

## 遮阴对疏叶骆驼刺叶形态和光合参数的影响

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**摘要** 通过设置自然光与遮阴(60%自然光)两种光环境, 观测了遮阴60天后疏叶骆驼刺(*Alhagi sparsifolia*)叶形态、光合生理参数和脯氨酸(Pro)含量的变化。结果表明: 与自然光照下的叶片相比, 遮阴叶的比叶面积显著增大( $p < 0.01$ ), 比叶干重、比叶鲜重和叶片厚度明显降低( $p < 0.01$ ); 叶绿素(a + b)和类胡萝卜素含量有所增加, 其中叶绿素a含量增加显著( $p < 0.01$ ); 光补偿点、光饱和点和暗呼吸速率降低, 表观量子效率提高, 最大净光合速率明显增大, 光能利用效率高于自然光叶; 强光照下遮阴叶的净光合速率明显降低, 易发生光合抑制现象。上述结果说明: 遮阴处理后, 疏叶骆驼刺在叶形态和光合生理上表现出对遮阴弱光条件的一定程度的驯化适应。另外, 遮阴叶片Pro的大量积累, 说明Pro在疏叶骆驼刺驯化适应弱光环境中起着重要作用。遮蔽环境下疏叶骆驼刺植株死亡率明显偏高, 表明塔克拉玛干沙漠南缘荒漠区的疏叶骆驼刺属于专性阳生植物不耐阴品种。

**关键词:** 疏叶骆驼刺 叶形态 光合特性 遮阴

**Abstract:** *Aims* *Alhagi sparsifolia*, which occurs in arid regions, is commonly considered a type of sun plant. Research indicates that sun plants can successfully adapt to a range of shade through changes in leaf morphology such as increased thickness and decreased size and specific leaf area (SLA). Our objective was to investigate the effects of shading on *A. sparsifolia*. *Methods* We selected two light regimes, natural and shade (60% of natural light), to understand the effects of shading on leaf morphology and response characteristics of photosynthesis in *A. sparsifolia* growing naturally on the southern edge of Taklimakan Desert, northwest China. *Important findings* Plants grown in the shade treatment had greater SLA ( $p < 0.01$ ), lower leaf fresh mass per unit leaf area, leaf dry mass per unit leaf area and leaf thickness than plants grown in full natural light treatments ( $p < 0.01$ ), and greater content of total chlorophyll a + b and total carotenoids, especially chlorophyll a content ( $p < 0.01$ ). With shade, plants had lower light-compensation point, light-saturation point and dark respiration rate, higher apparent quantum yield and light use efficiency and significantly higher photosynthetic rate of light-saturation point. Under high irradiation shade plants had net photosynthetic rate lower than that of plants grown in full natural light, leading to photoinhibition. We concluded that *A. sparsifolia* had the ability to adjust to shade in leaf morphology and characteristics of photosynthesis. In addition, the content of free proline (Pro) increased significantly in shade plants ( $p < 0.01$ ), which showed that free Pro plays an important role in shade acclimation of *A. sparsifolia*. However, the phenomenon of high module mortality in shade treatments showed that *A. sparsifolia* is the obligate sun species but intolerable shade plant.

**Keywords:** *Alhagi sparsifolia*, leaf morphology, photosynthetic characteristics, shade

**收稿日期:** 2010-03-18; **出版日期:** 2011-01-01

**基金资助:**

国家重点基础研究发展计划资助(2009CB421303); 自治区科技重大专项和科技攻关项目(200733144-2; 200633130); 国家科技支撑项目(2009BAC54B03)

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引用本文:

薛伟, 李向义, 朱军涛, 林丽莎, 王迎菊. 遮阴对疏叶骆驼刺叶形态和光合参数的影响. 植物生态学报, 2011,35(1): 82-90.


XUE Wei, LI Xiang-Yi, ZHU Jun-Tao, LIN Li-Sha, WANG Ying-Ju. Effects of shading on leaf morphology and response characteristics of photosynthesis in *Alhagi sparsifolia*. Chinese Journal of Plant Ecology, 2011,35(1): 82-90.


链接本文:

<http://www.plant-ecology.com/CN/10.3724/SP.J.1258.2011.00082> 或 <http://www.plant-ecology.com/CN/Y2011/V35/I1/82>

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