

三种子遗植物近地保护与迁地保护中的光合生理差异与生长适应性比较

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摘 要:“近地保护”(相同气候和相似生境保护)与“迁地保护”(非原生境保护)是拯救保护珍稀濒危植物和极小种群野生植物的重要措施。为明确西鄂尔多斯地区三种子遗珍稀植物四合木(*Tetraena mongolica*)、沙冬青(*Ammopiptanthus mongolicus*)、霸王(*Zygophyllum xanthoxylon*)在近地保护与迁地保护中的生长适应性与光合生理生态特性差异。利用 LI-6400XT 光合测定系统同步测定了近地和迁地保护试验区三种子遗植物的光合作用日变化特征,并分析了环境因子与光合生理特征之间的相互作用。结合气象、土壤等环境因子监测数据,比较各保护试验区不同植物种的生长存活差异。研究结果表明:(1)近地保护试验区与迁地保护试验区的生境特征差异明显,近地保护试验区中的四合木、沙冬青的年均生长量、生长势和越冬存活率等各项指标远高于迁地保护试验区的,霸王无显著差异;(2)不同试验区三种子遗植物净光合速率均呈“双峰”曲线的变化趋势且净光合速率(Pn)、蒸腾速率(Tr)、气孔导度(Gs)和胞间 CO₂ 浓度(Ci)均差异明显,表现出近地保护的光合速率大于迁地保护的光合速率;(3)对比三种子遗植物光合速率及其与环境因子的相关性,净光合速率与蒸腾速率、气孔导度、水分利用效率、光照强度(PAR)呈明显的正相关性,与大气相对湿度(RH)的相关性不明显,近地保护试验区的日平均水分利用效率(WUE)排序为沙冬青>霸王>四合木,迁地保护试验区的日平均水分利用效率排序为霸王>沙冬青>四合木;对比结果可以看出:三种子遗植物在不同保护试验区内对环境因子的耐受范围(生态幅)存在较大差异,水分因子是限制三种子遗植物生长的重要因素之一。各子遗植物在近地保护条件下的生长适应性和各光合生理生态指标要远远优于在迁地保护的。

关键词:近地保护;迁地保护;子遗植物;光合作用;西鄂尔多斯

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Comparison for photosynthetic physiological differences and growth adaptability of three relict plants between near situ and ex situ conservation

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Abstract: The “near situ conservation” and “ex situ conservation” were important measures to save rare and endangered plants and very small populations of wild plants in the past. In order to ascertain the differences in growth adaptability and photosynthetic characteristics between near situ and ex situ conservation of three relic plants--*Tetraena mongolica* and *Ammopiptanthus mongolicus* and *Zygophyllum xanthoxylon* in west Ordos. The diurnal variation characteristics of photosynthesis of three relic plants in near situ and ex situ conservation experimental site were measured simultaneously by the LI-6400XT photosynthesis apparatus, and the interaction between environmental factors and photosynthetic characteristics was analyzed. The growth and survival differences among different plant species in the conservation experimental site were compared with the monitoring data of environmental factors such as weather and soil. The results show that: (1) There were obvious differences in habitat characteristics between near situ and ex situ conservation experimental site. The average annual growth amount, growth potential and wintering survival rate of *Tetraena mongolica* and *Ammopiptanthus mongolicus* in the near situ conservation experimental site were much higher than those in the ex situ conservation experimental site. There were no significant difference between near situ and ex situ conservation experimental site of *Zygophyllum xanthoxylon*. (2) The net photosynthetic rate of three relic plants in different experimental sites were showed a “bimodal” curve. The net photosynthetic rate (Pn), transpiration rate (Tr), stomatal conductance (Gs) and intercellular CO₂ concentration (Ci) were significantly different. And the photosynthetic rate of near situ conservation experimental site was higher than that on ex-situ conservation experimental site. (3) The net photosynthetic rate were showed positive correlation with transpiration rate, stomatal conductance, water use efficiency and light intensity (PAR), by comparing the photosynthetic rate and its correlation with environmental factors. while the correlation with atmospheric relative humidity (RH) were not obvious. The average daily water use efficiency on near situ conservation experimental site were ranked as *Ammopiptanthus mongolicus* > *Zygophyllum xanthoxylon* > *Tetraena mongolica*. The average daily water use efficiency of ex situ conservation experimental site were ranked as *Zygophyllum xanthoxylon* > *Ammopiptanthus mongolicus* > *Tetraena mongolica*. The comparison results show that: The tolerance ranges (ecological ranges) of the three relic plants to environmental factors were significantly different in different experimental site. And water factor was identified as one of the important factors limiting the growth of the three relic plants. The growth adaptability and photosynthesis indexes of relic plants in near situ conservation experimental site were found to be much better than those in ex situ conservation experimental site.

Key words: near situ conservation; ex situ conservation; relic plant; photosynthesis; West Ordos nature.