

## 植被结构和环境特征对城市绿地传粉昆虫多样性的影响

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**摘要:**【目的】随着城市化进程的加速,城市生态系统中的昆虫传粉者面临着诸如花粉来源减少、栖息地碎片化和筑巢环境破坏等挑战。城市绿地空间(UGS)对传粉者群落的稳定至关重要。然而,关于UGS中垂直层异质性和水平层复杂性的植被结构与传粉者群落之间的关系知之甚少。本研究旨在评估植被结构和环境特征如何塑造UGS中的昆虫传粉者群落。【方法】为达此目的,本研究在中国安徽省合肥市的环城公园中,根据生态单元制图分类系统(BMCS)选择了7种典型植被类型进行研究。【结果】在为期8个月的调查中,共鉴定出6目34科的11,401个传粉者。7种生境中,主要是半开敞矮灌,半闭合多双层阔叶林,以及以无修剪草为主的半开敞植被空间被确定为城市绿地中高质量的传粉昆虫栖息地。根据广义线性回归的结果,4个最佳拟合广义线性模型的解释能力相对较高(超过77%)。在四个最佳模型中,植被结构对传粉者群落的影响大于环境特征的影响。冗余判别分析显示,蜜源植物的开花丰度、草本植物的丰富度和灌木覆盖率是影响城市绿地中传粉昆虫群落的3个最重要因素,累计解释能力高达78.8%。传粉者数量受自然草本植物和低强度管理的积极影响。然而,高强度管理、植物多样性较低、花蜜植物丰富度较低、忽视季节性花蜜植物配置以及树木分布密集可能限制传粉者的繁殖和种群增长。这些结果反映了合肥市城市绿地空间中昆虫传粉者群落的现状,并提出了改善城市绿地栖息地和植物配置的可能方向。

**关键词:** 昆虫传粉者; 城市绿地空间; 植被结构; 环境特征; 自然植被; 绿地管理。

## Effects of Vegetation Structure and Environmental Characteristics on Pollinator Diversity in Urban Green Spaces

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**Abstract:** 【Objective】 With accelerating urbanization, insect pollinators in urban ecosystems face challenges such as reduced pollen sources, habitat fragmentation, and damage to the nesting environment. Urban green spaces (UGS) are essential for the stability of pollinator communities. However, little is known about the relationship between vertical layer heterogeneity and horizontal layer complexity of vegetation structure in UGS and pollinator communities. The present study aimed to assess how vegetation structure and environmental characteristics shape the insect pollinator community in UGS. 【Method】 To this end, this study was conducted with seven typical vegetation types which were selected according to the biotope mapping classification system (BMCS) in the ring parks around Hefei City, in Anhui province, China. 【Result】 A total of 11,401 pollinators belonging to 6 orders and 34 families were identified during the eight-month survey. Among the seven habitats under the BMCS, mainly successional short-cut shrub and partly open green space, trees two- or multi-layered broad-leaved mixed forest and partly closed green space, and mainly successional tall grass and partly open green space were identified as high-quality insect pollinator habitats. According to the results of the generalized linear regression, the explanatory power of the four best-fitting generalised linear models is relatively high (over 77%). In four optimal models, the effect of vegetation structure on pollinator community was greater than that of environmental characteristics. The redundancy

discriminant analysis showed that the flowering abundance of nectar plants, herb richness, and shrub coverage rate were the three most important factors influencing insect pollinator communities, with a cumulative explanatory power of up to 78.8%. **【Conclusion】** Pollinator abundance was positively influenced by spontaneous herbs and low-intensity management. However, high-intensity management, low diversity of plants, low nectar plant richness, ignoring seasonal nectar plant configuration, and dense tree distribution could limit pollinator reproduction and population growth. These results reflect the status of insect pollinator community in UGS in Hefei city and present a possible direction for improving urban green habitats and plant configurations.

**Key words:** insect pollinators; urban green space; vegetation structure; environmental characteristics; spontaneous vegetation; green space management.