

NaCl胁迫下黄连木叶片光合特性及快速叶绿素荧光诱导动力学曲线的变化

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Effects of NaCl stress on photosynthesis characteristics and fast chlorophyll fluorescence induction dynamics of *Pistacia chinensis* leaves.LI Xu-xin¹, LIU Bing-xiang¹, GUO Zhi-tao², CHANG Yue-xia¹, HE Lei², CHEN Fang², LU Bing-she^{2,3}

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摘要

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摘要

以1年生黄连木为试材,设置NaCl浓度分别为0(CK)、0.15%、0.3%、0.45%、0.6%5个处理,利用快速叶绿素荧光诱导动力学曲线分析技术(JIP-test),研究了NaCl胁迫对黄连木叶片光合特性和快速叶绿素荧光诱导动力学参数的影响.结果表明:随着NaCl浓度的升高,黄连木叶片中的叶绿素a、叶绿素b和总叶绿素含量逐渐降低,叶绿素a/b比值先升高后下降,类胡萝卜素含量逐渐增加;叶片的净光合速率(P_n)、气孔导度(g_s)逐渐降低,其中NaCl浓度<0.3%时,叶片 P_n 下降主要受气孔限制;当NaCl浓度>0.3%时, P_n 下降主要由非气孔因素限制;单位面积捕获的光能(TR_o/CS_o)、电子传递的量子产额(ET_o/CS_o)、单位面积的反应中心数量(RC/CS_o)、量子产额或能量分配比率(ψ_o 和 ϕ_{Eo})逐渐降低,而单位面积吸收的光能(ABS/CS_o)、荧光诱导曲线中K点(W_k)和J点(V_j)明显增加,说明盐胁迫对黄连木叶片放氧复合体(OEC)、受体侧和PS II反应中心造成了伤害.当NaCl浓度为0.3%时,PS II最大光化学效率(F_v/F_m)和光化学性能指数(PI_{ABS})分别比对照下降17.7%和36.6%.

关键词: 黄连木 NaCl胁迫 光合特性 叶绿素荧光诱导动力学 JIP-测定

Abstract:

By using fast chlorophyll fluorescence induction dynamics analysis technique (JIP-test), this paper studied the photosynthesis characteristics and fast chlorophyll fluorescence induction dynamics of 1-year old *Pistacia chinensis* seedlings under the stress of NaCl at the concentrations 0% (CK), 0.15%, 0.3%, 0.45%, and 0.6%. With the increasing concentration of NaCl, the contents of Chl a, Chl b, and Chl (a+b) in the seedlings leaves decreased, the Chl a/b ratio decreased after an initial increase, and the carotenoid content increased. The net photosynthetic rate (P_n) and stomatal conductance (g_s) decreased gradually with increasing NaCl concentration. The decrease of P_n was mainly attributed to the stomatal limitation when the NaCl concentration was lower than 0.3%, and to the non-stomatal limitation when the NaCl concentration was higher than 0.3%. The trapped energy flux per RC (TR_o/CS_o), electron transport flux per RC (ET_o/CS_o), density of RCs (RC/CS_o), and yield or flux ratio (ψ_o or ϕ_{Eo}) decreased, but the absorption flux per CS (ABS/CS_o) and the K phase (W_k) and J phase (V_j) in the O-J-I-P chlorophyll fluorescence induction curves increased distinctly, indicating that NaCl stress damaged the leaf oxygen evolving complex (OEC), donor sides, and PS II reaction centers. When the NaCl concentration reached 0.3%, the maximum photochemical efficiency (F_v/F_m) and performance index (PI_{ABS}) decreased 17.7% and 36.6%, respectively, as compared with the control.

Key words: *Pistacia chinensis* NaCl stress photosynthetic characteristics chlorophyll fluorescence induction dynamics JIP-test.

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