

园艺—研究报告

磷胁迫对不同基因型甜菜根系形态及根分泌物的影响

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摘要:

选用了三种不同抗磷胁迫能力的基因型甜菜种质材料‘品14’、‘品17’和‘品20’，通过液培和沙培法对低磷胁迫下甜菜根长、根冠比、根系H⁺及有机酸分泌等形态和生理特性进行了研究。结果表明：（1）磷胁迫对甜菜根系的形态特征影响显著，与正常磷营养水平比，各基因型甜菜的根系长度和根冠比均有显著增加（ $p < 0.05$ ），其中抗磷胁迫能力最强的‘品20’增加幅度显著高于其他两个基因型；（2）甜菜根系主要分泌草酸、乳酸、马来酸及反丁烯二酸，其中大部分为草酸和乳酸，在低磷胁迫下，只有抗磷胁迫能力最强的‘品20’此两种酸的分泌达到显著增加水平；（3）不同基因型甜菜受磷胁迫后，近根区生长环境变化各异，其中抗磷胁迫能力最强的‘品20’H⁺的分泌量的增幅显著高于其他两个基因型。

关键词: 甜菜; 磷胁迫; 根系形态; 根系分泌物

Effects of Phosphorus Stress on the Root Morphology and Root Exudates in Different Sugar Beet Genotypes

Abstract:

Phosphorus deficiency was induced in sugar beet plants (*Beta vulgaris* L., ‘var. 14’, ‘var. 17’ and ‘var. 20’ with different resistance ability to phosphorus stress), cultured hydroponically and sandily under standardized environmental conditions, by removing phosphorus from the nutrient supply at the seedling stage. Root morphology, H⁺ excretion and organic acid in rhizosphere were investigated. The main results were showed as following: the average length of roots and the ratio of root to shoot in all genotypes were increased significantly ($p < 0.05$), among which, the decreasing range of ‘var. 14’ was the biggest one; sugar beet root mainly excreted oxalic, lactic, maleic acid and trans-butenedioic acid, among which, the first two kinds of the organic acids were the main ingredient, and the phenomena of the significant increase in the secretion amount of those two kinds acids was only appeared in ‘var. 20’ with higher resistance to phosphorus stress; phosphorus deficiency stimulated the environment changed in root vicinity of sugar beet, and showed as an increase of the H⁺ secretion in all the genotypes used in the experiment, but the increased amount of H⁺ were genetic dependent, i.e. ‘var.20’ > ‘var.17’ > ‘var.14’.

Keywords: sugar beet (*Beta vulgaris* L.) phosphorus deficiency root morphology root exudates

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