

设施农业景观下破碎化麦田麦蚜及寄生蜂种群的最小适生面积

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Minimum amounts of suitable habitat for wheat aphid, parasitoid, and hyperparasitoid in facility-based agricultural landscapes.

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摘要

最小适生面积(MASH)指在一定的时空范围内物种能稳定存在的最小生境面积,它是种群生存力分析(PVA)的重要方法之一.本文采用基于种群数量-面积关系原理的MASH模型模拟了银川平原设施农业景观下破碎化麦田麦蚜、初寄生蜂与重寄生蜂种群发生的MASH.研究表明:密度-面积、增长速度-面积关系模型间存在反比例函数关系,不同物种存在的函数关系明显不同,尤其在不同营养级别的物种间,其函数关系差异更为明显.根据密度-面积关系,利用多项式回归模型计算了麦二叉蚜、麦长管蚜、燕麦蚜茧蜂、烟蚜茧蜂与蚜虫宽缘金小蜂的MASH,其营养级间的MASH差异显著.不同物种的MASH与营养级高低、体型大小、生境质量等有关.初寄生蜂最高的寄生率出现在800~1000 m²,可作为利用初寄生蜂自然控制麦蚜的依据,而不同营养级物种MASH差异可用于害虫的种群控制.

关键词: 最小适生面积(MASH) 种群生存力分析(PVA) 初寄生蜂 重寄生蜂 保护性生物防治(CBC)

Abstract:

Minimum amount of suitable habitat (MASH) is the minimum habitat area that a population requires to persist in a given environmental setting for a long time, being an important aspect of population viability analysis (PVA). In this paper, we estimated the MASH for wheat aphids, parasitoids, and hyperparasitoids in facility-based agricultural landscapes in Yinchuan Plain of Northwest China, based on the relationships between population density and habitat area, and by using regression analysis. It was found that the population density and growth rate were consistently inversely related to area, but the exact mathematical functions varied with different species, especially those at different trophic levels. The MASH values for *Macrosiphum avenae*, *Schizaphis graminum*, *Aphidius avenae*, *Aphidius gifuensis*, and *Pachyneuron aphidis* were estimated with a polynomial regression model of density-area relationship, and the results were similar to those estimated from an inverse relationship between population and area. The differences of MASH between trophic levels were significant. It was concluded that these species had different values of MASH, which reflected their different habitat requirements and their differences in body size, migration, trophic position, and habitat quality. For parasitoids, the highest parasitic rates always took place at a spatial scale of 800-1000 m², which could be considered as the base of aphids control with parasitoids, while the difference of MASH among trophic levels could be used to suppress the pest population.

Key words: minimum amount of suitable habitat (MASH) population viability analysis (PVA) parasitoid hyperparasitoid conservation biological control (CBC)

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