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鼠李糖脂对底泥中17 $\alpha$ -炔雌醇生物降解性的作用 

### Effects of rhamnolipids on the bioavailability of 17 $\alpha$ -ethinylestradiol in sediment

关键词: [鼠李糖脂](#) [17 \$\alpha\$ -炔雌醇](#) [生物降解](#) [代谢产物](#)

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摘要: 采用HPLC-ESI-MS分析了铜绿假单胞杆菌诱变株MIG-N146的发酵液粗提物,发现其中含有15种鼠李糖脂同系物,临界胶束浓度(CMC)为0.125 mmol · L<sup>-1</sup>,最小平均表面张力为29.2 mN · m<sup>-1</sup>,表面活性良好.同时,通过摇瓶实验,考察了不同浓度鼠李糖脂(RL)对底泥中17 $\alpha$ -炔雌醇(EE2)生物降解性的影响.结果表明,随着鼠李糖脂浓度的增加,EE2的生物降解速率常数 $k$ 值逐渐增大,可生物降解性增强.在浓度低于2.0 mmol · L<sup>-1</sup>的鼠李糖脂作用下,EE2的生物降解效率仅稍有提高;而浓度高于6.0 mmol · L<sup>-1</sup>后,水/底泥混合体系中EE2的生物降解速率提高至1.346 d<sup>-1</sup>以上,是无鼠李糖脂时的2.9倍以上.当鼠李糖脂浓度达到10.0 mmol · L<sup>-1</sup>时,2 d内混合体系中EE2的降解率可达到90%.HPLC-PDA检测显示,鼠李糖脂易被微生物降解,不会在环境中长期残留;EE2降解过程中检测出2种中间产物,鼠李糖脂会影响EE2代谢中间产物的相对含量,但不会改变EE2的代谢途径.

**Abstract:** Liquid chromatography/mass spectrometry (HPLC-ESI-MS) was used to analyze the crude extracts of fermentation liquor produced by *Pseudomonas aeruginosa* mutant strain MIG-N146. Fifteen types of rhamnolipid homologues were identified, and the critical micelle concentration (CMC) of rhamnolipids (RL) was 0.125 mmol · L<sup>-1</sup> with average minimal surface tension of water being 29.2 mN · m<sup>-1</sup>, indicating a good surface activity of RL. The effects of different concentrations of rhamnolipids on the bioavailability of 17 $\alpha$ -ethinylestradiol (EE2) in sediment were tested by shaking flask experiment. The results indicated that the biodegradation rate constant  $k$  of EE2 increased with increasing dosages of rhamnolipids, and its bioavailability was thus enhanced. EE2 biodegradation was slightly improved at RL dosages below 2 mmol · L<sup>-1</sup>, but the biodegradation rate constant  $k$  was higher than 1.346 d<sup>-1</sup> at RL dosages above 6 mmol · L<sup>-1</sup>, which was more than 2.9 times of that without RL. Almost 90% of EE2 were removed in 2 d by adding 10 mmol · L<sup>-1</sup> RL. The results of HPLC-PDA displayed that RL was easily biodegraded by microorganism, and thus would not residue in the environment for a long time. Two intermediates of EE2 were also detected during its biodegradation, the dosages of which were affected by the presence of RL, but the metabolic pathway of EE2 was not affected by RL.

**Key words:** [rhamnolipids](#) [17 \$\alpha\$ -ethinylestradiol](#) [biodegradation](#) [intermediates](#)

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