

不同浓度Ni、Cu处理对骆驼蓬光合作用和叶绿素荧光特性的影响

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Influence of different concentration Ni and Cu on the photosynthesis and chlorophyll fluorescence characteristics of *Peganum harmala*.LU Yan^{1,2}, LI Xin-rong³, HE Ming-zhu³, SU Yan-gui¹, ZENG Fan-jiang^{1,2}

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摘要

以骆驼蓬幼苗为材料, 采用盆栽试验研究不同浓度 (0、50、100、200、400 mg · kg⁻¹) Ni、Cu处理对骆驼蓬叶片光合作用、叶绿素荧光特性及生长状况的影响。结果表明: 随着Ni浓度的增加, 骆驼蓬幼苗叶片的光合色素含量、净光合速率 (P_n)、气孔导度 (G_s)、蒸腾速率 (T_r)、PS II最大光化学效率 (F_v/F_m)、PS II电子传递量子产率 (Φ_{PSII})、光化学猝灭系数 (q_p) 及各项生长指标均呈显著下降趋势, 而细胞间隙CO₂浓度 (C_i) 和非光化学猝灭系数 (q_N) 呈显著增加趋势, 其中 P_n 的下降主要是由非气孔限制所致; 骆驼蓬幼苗叶片的光合色素含量、 P_n 、 G_s 、 T_r 、 C_i 、 F_v/F_m 、 Φ_{PSII} 、 q_p 及各项生长指标均在50 mg · kg⁻¹ Cu处理时达到峰值, 叶绿素a和b、 P_n 、 G_s 、 T_r 、 C_i 、 F_v/F_m 及各项生长指标值在100 mg · kg⁻¹ Cu处理时仍微高于对照, 而后随Cu浓度的增加, 光合色素含量、 P_n 、 G_s 、 T_r 、 C_i 、 F_v/F_m 、 Φ_{PSII} 、 q_p 及各项生长指标均呈下降趋势, q_N 呈增加趋势, 其中 P_n 的下降主要是由气孔限制所致。

关键词: 光合作用 叶绿素荧光 骆驼蓬 镍 铜

Abstract:

A pot experiment was conducted to study the influence of different concentration (0, 50, 100, 200, and 400 mg · kg⁻¹) Ni and Cu on the growth, photosynthesis, and chlorophyll fluorescence characteristics of *Peganum harmala* seedlings. With increasing concentration Ni in the medium, the seedlings growth parameters, photosynthetic pigment content, net photosynthetic rate (P_n), stomatal conductance (G_s), transpiration rate (T_r), maximal photochemical efficiency of PS II (F_v/F_m), quantum efficiency of electric transport of PS II (Φ_{PSII}), and coefficient of photochemical quenching (q_p) of *P. harmala* decreased significantly, while the intercellular CO₂ concentration (C_i) and the coefficient of non-photochemical quenching (q_N) were in adverse. The decrease of P_n under Ni stress was mainly caused by non-stomatal limitation. At 50 mg · kg⁻¹ Cu, the growth parameters, photosynthetic pigment content, P_n , G_s , T_r , C_i , F_v/F_m , Φ_{PSII} , and q_p reached their peak values; at 100 mg · kg⁻¹ Cu, the growth parameters, chlorophyll a and b contents, P_n , G_s , T_r , C_i , and F_v/F_m were still slightly higher than the control; while with the further increasing Cu concentration in the medium, all the test indices except q_N tended to decrease. The decrease of P_n under Cu stress was mainly caused by stomatal limitation.

Key words: photosynthesis chlorophyll fluorescence *Peganum harmala* nickel copper

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