γ-氨基丁酸（GABA）对低氧胁迫下甜瓜幼苗光合作用和叶绿素荧光参数的影响

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Effects of γ-aminobutyric acid on the photosynthesis and chlorophyll fluorescence parameters of muskmelon seedlings under hypoxia stress.

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摘要

采用营养液水培方法，研究了低氧胁迫下外源γ-氨基丁酸（GABA）对甜瓜幼苗光合色素含量、光合作用及叶绿素荧光参数的影响. 结果表明：低氧胁迫导致甜瓜幼苗光合色素含量显著下降，光合作用降低；外源GABA能显著提高正常通气和低氧胁迫下甜瓜幼苗的光合色素含量、净光合速率、气孔导度、胞间CO_2浓度、CO_2羧化效率、最大光化学效率、光化学猝灭系数、表观光合电子传递速率和PSⅡ光合电子传递量子效率，而气孔限制值、初始荧光和非光化学猝灭系数显著降低，GABA在低氧胁迫下的提高效果更明显；同时添加GABA和GABA转氨酶抑制剂γ-乙烯基-γ-氨基丁酸（VGB）处理显著降低了低氧胁迫下GABA对甜瓜幼苗光合特性的缓解效果.

关键词： 低氧胁迫 γ-氨基丁酸 甜瓜 光合作用 叶绿素荧光参数

Abstract:

By the method of hydroponic culture, this paper studied the effects of exogenous γ-aminobutyric acid (GABA) on the photosynthetic pigment contents, photosynthesis, and chlorophyll fluorescence parameters of muskmelon seedlings under hypoxia stress. Hypoxia stress induced a significant decrease of photosynthetic pigment contents, resulting in the decrease of photosynthesis. Applying GABA could significantly increase the photosynthetic pigment contents, net photosynthetic rate (P_n), stomatal conductance (G_s), intercellular CO_2 concentration (C_i), carboxylation efficiency (CE), maximal photochemical efficiency of PSⅡ (F_v/F_m), photochemical quenching (q_P), apparent photosynthetic electron transfer rate (ETR), and quantum yield of PSⅡ electron transport ($\Phi_{PSⅡ}$), and decrease the stomatal limitation value (L_s), minimal fluorescence (F_o), and non-photochemical quenching (NPQ) under both hypoxic and normal conditions. The alleviation effect of GABA on photosynthetic characteristics was more obvious under hypoxia stress. However, simultaneously applying GABA and VGB could significantly decrease the alleviation effect of GABA under hypoxia stress.

Key words: hypoxia stress γ-aminobutyric acid muskmelon photosynthesis chlorophyll fluorescence parameters

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