Screening of microalgae for wastewater purification

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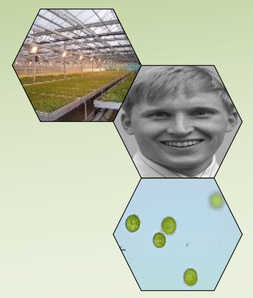
B G T Biosystems Engineering



introduction

In India wastewater treatment plants usually do not contain biological treatment steps. This causes high fertilizer input into lakes and rivers. Microalgae are capable of taking nutrients from wastewater[4]. As a study of feasibility nitrogen and phosphorous reduction capacity of a *Nannochloropsis salina* culture has been studied.

material & methods

culture of algae

temperature: 25 °C ± 2 °C
light: 30 µmol $m^{-2}s^{-1}$
algae: *Nannochloropsis salina*

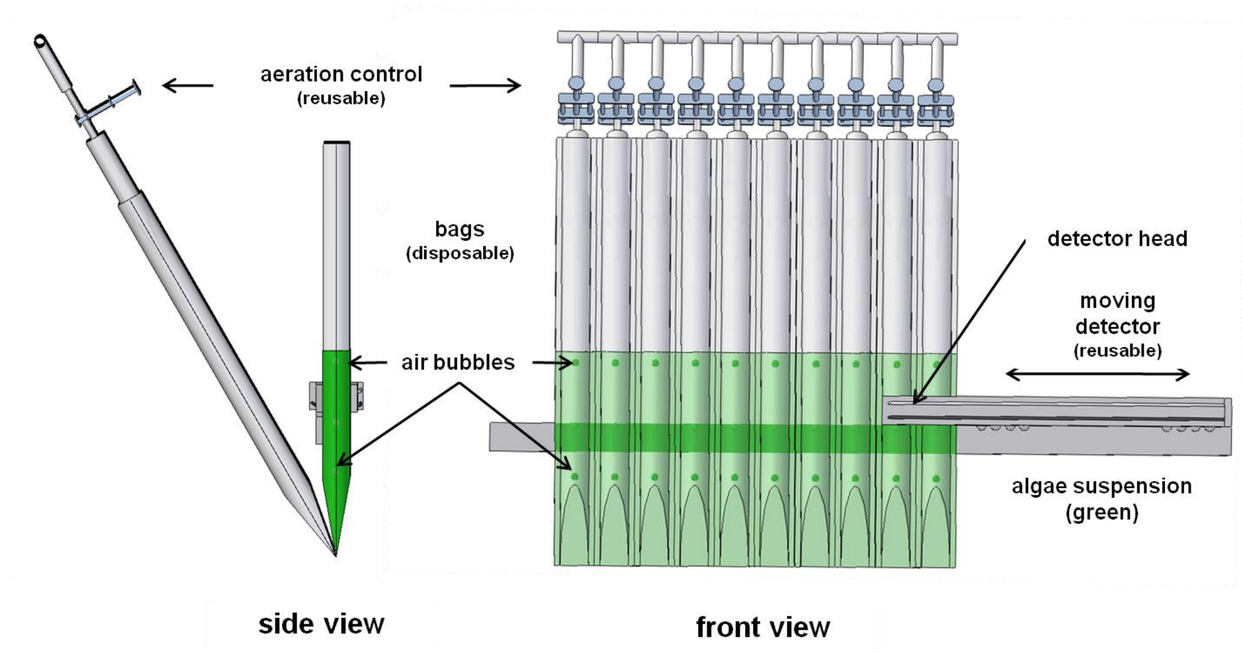
wastewater

wastewater from sewage treatment plant (VIT)[5]
factor design: 0 (seawater), 25, 50, 75 and 100 % (v/v) wastewater
nitrogen: 0.76 mg/L (KNO_3)
phosphorous: 0.33 mM ($Na_2HPO_4 * 2H_2O$)

analysis & calculation

phosphorous[1] modified
nitrogen[3] modified
specific growth rate[2]

disposable airlift-reactor



results

Maximum growth rate of 0.30 d^{-1} in a wastewater concentration of 75 % causes doubling time of algae every 2.3 days.
After a culture of 10 days in 75 % wastewater, phosphorous and nitrogen was reduced to 72.8 % and 80.4 %, respectively (figure 1).

N. salina growthrate increases by culturing in wastewater in stead of standard seawater medium. In 100 % wastewater, growth is not inhibited (figure 2), only the phosphorous reduction is decreased.

