

光强和水分胁迫对姜叶片光合特性的影响

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Effects of Light Intensity and Water Stress on Leaf Photosynthetic Characteristics of Ginger

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摘要 为探讨根际供水状况与姜叶片需光特性的关系, 通过模拟干旱与遮光(50%)交互处理, 研究了自然光照正常供水(T1)、遮光正常供水(T2)、自然光照干旱(T3)、遮光干旱(T4)等对姜叶片光合参数及叶绿素荧光参数的影响。结果表明, 试验处理过程中, T1、T2 姜叶片Pn 无显著变化, 而T3、T4 均持续降低, 且降幅以T3 较大; 随处理时间的延长, T1、T2 的Ci 及Ls 未发生显著变化, 而T3、T4 分别在胁迫1 d、3 d 后, 其Ci 即升高而Ls 降低, 表明胁迫初期T3、T4 姜叶片Pn 的降低主要为气孔限制, 而后期则以非气孔限制为主; 处理6 d 时, 尽管各处理姜叶片Pn 在午间均显著降低, 但降幅以T3、T4 较大, 尤其T3 在午后未出现第二峰值, 而T1、T2、T4 均表现为双峰曲线变化。试验处理过程中, T1、T3、T4 姜叶片Fv/Fm 持续降低, NPQ 升高, 但变幅以T3 较大, T4 次之, T1 较小, T2 则无显著变化; 处理6 d 时, 虽然各处理姜叶片Fv/Fm、ΦPSII、qP 均在午间显著降低, NPQ 显著升高, 但变幅以T3 较大, T4、T1 次之, T2 较小。表明干旱胁迫对姜叶片光化学效率的影响大于自然光照胁迫, 而遮光则可缓解干旱胁迫。

关键词: 姜 水分 光强 光化学效率 光合作用

Abstract: To investigate the relation of water supply condition in rhizosphere and leaf photosynthetic characteristics, the paper studied the effects of different treatments such as Natural light with normal water supply (T1), Shading 50% with normal water supply (T2), Natural light with drought (T3) and Shading 50% with drought (T4) on leaf photosynthetic parameters and chlorophyll fluorescence parameters of potted ginger. The results showed that during the treatment, the Pn in T1, T2 had no significant change, but in T3, T4 reduced constantly and amplitude of T3 was significantly higher than T4; With the prolonging of treatment, Ci and Ls in T1, T2 all had no significant change, but Ci in T3 and T4 increased and Ls reduced after 1 and 3 days of stress treatment respectively, showing that the initial reduced of Pn in T3, T4 is mainly due to stomatal limitation and the latter to non-stomatal limitation; After six-day stress, although Pn reduced significantly in all treatments at midday, but the amplitude of T3, T4 was higher than T1 and T2, especially T3 did not appear second peak, while T1, T2, T4 all showed a bimodal curve. The Fv/Fm of ginger leaves in T1, T3, T4 reduced constantly during stress treatment, meanwhile NPQ increased, and the largest change amplitude was got by T3, and followed by T4 and T1, but T2 had no significant change. After six-day treatment, Fv/Fm, ΦPSII, qP in all treatments reduced significantly at noon, meanwhile NPQ increased prominently, the largest change amplitude was got by T3, and followed by T4 and T1, but the change amplitude of T2 was smaller. The results indicated that the effect of water stress was greater than strong light on ginger leaves photochemical efficiency, and shading can relieve drought stress.

Keywords: ginger, light, photochemical efficiency, photosynthesis

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