

## EDDS对印度芥菜Cu积累的影响及与P-ATPase的关系研究

The effect of EDDS on the accumulation of Cu in Indian mustard in relation to the plasma membrane P-type ATPase

中文关键词: [Cu](#) [EDDS](#) [P-ATPase](#) [印度芥菜](#)

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### 中文摘要:

印度芥菜是一种常用的研究植物吸收、积累重金属的模式植物。本实验通过水培的方法研究了可降解螯合剂EDDS诱导下印度芥菜对Cu积累的特点,并分析了根系中与Cu主动排出有关的P型ATPase的活性及其基因表达。结果表明:根系中Cu的积累量随外界浓度的升高而升高,但Cu在茎秆与叶片中的积累量则变化不大。但是随着外加EDDS浓度的增加,根、茎、叶中的Cu的积累量均出现下降的趋势。上述结果表明,根系以Cu离子为主要的吸收形式,而不是EDDS-Cu。通过对印度芥菜根系细胞膜上P型ATPase活性及基因表达发现,不加EDDS时,随着外界Cu浓度的升高,ATPase活性增强,但是当达到16  $\mu\text{mol/L}$  Cu时出现降低的趋势。相反,ATPase活性随着外加EDDS的浓度增加反而降低。RT-PCR分析结果表明,该ATPase的基因(BjHMA)在转录水平上的表达与活性变化一致。由于印度芥菜可以通过P型ATPase的作用将过量吸收的Cu排出细胞,上述结果说明,其活性大小以及转录水平的变化受到外界Cu离子浓度的诱导,但是仅在一定的范围内可以调节植物对Cu的积累。

### 英文摘要:

Indian mustard (*Brassica juncea* L.) is a plant species used to investigate accumulation of heavy metals. In this study, a hydroponics experiment was conducted to investigate the accumulation of Cu by Indian mustard with application of EDDS, a biodegradable chelator for phytoremediation. The activity of P-type ATPase, a heavy metal ATPase (HMA) responsible for the Cu export, and its transcriptional expression in roots was analyzed. The results showed that increased accumulation of Cu with elevated Cu concentration in medium was only occurred in roots, but not in stems or leaves. The accumulation of Cu in roots, stems and leaves was decreased with elevated EDDS concentration. The results indicated that the uptake of Cu was controlled by plasma membrane of roots and Cu ions rather than Cu-EDDS chelator complexes were taken up by roots. The activity of P-type ATPase in roots was increased with elevated Cu concentration, but decreased with elevated EDDS concentration. The expression pattern of P-type ATPase gene (BjHMA) was in according to the change of its activity. Our results indicated that P-type ATPase might regulate Cu uptake in Indian mustard by actively exporting Cu outside root cells amongst a certain range of ambient Cu concentration.

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