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蔬菜

外源亚精胺对高温胁迫下番茄幼苗快速叶绿素荧光诱导动力学特性的影响

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Effects of Exogenous Spd on the Fast Chlorophyll Fluorescence Induction Dynamics in Tomato Seedlings Under High Temperature Stress

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- 摘要
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摘要 以高温敏感型番茄品种‘浦红968’为试材，在人工气候箱中采用基质栽培的方式，研究了外源亚精胺（Spd）处理对高温胁迫下幼苗生长、快速叶绿素荧光诱导动力学特性和叶绿素含量的影响。结果表明，高温胁迫抑制番茄幼苗生长，引起叶片快速叶绿素荧光诱导曲线变形，初始荧光产额大幅增加，最大荧光显著减小，导致最大光化学效率（Fv/Fm）下降，而Spd 处理促进了幼苗生长，提高了高温胁迫下幼苗的最大荧光和Fv/Fm，降低了初始荧光。高温胁迫引起单位反应中心吸收的光能（ABS/RC）、捕获的光能（TRo/RC）和热耗散的能量（DIo/RC）增加，而降低单位反应中心传递的能量（ETo/RC）和光合性能[PI(abs)]，放氧复合体受损，类囊体严重解离，电子传递活性受到抑制。高温胁迫下，外源Spd处理显著降低叶片ABS/RC、TRo/RC、DIo/RC，提高ETo/RC 和PI(abs)。说明外源Spd 能够稳定光合系统的结构和功能，优化能量在PSⅡ反应中心的分配，促进电子在PSⅡ和PSⅠ之间的传递，进而缓解高温胁迫对番茄幼苗光化学活性和光合性能的抑制。

关键词： 番茄 高温胁迫 亚精胺 叶绿素荧光

Abstract: Taking a relatively heat-sensitive tomato (Lycopersicon esculentum) cultivar ‘Puhong 968’ as test material, a substrate culture experiment was conducted in growth chamber to investigate the effects of foliar spraying spermidine (Spd) on the protection in tomato seedling leaves under high temperature stress. The heat treatment at 38 ℃ significantly altered the shape of O-J-I-P fluorescence transient. An increase in basal fluorescence and decrease in maximum fluorescence was observed. Higher K, J, L-band and lower I-band were detected compared to control samples at 130 μs, 300 μs, 2 ms and 30 ms on the cholorophyll fluorescence induction curve. High temperature stress significantly increased the values of ABS/RC, TRo/RC, DIo/RC, φDo, Mo, and Fv/Fm, but decreased ETo/RC, PI(abs), Sm, DF(abs), Ψo, RC/CSo and φEo in leaves. However, Spd treatment reverted these changes induced by high temperature stress. Spd resulted in a better utilization of excitation energy and a higher stability of the photosystem Ⅱ, causing much enhancement of the oxygen evolving complex capacity, thermal stability of thylakoid membranes, connectivity among PSⅡ units and electron transport activity. Meanwhile, positive effects showed up in the photosynthetic pigment contents and growth in tomato seedling by heat treat treated with Spd.

Keywords: tomato, high temperature stress, spermidine, chlorophyll fluorescence

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