PLANT NUTRITION AND FERT

ISSN 1008-505X
CN 11-3996/S

植物营养与肥料学报 » 2011, Vol. 17 » Issue (4) :1005-1011 DOI:

硝态氮供应下植物侧根生长发育的响应机制

汪 洪[1]， 高 翔[1,2]，陈 磊[1,2]， 王盛锋[1,2]， 刘荣乐[2]

1 农业部作物营养与施肥重点开放实验室，中国农业科学院农业资源与农业区划研究所，北京100081

2 中国农业科学院研究生院，北京100081

The mechanisms underlying plant lateral root development in response to nitrate

WANG Hong[1], GAO Xiang[1,2]， CHEN Lei [1,2]， WANG Sheng-feng[1,2]， LIU Rong-le[2]*

1 Ministry of Agriculture Key Laboratory of Crop Nutrition and Fertilization，
Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences, Beijing 100081, China；

2The Graduate School of Chinese Academy of Agricultural Sciences, Beijing 100081, China

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摘要 旱地土壤上硝态氮是作物吸收和利用的主要无机氮形态。硝态氮不仅是植物营养的主要氮源，而且还可以作为信号物质调节植物根系生长发育。为适应土壤中硝态氮非均衡供应，植物侧根发育往往呈现出可塑性反应。本文综述了植物侧根生长发育对硝态氮供应的响应机制。在拟南芥、玉米、大麦等植物上研究表明，硝态氮对植物侧根发育具有双向调节途径，即：1)局部供应硝态氮，硝态氮自身作为信号物质通过信号传导通路发生作用，对侧根具有伸长的刺激效应，硝态氮转运蛋白AtNRT1.1作用于转录因子ANR1的上游，ANR1的转录调节侧根发育；2)植物组织中高浓度的硝态氮对侧根分裂组织活动具有抑制效应，植物激素如生长素和脱落酸可能参与其中的信号传导过程。近些年来研究发现小RNA也参与调控硝态氮供应下植物侧根发育。

关键词： 侧根 硝态氮 响应机制

Abstract： Nitrate (NO3-) is the main source of inorganic nitrogen for plants in aerobic soil conditions. Adequate supply of nitrate is necessary for good plant growth. Plant lateral root development can show morphological plasticity in response to the heterogeneous supply of soil nitrate. In barley, Arabidopsis thaliana and maize, the effects of the nitrate supply on root growth and development have been identified. These are a localized stimulatory effect of external nitrate on lateral root elongation and a systemic inhibitory effect of high tissue nitrate concentrations on lateral root growth. A review is given on the study progress of the mechanisms underlying plant lateral root development under different concentrations of nitrate. Several sensing and signaling pathways are involved in root nitrate responses in Arabidopsis thaliana. The MADS-box transcription factor ARABIDOPSIS NITRATE-REGULATED1 (ANR1) is associated with external nitrate abundance. Nitrate transporters such as o NRT1.1 and NRT2.1 may also be components of signaling pathways. Systemic inhibition of LR development has been linked to abscisic acid. Long-distance signals mediating the shoot response to nitrate perception in roots may also involve auxin signalings. MicroRNAs have also been shown to modulate LR emergence in response to nitrate.

Keywords： lateral root nitrate mechanisms underlying

Received 2010-06-24; published 2011-06-24

Fund:

国家级项目

Corresponding Authors: 汪洪 Email: wanghong@caas.ac.cn

引用本文:

汪洪 高翔 陈磊 王盛锋 刘荣乐.硝态氮供应下植物侧根生长发育的响应机制[J] 植物营养与肥料学报, 2011,V17(4): 1005-1011

.The mechanisms underlying plant lateral root development in response to nitrate[J] Acta Metallurgica Sinica, 2011,V17(4): 1005-1011

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