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一株解淀粉芽胞杆菌的分离鉴定及水质净化效果的研究

Identification of a *Bacillus amyloliquefaciens* strain and its potential application in water purification

关键词：解淀粉芽胞杆菌 分离鉴定 水质净化

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摘要：采用富集培养及摇瓶实验,从污染河沟底质活性污泥中分离筛选到1株对亚硝态有较强转化能力的菌株HN.经形态特征、生理生化特性、16S rDNA 基因序列分析、细胞脂肪酸组成及Biolog全自动微生物鉴定系统分析,鉴定菌株HN为解淀粉芽胞杆菌(*Bacillus amyloliquefaciens*),并在3种模拟水体环境中对菌株HN的水质净化效果进行了初步研究.结果表明,该菌株在试验第4 d能将高浓度模拟污水(水样Ⅰ)、鲫鱼养殖废水(水样Ⅱ)、鲤鱼和对虾养殖废水(水样Ⅲ)中初始浓度分别为6.47、1.20和4.50 mg·L^{-1}的亚硝态氮去除100%、46%和100%,而对照的转化率分别为-10.4%、-800%和16.0%,同时对硝态氮也表现较强的去除能力且基本不累积氨氮.环境耐受性试验表明,该菌株在20~45 ℃、pH5.0~10.0、海盐浓度0.5%~3.0%的范围内都能正常生长.研究认为,解淀粉芽胞杆菌HN能显著降低水体中亚硝态氮和硝态氮的含量,且环境耐受力强,有望将其开发成高效的水产养殖水体净化微生态制剂.

Abstract: In this study we isolated a *Bacillus* strain, strain HN, by enrichment and shaking culture from the sludge of a polluted river in Xiqing district of Tianjin, China. This strain could convert both nitrate and nitrite effectively. According to morphological and physio-biochemical characteristics, 16S rDNA gene sequence analysis, fatty acid composition and Biolog automated microbial identification analysis, the strain was identified as *Bacillus amyloliquefaciens*. *B. amyloliquefaciens* is similar to *Bacillus subtilis* in phenotype, and it could produce antifungal metabolites and enzymes. *B. subtilis* has been widely applied as probiotics in aquiculture to purify the polluted water. However, few studies on the application of *B. amyloliquefaciens* in aquiculture has been reported till now. The purpose of this work was to study the potential water purification ability of *B. amyloliquefaciens* HN in order to obtain excellent strains for aquiculture water purification. Strain HN was tested under three kinds of water conditions, i.e. high concentration mixed pollutants (water I), crucian aquiculture water (water II), and cyprinoid and prawn aquiculture water (water Ⅲ). Their original nitrite concentration were 6.47, 1.20 and 4.50 mg·L^{-1}, respectively. After four days' treat by strain HN, nitrite was removed by 100% in water I, 46% in water II and 100% in water III while the degradation rates of the controls were -10.4%, -800% and 16.0%, respectively. Furthermore, nitrate in the three kinds of water could be almost completely removed and ammonia was hardly accumulated. From environmental endurance tests, we found that strain HN could grow normally in the culture with the temperature from 20 ℃ to 45 ℃, initial pH from 5.0 to 10.0 and salinity from 0.5% to 3.0%. Considering its high nitrite and nitrate removal ability as well as strong environmental tolerances, we suggested that *B. amyloliquefaciens* HN would be a promising microorganism strain for water purification in aquiculture.

Key words: *Bacillus amyloliquefaciens* isolation and identification water purification

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