小球藻共生菌的分离鉴定及藻菌共生系统的构建

Isolation and identification of symbiotic bacteria of *Chlorella vulgaris* and construction of algae-bacteria co-culture system

王其鹏，张达娟，王鑫鑫，张树林*

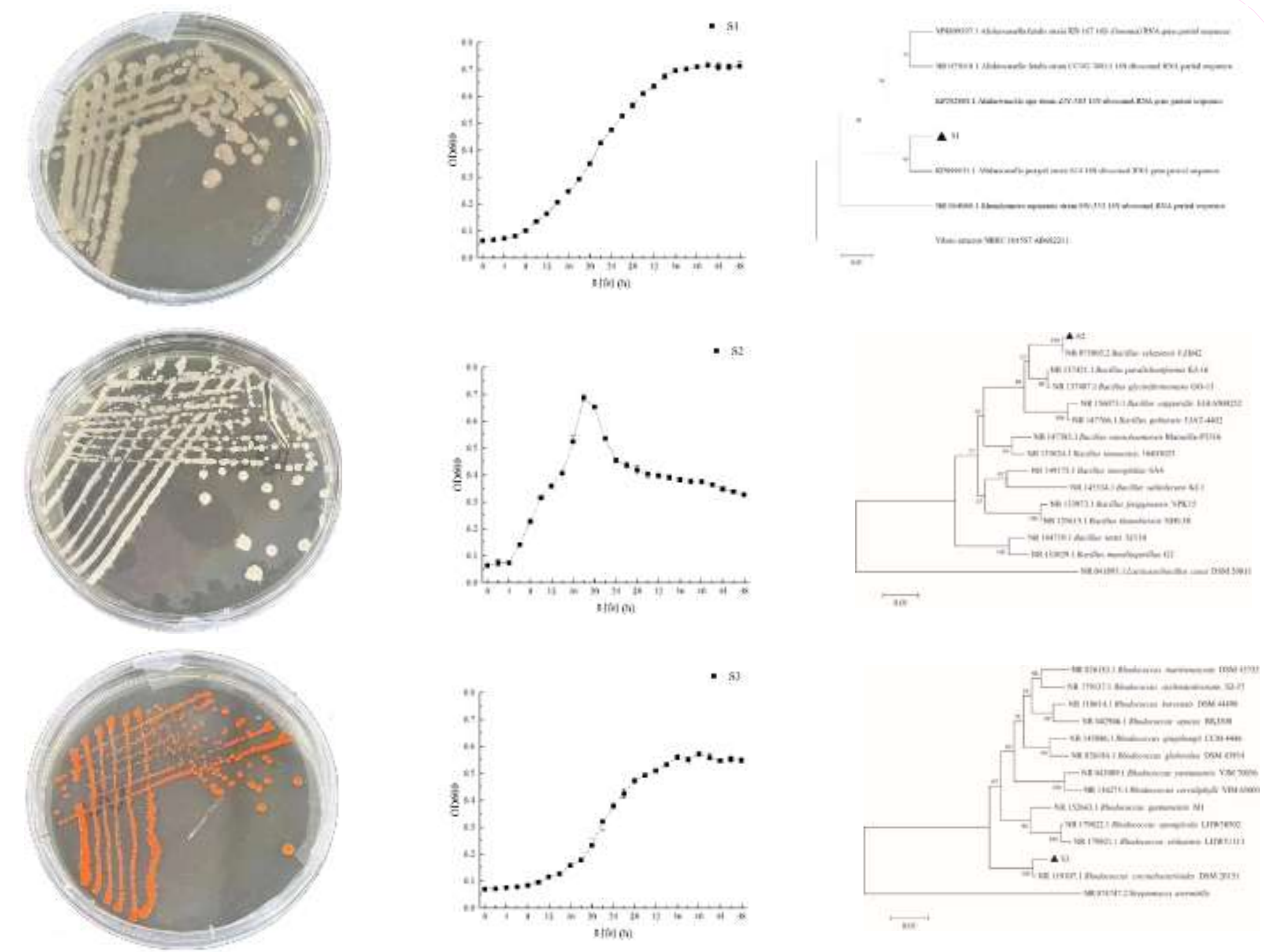
（天津市水产生态及养殖重点实验室/天津农学院水产学院，天津 300384）

The synergistic effect of algae-bacteria is achieved by optimizing the algae and bacteria community in the water environment and constructing the algae-bacteria system reasonably, which is important for water purification and resource utilization. Bacteria were isolated from phycosphere of *Chlorella vulgaris*, and gene sequencing, morphological observation and biochemical test were carried out to determine the bacterial species and biochemical characteristics in this study. Moreover, a stable algal bacterial co-culture system was constructed based on examined the effects of different bacterial strains on the growth of *C. vulgaris*, and screened algae growth promoting bacteria and optimal inoculation ratios. The results showed that three strains of bacteria were identified as *Alishewanella jeotgali*, *Bacillus velezensis* and *Rhodococcus corynebacterioides*, and all the three strains of bacteria could promote the growth of *C. vulgaris*. The *Fv*/*Fm* of the three algal-bacteria systems were significantly higher than that of *C. vulgaris* (*P*<0.05). The algal cell density of *C. vulgaris* amounted to 29.65×10^{6} cells/mL in the algae-bacteria system constructed by *B. velezensis*, was significantly higher than that of other algae-bacteria systems (*P*<0.05). Under the same culture conditions, Chl-a content of *C. vulgaris* reached at 5.68 mg/L on the 8th day when the inoculation ratio of *C.vulgaris* and *B. velezensis* was 1:3. The algal cell density reached 33.05×10^{6} cells/mL, which was significantly higher than that of other combinations of ratios (*P*<0.05).

