

研究报告

盐胁迫对黄瓜幼苗根系生长和水分利用的影响

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摘要 采用营养液水培法, 研究了NaCl胁迫对两个耐盐性不同的黄瓜品种幼苗根系生长、活力、质膜透性和叶片生长、蒸腾速率 (T_r)、相对含水量 (RWC) 及水分利用率 (WUE) 的影响. 结果表明, 盐胁迫下黄瓜植株根系吸收面积下降, 质膜透性升高, 叶片数减少, 叶片 T_r 和 RWC 在盐胁迫 2 d 后明显下降, 根系活力和叶片 WUE 均先升后降, 50、75 和 100 $\text{mmol} \cdot \text{L}^{-1}$ NaCl 胁迫 9 d 时, 耐盐性较弱的津春 2 号根系活力降低幅度分别比耐盐性较强的长春密刺高 18.01%、12.17% 和 10.95%, 胁迫 8 d 时 WUE 下降幅度分别比长春密刺高 2.74%、5.27% 和 0.23%. 短期盐胁迫下, 黄瓜植株通过提高根系吸收能力来补偿根系吸收面积的下降, 通过降低叶片 T_r 和提高 WUE 来减少水分散失, 在一定程度上有利于缓解水分失衡, 提高植株耐盐性; 盐胁迫 5 d 后, 根系活力和 WUE 的下降导致水分失衡加剧, 表明根系吸收能力的下降是导致水分失衡的重要原因, 叶片 WUE 的下降是水分失衡的反应, 两者均与品种的耐盐性关系密切.

关键词 [盐胁迫](#) [黄瓜](#) [氯化钠](#) [根系](#) [水分利用率](#)

分类号

Effects of salt stress on the root growth and leaf water use efficiency of cucumber seedlings

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Abstract

By the method of water culture, and with the seedlings of two cucumber cultivars having different tolerance to salt stress as test materials, this paper studied their root growth, vitality, and membrane permeability, as well as their leaf growth, transpiration rate (T_r), relative water content (RWC), and water use efficiency (WUE) under effects of different NaCl levels. The results showed that under salt stress, the absorption surface area of root was declined, whereas its membrane permeability was increased significantly. The leaf number per cucumber seedling was decreased, compared with that of the control. Both T_r and RWC were markedly decreased after 2 days exposure to salt stress. During the period of salt treatment, root vitality and leaf WUE were increased initially, but decreased then. For the salt-susceptible cultivar Jinchun No. 2, the decrement of its root vitality was 18.01%, 12.17% and 10.95% higher than that of the salt tolerant cultivar Changchun Mici on the 9th day exposure to 50, 75 and 100 $\text{mmol} \cdot \text{L}^{-1}$ NaCl, and the decrement of its leaf WUE was 2.74%, 5.27% and 0.23% higher than that of Changchun Mici on the 8th day exposure to 50, 75 and 100 $\text{mmol} \cdot \text{L}^{-1}$ NaCl, respectively. Under short-term salt stress, the absorption capacity of root was raised to compensate its reduced absorption surface area, while the decrease of T_r and the increase of WUE could reduce the leaf water loss, which alleviated the imbalance between water demand and need and improved the salt-tolerance of cucumber seedlings. After 5 days exposure to salt stress, both root vitality and leaf WUE decreased, which showed more severe water imbalance. It could be concluded that the decrease of root absorption capacity was one of the main reasons of water imbalance, and the decrease of leaf WUE was one of the responses to water imbalance. Both the absorption capacity of root and the WUE of leaf were closely related to the salt-tolerance of cucumber cultivar.

Key words [Salt stress](#) [Cucumber](#) [NaCl](#) [Root system](#) [Water use efficiency](#)

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