# Competitive dominance of

Microcystis aeruginosa and Raphidiopsis raciborskii (previously Cylindrospermopsis raciborskii) are both common bloom-forming cyanobacteria which can coexist but alternatively dominate in freshwater ecosystems. To predict their blooming dynamics, we need to understand the potential environmental factors determining their succession. In the present study, we examined the pairwise competition of the three M. aeruginosa strains (FACHB905, 469 and 915) with one R. raciborskii strain (N8) at three temperature levels (16 °C, 24 °C, and 32 °C). We found that the competitive ability of three Microcystis strains were highly variable. M. aeruginosa FACHB905 was the strongest competitor among them which can finally exclude R. raciborskii N8 regardless of initial biovolume ratios and temperature levels. The competitive exclusion of N8 by 915 also was observed at 24 °C, but they coexisted at 16 °C and 32 °C. We observed that M. aeruginosa FACHB469 and R. raciborskii N8 were able to coexist under all the temperature levels, and M. aeruginosa FACHB469 was the weakest competitor among the three M. aeruginosa strains. Rates of competitive exclusion (RCE) showed that temperature affects the competition between three M. aeruginosa strains and R. raciborskii N8. M. aeruginosa strains always grew quickly at 24 °C and significantly enlarged its dominance in the co-culture system, while R. raciborskii N8 was able to maintain its initial advantages at both 16 and 32 °C. The competitive advantage of M. aeruginosa FACHB905 may be explained by allelopathic interactions through its allelochemicals and other secondary metabolites other than microcystin. We concluded that both strain difference and temperature can affect the competition between M. aeruginosa and R. raciborskii. Our results highlighted the complexity of cyanobacterial dynamics in waterbodies where there exist multiple strains.

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**Obtenir le document :** EDP Sciences
**Mots clés :** temperature, allelopathy, competition, température, allélopathie, compétition
**Date :** 2020-08-03
**Format :** text/xml
**Source :** https://doi.org/10.1051/kmae/2020023
**Langue :** Anglais
**Télécharger les documents :** https://www.kmae-journal.org/10.1051/kmae/2020023/pdf
**Permalien :** https://www.documentation.eauetbiodiversite.fr/notice/competitive-dominance-of0