

## 不同状态绿豆根边缘细胞对Cd<sup>2+</sup>的响应

### Response of mung bean root border cells to cadmium in relation to their status

中文关键词: [绿豆](#), [Cd<sup>2+</sup>](#), [根边缘细胞](#), [PME活性](#)

Key words: [Mung bean](#), [Cd<sup>2+</sup> toxicity](#), [Root border cell](#), [PME](#)

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作者	单位	E-mail
<a href="#">王亚男</a>	<a href="#">四川师范大学生命科学学院</a>	yanan.w@163.com
<a href="#">姜华</a>	<a href="#">四川师范大学生命科学学院</a>	
<a href="#">王煜</a>	<a href="#">四川师范大学生命科学学院</a>	
<a href="#">马丹炜</a>	<a href="#">四川师范大学生命科学学院</a>	
<a href="#">李欣欣</a>	<a href="#">四川师范大学生命科学学院</a>	
<a href="#">汪利沙</a>	<a href="#">四川师范大学生命科学学院</a>	

#### 中文摘要:

以绿豆 (*Phaseolus radiatus*) 为材料, 采用琼脂悬空培养法和培养皿滤纸培养法, 以不同浓度的Cd<sup>2+</sup>处理洗脱根边缘细胞和未洗脱根边缘细胞的绿豆根尖, 研究了离体状态和活体状态绿豆根边缘细胞对镉毒的响应。结果表明: 在Cd<sup>2+</sup>的诱导下, 离体状态的绿豆根边缘细胞凋亡和分泌黏液, 同时随着Cd<sup>2+</sup>浓度的升高, 其存活率逐渐递减; Cd<sup>2+</sup>具有诱导根尖产生根边缘细胞的作用, 根尖释放的根边缘细胞数量随着Cd<sup>2+</sup>浓度的增加先增多后减少, 其中, 50μmol L<sup>-1</sup> Cd<sup>2+</sup>处理在洗脱组和未洗脱组均呈现最大诱导效应; Cd<sup>2+</sup>对根边缘细胞的活性具有影响, 随着Cd<sup>2+</sup>浓度的增加, 根边缘细胞的存活率在未洗脱组逐渐降低, 而洗脱组则先升高后降低。与对照相比, 25μmol L<sup>-1</sup>, 200μmol L<sup>-1</sup>, 400μmol L<sup>-1</sup> Cd<sup>2+</sup>在各处理时间段具有显著性差异 ( $p < 0.05$ ); 根冠果胶甲基酯酶活性 (PME) 随着Cd<sup>2+</sup>浓度的增加呈现上升趋势, 处理24h高浓度Cd<sup>2+</sup>均会引起根冠PME活性的显著性升高 ( $p < 0.05$ )。以上结果表明, 受到Cd<sup>2+</sup>胁迫时, 绿豆根尖可释放更多根边缘细胞, 并通过离体根边缘细胞形成黏液层、凋亡等来抵御Cd<sup>2+</sup>对根尖的毒害作用。

#### 英文摘要:

Mung bean (*Phaseolus radiatus*) was used as subject in this study exploring responses of root border cells to cadmium toxicity in vitro and in vivo with the methods of pre-suspended culture using agar pour plate and filter paper pad in the later part of the culture. In the experiment mung bean root tips with root border cells unwashed in group A and washed off in group B were treated with different concentrations of Cd<sup>2+</sup>. Results show that Cd<sup>2+</sup> induced apoptosis and then mucus secretion of the root border cells in vitro. Survival rate of the root border cells in vitro decreased with increasing concentration of Cd<sup>2+</sup>. It was also found that Cd<sup>2+</sup> induced in vivo generation of root border cells, of which the number increased first and then decreased with the increasing Cd<sup>2+</sup> concentration. The maximum induction effect was observed when the roots were treated with 50μmol L<sup>-1</sup> Cd<sup>2+</sup>, regardless of whether the root border cells were washed off or not; Cd<sup>2+</sup> affected survival rate of the root border cells, and in Group A, the survival rate of root border cells decreased gradually with the increasing Cd<sup>2+</sup> concentration, but in Group B it increased first and decreased later. Compared with the control, the treatments of 25μmol L<sup>-1</sup>, 200μmol L<sup>-1</sup> and 400μmol L<sup>-1</sup> varied significantly ( $p < 0.05$ ), PME activity of root cap increased with increasing Cd<sup>2+</sup> concentration, and the effect was significant ( $p < 0.05$ ) when the roots were treated with a high concentration of Cd<sup>2+</sup> concentration for 24h. All the above-described findings indicate that mung bean root tips can release more root border cells under Cd<sup>2+</sup> stress, and the detached root border cells form a layer of mucilage and apoptotic cells to protect the root tips against Cd<sup>2+</sup>.

王亚男, 姜华, 王煜, 马丹炜, 李欣欣, 汪利沙. 不同状态绿豆根边缘细胞对Cd<sup>2+</sup>的响应[J]. 土壤学报, 2013, 50(1): 165-170. Wang Yanan, Jiang Hua, Wang Yu, Ma Danwei, Li Xinxin and Wang Lisha. Response of mung bean root border cells to cadmium in relation to their status[J]. Acta Pedologica Sinica, 2013, 50(1): 165-170

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地址：南京市北京东路71号 邮编：210008 Email: actapedo@issas.ac.cn

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