those in the plantations without intercropped herbage ($p<0.05$). Also in the pl antation with the herbage treatment, the natural predators under the integrated pest managemen t were significantly larger than those under the conventional management ($p<0.05$). During the per iods of the jujube development, the treatment with intercropped herbage has significantly weaken ed the pests' development in terms of its number of species, indices of diversity and evenness tha n its counterpart ($p<0.05$). On the contrary, larger dominant degree is found in the plantations wit hout herbage treatment than those with intercropped herbage treatment ($p<0.05$). In addition, th e ratio of numbers of natural enemies to pests was significantly larger in the plantations with intercr opped herbage, and significantly larger under the integrated pest management than their respectiv e counterparts ($p<0.05$). In different developing stages of the jujube trees, no significant differenc es were found between the pests' breadths of two-dimensional temporal-spatial niches. Howeve r, the average breadth of two-dimensional temporal-spatial niches of the natural predators was sig nificantly larger in the plantations intercropped with herbage than in those without herbage ($p<0.0$ 5). Similarly, the average overlap value of two-dimensional temporal-spatial niches between the n atural enemies and pests were significantly larger in the plantations intercropped with herbage ($p<$ 0.05) than in those without herbage ($p<0.05$). Loadings of the first two principal components o f major natural enemies were significantly larger ($p<0.05$) at the plantations intercropped with her bage than those without herbage. On the contrary, loadings of the first two principal component s of major insect pests were significantly larger ($p<0.05$) at the plantations without herbage than th ose with herbage. Further statistical analysis revealed a close correlation of the dynamic change s between the natural enemies and pests in the investigated jujube plantation under different treatm ents. The results suggested that it was practicable to investigate the dynamic community of natura l enemies and pests on the basis of their functional groups rather than species in different developi ng stages of jujube trees. In general, the increased population of natural predators in the jujube pl antation treated with intercropped herbage has improved the stability and sustainability of controlli ng jujube pests.

Key words jujube field intercropped with herbage _ predacity enemies _ insect pests _ diversity _ niches, community dynamics

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