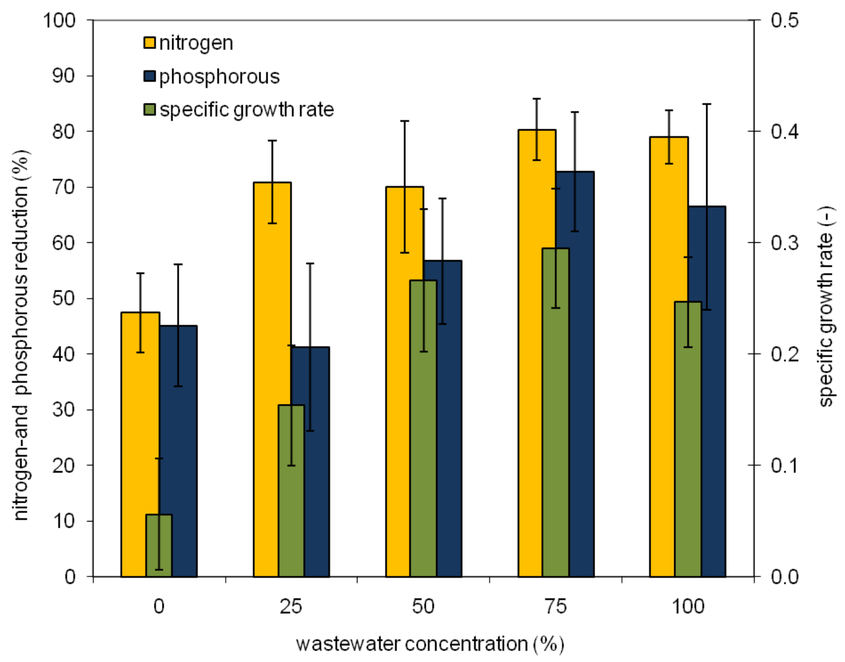


figure 1: analysis of nitrogen and phosphorous

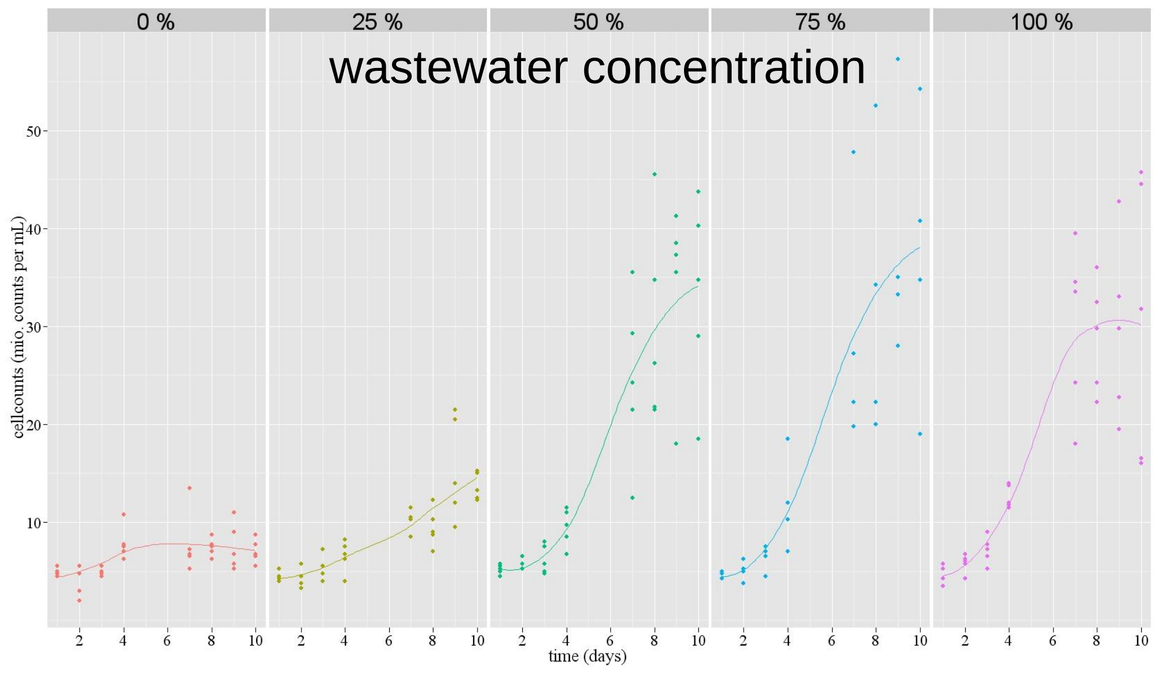


figure 2: growth curve of N. salina

conclusion

1. ***N. salina* is qualified for sewage purification because the algae grows in pretreated wastewater**
2. **Highest growth rate is measured in 75 % (v/v) of wastewater**
3. **A significant reduction of nitrogen and phosphorous contents in growth media is observed**

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[2] Levasseur, M., Thompson, P.A., Harrison, P.J., 1993. Physiological acclimation of marine phytoplankton to different nitrogen sources. J Phycol 29, 587-595.
[3] Perkampus, H.-H., 1986. UV-VIS-Spektroskopie und ihre Anwendungen. Springer Verlag Berlin.
[4] Ruiz-Marin, A., Mendoza-Espinosa, L.G., Stephenson, T. , 2010: Growth and nutrient removal in free and immobilized green algae in batch and semi-continuous cultures treating real wastewater. Bioresource Technology 101, 58-64.
[5] Seenivasan, R., 2010. Abwasserproben von der VIT-University, School of Bio Sciences and Technology, Vellore , Tamil Nadu, India.

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