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一种能同时固定CO₂和N₂的微生物——兼性固CO₂、N₂菌的分离鉴定及其验证实验

Isolation, identification and validation of the facultative fixed carbon and nitrogen bacteria: A type of microorganisms that can fix CO₂ and N₂ at the same time

关键词: [微生物固碳](#) [兼性固碳氮菌](#) [无碳氮培养基](#) [固碳酶](#) [固氮酶](#)

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摘要: "温室效应"日趋严重,生物固碳特别是微生物固碳将发挥独特的作用.固定N₂的微生物固氮菌和固定CO₂的微生物固碳菌早已被研究和发现,但能同时固定大气中的CO₂、N₂并以CO₂、N₂分别为碳、氮源的微生物至今未见报道,本研究称之为兼性固CO₂、N₂菌.研究通过固碳菌、固氮菌培养基的优化组合出无碳、氮培养基(分别以空气中的CO₂、N₂为碳源和氮源);通过无氮碳源的兼性固碳氮菌培养基进行分离,筛选分离到一株分别以CO₂和N₂为碳源和氮源.通过对该菌株的生长特性和固碳酶活性及固氮酶活性进行测定;利用PCR和琼脂糖凝胶电泳技术检测到该菌含有固碳酶RubisCO中*cbbL*基因及固氮酶*nifH*基因片段的特异性条带;对该菌进行对照验证实验证明该菌能同时固定空气中的CO₂和N₂并分别以CO₂和N₂为碳源和氮源;最后对其形态观察和16S rRNA全序列分析证明该菌株HSJ隶属于链霉菌.

Abstract: Currently, greenhouse effect becomes more and more serious, and biological carbon-fixing, especially microbial biological carbon-fixing, can play a unique role in curbing the greenhouse effect. The N₂-fixing microbial azotobacter and the CO₂-fixing bacteria have been discovered for years. However, there is few report about microorganisms that can fix CO₂ and N₂ simultaneously while taking CO₂ and N₂ separately as microbial carbon and nitrogen sources. Such a microorganism was defined as facultative CO₂ and N₂-fixing bacteria in this study. A carbon and nitrogen-free medium was optimized by carbon-fixing medium and nitrogen-fixing medium. A strain of CO₂ and N₂ as the carbon source and nitrogen source, respectively, was isolated by a nitrogen and carbon-free culture medium and was labeled as HSJ. In addition, the HSJ's characteristics of carbon fixation enzyme activity and nitrogenase activity was determined. The HSJ with a carbon fixation enzyme specificity of *cbbL* gene stripe (*cbbL* in RubisCO genes) and nitrogen-fixing enzyme specificity of *nifH* gene stripe was detected by PCR and agarose gel electrophoresis. To testify fixation of CO₂ and N₂ in the air simultaneously with CO₂ and N₂ separately as the carbon and nitrogen sources, validation testing of the bacterium HSJ was carried out. The observation morphology and sequence analysis of 16S rDNA of the HSJ is subordinate to the strains of *Streptomyces*.

Key words: [microbial carbon-fixing](#) [facultative CO₂ and N₂-fixing bacteria](#) [carbon and nitrogen-free medium](#) [carbon fixation enzymes](#) [nitrogenase](#)

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