

生物化学工程与技术

紫色杆菌素合成工程菌太空诱变效应及其高产菌株的筛选

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摘要

利用太空搭载(“神舟七号”航天飞船)对合成紫色杆菌素的弗氏柠檬酸杆菌(*Citrobacter freundii*)基因工程菌株进行了太空诱变,平板和液体发酵筛选实验表明太空诱变后菌株突变率达到70%左右,其中正向突变率7.3%,负向突变率为61.2%。筛选到一株紫色杆菌素高产突变菌株 M_{S4} ,该菌株在摇瓶水平上,以0.45%(体积分数)的甘油为碳源,于20℃发酵32 h,紫色杆菌素浓度达到 $2.16 \text{ g} \cdot \text{L}^{-1}$,较出发菌株提高约143.8%。遗传稳定性、HPLC和DNA序列分析结果表明太空搭载突变菌株有很高的遗传稳定性,产生的紫色杆菌素比例比出发菌株有明显提高,但是紫色杆菌素生物合成基因簇序列没有发生突变,表明太空搭载有可能对菌株的基因调控网络产生了影响。

关键词

[紫色杆菌素](#) [脱氧紫色杆菌素](#) [太空诱变](#) [天然色素](#)

分类号

Outer space mutagenesis of violacein-producing strain and screening of mutants with high violacein productivity

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Abstract

Outer space mutation of violacein-producing bacterium was carried out by the space piggyback of manned spacecraft Shenzhou-7. The original strain for the mutation was engineered by introducing violacein-synthesizing gene cluster into *Citrobacter freundii*. The plate screening and liquid fermentation experiments showed that the mutation ratio of violacein-producing strain reached to 70%, and the mutation range for violacein productivity was from -61.2% to 7.3%. The violacein concentration produced by the selected efficient strain M_{S4} was $2.16 \text{ g} \cdot \text{L}^{-1}$ using 0.45% (vol) of glycerol as the carbon source in shake flask culture for 32 h at 20°C, which was about 143.8% higher than that produced by the original engineered strain. By serial subculture experiment, HPLC, and DNA sequencing, the screened mutant strain showed high genetics stability and obvious difference from the original strain on the component of crude violaceins, but there was no change in the DNA sequence of the violacein biosynthesis gene cluster, indicating that the space piggyback is likely having impacts on the gene regulatory networks of space-mutated strain.

Key words

[violacein](#) [deoxyviolacein](#) [space-mutated](#) [natural pigment](#)

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