徐智广,邹定辉,高坤山,李美真.不同温度、光照强度和硝氮浓度下龙须菜对无机磷吸收的影响[J].水产学报,2011,35(7):1023~1029

不同温度、光照强度和硝氮浓度下龙须菜对无机磷吸收的影响

Effects of temperature,irradiance level and nitrate concentration on the uptake of inorganic phosphorus in *Gracilaria lemaneiformis* (Rhodophyta)

投稿时间：2010/8/17 最后修改时间：2011/4/26

DOI：10.3724/SP.J.1231

中文关键词：龙须菜 无机磷 吸收动力学 温度 光照强度 硝氮

英文关键词:*Gracilaria lemaneiformis* (Rhodophyta) inorganic phosphorus uptake dynamics temperature irradiance nitrate

基金项目:国家海洋公益性行业科研专项经费项目(20090519-2,200905020-2);山东省科技攻关计划(2009GG10005012);国家自然科学基金资助项目(No.41076094和30970450);教育部“新世纪优秀人才支持计划”项目(NCET-10-0375)

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中文摘要:

龙须菜的细胞壁含有丰富的胶质成份,是琼胶生产的良好原料,在中国沿海已经形成了大规模的人工养殖。同时,随着中国近海富营养化现象的日趋严重,龙须菜的规模养殖被认为是缓解海水富营养化的一条有效途径。以探讨龙须菜的生物修复功能为目的,研究了龙须菜对无机磷吸收的基本特征以及不同温度、光照强度和硝氮浓度对其的影响。整个实验在实验室可控条件下进行,分别设置了3个不同温度:15、23和31 ℃;3个不同的光照强度:0、30和200 μmol photons/(m^2 • s)和3个不同的硝氮浓度:0、30和200 μmol/L,测定了在不同的条件下培养的龙须菜对无机磷吸收的动力学曲线。结果表明:龙须菜对无机磷的吸收动力学曲线符合典型的米氏方程特征,并且吸收能力随温度和硝氮浓度的升高而增大,吸收效率在较低温度(15 ℃)和接近自然海水的硝氮浓度条件(30 μmol/L)下较高;而低光照强度下［30 μmol photons/(m^2 • s)］的吸收能力和吸收效率均高于黑暗和高光强条件［200 μmol photons/(m^2 • s)］。由此可见,温度、光照强度及硝氮浓度等环境因子都影响龙须菜对无机磷的吸收特性,但是,其具体的机制仍需进一步深入研究。

英文摘要:

Gracilaria lemaneiformis (Bory)Weber van Bosse is an economically important red seaweed that is cultivated on a large scale in China due to the quantity and quality of agar in its cell walls.This alga is also considered an excellent species for alleviating coastal eutrophication,which has become ever more serious in China.To aim at such a function of bioremediation,in this study,the characteristics of inorganic phosphorus(Pi)uptake in *G.lemaneiformis* were investigated.Thalli were incubated in artificial seawater with *f*/2 enrichment and different Pi concentrations under different conditions of temperature(15,23,31 ℃),irradiance levels［0,30,200 μmol photons/(m^2 • s)］and nitrate concentrations(0,30,200 μmol/L),and the uptake dynamics of Pi were determined.The results showed that the uptake dynamic curve of Pi was always accordant with Michaelis-Menten equation under various conditions.The maximal uptake rate of Pi increased with the enhancements of temperature and nitrate concentration.However,the ratio of maximal uptake rate and half saturation constant(V_m/K_s),which represented the efficiency of Pi uptake,was the highest at the lowest temperature(15 ℃)and the level of nitrate concentration close to natural seawater(30 μmol/L).Both the maximal uptake rate and efficiency were higher at lower irradiance level［30 μmol photons/(m^2 • s)］than at higher level［200 μmol photons/(m^2 • s)］or dark［0 μmol photons/(m^2 • s)］.It is concluded that environmental factors such as temperature,irradiance level and nitrate concentration,could significanty affect the Pi uptake in *G.lemaneiformis*,and the mechanisms should be further studied in detail.

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