

氮素不同形态对比对菠菜体内游离氨基酸含量和相关酶活性的影响

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Effect of $\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}$ ratios on the free amino acids and three kinds of enzymes of nitrogen metabolism in spinach (*Spinacia Oleracea* L.) shoot

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摘要 采用溶液培养试验,研究了氮素不同形态对比对菠菜茎叶中游离氨基酸含量及3种主要氮代谢酶活性的影响。结果表明:1)随着营养液中铵硝比($\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}$)的降低,菠菜茎叶中游离氨基酸的总量呈下降趋势。在全硝营养下($\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}=0:100$)下,菠菜茎叶中游离氨基酸的总量只有全铵营养($\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}=100:0$)的34.4%。2)在全铵营养下,菠菜茎叶中游离氨基酸的主要组分是谷氨酰胺、精氨酸和谷氨酸,三者占游离氨基酸总量的百分比依次为39.8%、20.2%和8.9%;在全硝营养下,菠菜茎叶中游离氨基酸以谷氨酸、天冬氨酸和丝氨酸为主,三者占游离氨基酸总量的百分比分别为30.3%、18.6%和8.5%。3)提高营养液中硝态氮的比例,可以显著提高菠菜茎叶中硝酸还原酶(NR)的活性,同时降低了谷氨酸脱氢酶(GDH)的活性,谷氨酰胺合成酶(GS)活性则呈现先升后降的抛物线状变化规律。4)菠菜茎叶中NR活性与谷氨酰胺含量之间存在着显著负相关关系($r=-0.968$)。

关键词: 菠菜 氮素形态 游离氨基酸 谷氨酰胺合成酶 谷氨酸脱氢酶 菠菜 氮素形态 游离氨基酸 谷氨酰胺合成酶 谷氨酸脱氢酶

Abstract: A solution culture experiment was conducted to study the effect of $\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}$ ratios on the content of total and all composition of free amino acids, and three kinds of enzymes of nitrogen metabolism in spinach shoot. The results indicated that total content of free amino acids in spinach shoot decreased with decreasing $\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}$ ratio, and the value at 0: 100 was 34.4% of that at 100: 0 of $\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}$ ratio. When ammonium was sole nitrogen source, the main composition of free amino acids in spinach shoot were glutamine (39.8%), arginine (20.2%) and glutamate (8.9%), and under nitrate as sole nitrogen source the main amino acids were glutamate (30.3%), aspartate (18.6%) and serine (8.5%). With the increase of the $\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}$ ratio, the nitrate reductase activity of spinach shoot markedly increased, simultaneously, the glutamate dehydrogenase activity declined. Moreover, the glutamine synthetase activity was the highest at the $\text{NH}_4^+-\text{N}/\text{NO}_3^--\text{N}$ ratio of 50: 50, the relationship between the activity and the ratio could be described with an approximate parabola curve. There was an inverse relationship between the nitrate reductase activity and glutamine content in spinach shoot, and when the free glutamine content was higher, it had a feedback regulation role to repress the glutamine activity in spinach shoot.

Keywords:

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