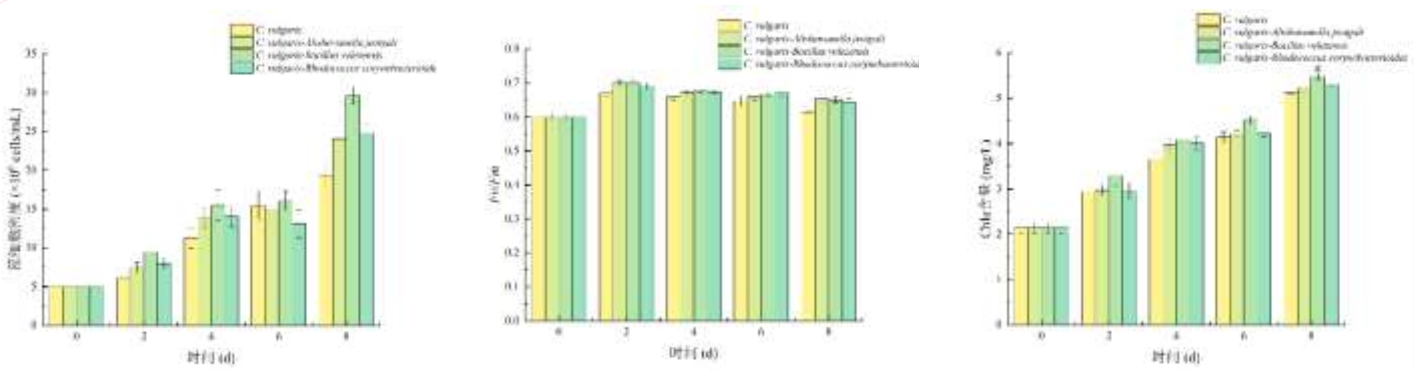
菌株S1白色，菌落圆形，不透明，中间凸起，边缘光滑，易挑起，湿润。在0~8 h处于延滞期，10~32 h处于指数生长期，34 h后达到稳定期。

菌株S2白色，菌落圆形，隆起，不透明，表面褶皱，易挑起。在0~4 h处于延滞期，4~16 h处于指数生长期，18 h后达到稳定期，20 h时进入衰亡期。

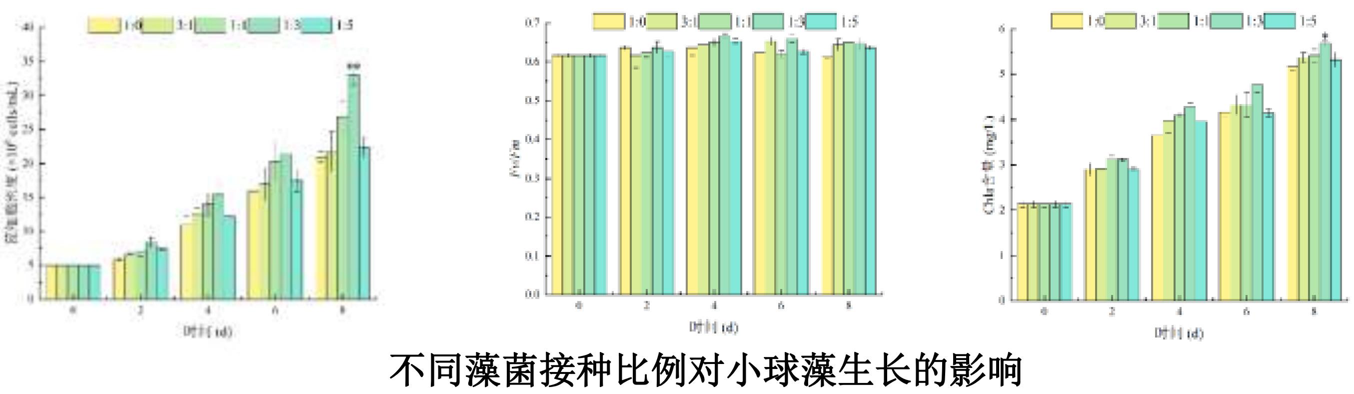
菌株S3橘红色，菌落圆形，隆起，边缘整齐，略透明，表面光滑，湿润；随着培养时间的延长，菌落颜色逐渐加深。在0~16 h处于延滞期，18~28 h处于指数生长期，34 h后达到稳定期。



菌株形态结构、生长曲线及系统发育树



不同菌株对小球藻生长的影响



不同藻菌接种比例对小球藻生长的影响

3株菌均可促进小球藻生长，且藻菌体系*Fv/Fm*均显著高于小球藻纯培养体系（*P*<0.05），贝莱斯芽胞杆菌与小球藻构建的藻菌共培养体系中，藻细胞密度达29.65×10^{6} cells/mL，显著高于其它藻菌体系（*P*<0.05）。相同培养条件下藻菌接种比例为 1:3 时小球藻Chl-a含量在第8 d达5.68 mg/L，藻细胞密度为33.05×10^{6} cells/mL，显著高于其它比例组合（*P*<0.05）。

1. 陈永志,黄翔鹄,朱春华等.一株微藻附生菌的分离鉴定及藻菌体系的氮吸收特性[J].广东海洋大学学报,2022,42(04):49-63. DOI:10.3969/j.issn.1673-9159.2022.04.006.
2. 王书亚,李志,高仪瑶等.藻菌共培养体系优势菌株筛选及沼液处理[J].农业资源与环境学报,2019,36(01):121-126.DOI:10.13254/j.jare.2018.0068.