

研究报告

# 供氮水平对菠菜营养品质和体内抗氧化酶活性的影响

张英鹏; 林咸永; 章永松

浙江大学环境与资源学院, 杭州 310029

收稿日期 2004-7-2 修回日期 2004-11-22 网络版发布日期 接受日期

## 摘要

通过水培实验, 研究了供氮水平对菠菜营养品质和抗氧化酶活性的影响. 结果表明, 供氮水平由  $4 \text{ mmol}\cdot\text{L}^{-1}$  增加到  $8 \text{ mmol}\cdot\text{L}^{-1}$ , 菠菜产量显著增加, 叶片中的维生素 C (Vc) 含量随着供氮浓度由  $4 \text{ mmol}\cdot\text{L}^{-1}$  提高到  $8 \text{ mmol}\cdot\text{L}^{-1}$ , 再提高供氮水平, Vc 含量则明显下降. 叶片硝酸盐含量随着氮浓度的提高而增加. 供氮浓度从  $4 \text{ mmol}\cdot\text{L}^{-1}$  增加到  $8 \text{ mmol}\cdot\text{L}^{-1}$ , 叶片可溶态草酸含量略有下降, 再提高供氮水平则明显上升, 而草酸总量随供氮水平提高, 先显著升高然后略有降低. SOD 和 POD 酶的活性随供氮水平由  $4 \text{ mmol}\cdot\text{L}^{-1}$  提高到  $8 \text{ mmol}\cdot\text{L}^{-1}$  而增加, 再提高供氮水平, 酶活性显著下降; CAT 活性随供氮水平的增加而降低, 叶片 MDA 含量先降低后显著升高, 而游离脯氨酸含量随氮水平的升高而增加. 可见供氮水平为  $8 \text{ mmol}\cdot\text{L}^{-1}$  时, 菠菜叶片具有较高的生物量、Vc 含量和抗氧化酶活性, 较低的硝酸盐和草酸含量以及较低的 MDA 和游离脯氨酸含量, 表明供氮浓度  $8 \text{ mmol}\cdot\text{L}^{-1}$  有利于提高菠菜的产量、营养品质和抗逆能力, 是菠菜生长较适宜的供氮水平.

## 关键词

菠菜; 供氮水平; 硝酸盐; 维生素; 草酸; 抗氧化酶活性; 脯氨酸

## 分类号

# Effects of nitrogen supply on nutritional quality and antioxidative enzyme activities of spinach

ZHANG Yingpeng, LIN Xianyong, ZHANG Yongsong

College of Environment and Resource, Zhejiang University, Hangzhou 310029, China

## Abstract

A hydroponic experiment was carried out to study the effects of nitrogen (N) supply on the nutritional quality and antioxidative enzyme activities of spinach. The results showed that when the N supply increased from 4 to  $8 \text{ mmol}\cdot\text{L}^{-1}$ , the biomass of spinach and its leaf vitamin C (Vc) content increased significantly, but a further increase of the N supply induced an obvious decrease of Vc content. An increasing N supply increased the nitrate content in leaves. The soluble oxalate content in leaves decreased slightly with the N supply from 4 to  $8 \text{ mmol}\cdot\text{L}^{-1}$  N, but increased with a further increase of supplied N. Total oxalate content increased firstly, and then

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decreased with increasing N supply. SOD and POD activities increased with the N level up to 8 mmol·L<sup>-1</sup> N, but drastically decreased with increasing N levels. CAT activity decreased when N level elevated. MDA content decreased firstly and then increased with increasing N levels, while free proline content decreased with increasing N supply. All of these indicated that 8 mmol·L<sup>-1</sup> N was an appropriate N supply level for spinach to improve its biomass, nutritional quality, and resistance.

**Key words**

[Spinacia oleracea](#) [Nitrogen supply](#) [Nitrate](#) [Vitamin C](#)  
[Oxalate](#) [Antioxidative enzyme activities](#) [Proline](#)

DOI:

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