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Species composition and toxicity of the genus *Pseudo-nitzschia* in Taiwan Strait, including *P. chiniana* sp. nov. and *P. qiana* sp. nov.

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ABSTRACT

In a field survey in the Taiwan Strait during April 2016, the species composition and the domoic acid production of the diatom genus *Pseudo-nitzschia* were investigated. A total of 80 strains of *Pseudo-nitzschia* were established, and species identification was determined based on a combination of morphological and molecular data. Fourteen taxa were recognized, i.e., *P. americana*, *P. brasiliana*, *P. calliantha*, *P. cuspidata*, *P. galaxiae*, *P. lundholmiae*, *P. multiseries*, *P. multistriata*, *P. pseudodelicatissima*, *P. pungens* var. *aveirensis*, *P. pungenus* var. *pungens* and *P. sabit*, as well as two novel species *P. chiniana* C.X. Huang & Yang Li and *P. qiana* C.X. Huang & Yang Li. Morphologically, *P. chiniana* is characterized by striae comprising one or two rows of poroids, and valve ends that are normally dominated by two rows of poroids within each stria. Whereas *P. qiana* is unique by having a narrow valve width (1.3–1.5 µm) and sharply pointed valve ends. Both taxa constitute their own monophyletic lineage in the phylogenetic analyses inferred from LSU and ITS2 rDNA, and are well differentiated from other *Pseudo-nitzschia* species. *Pseudo-nitzschia chiniana* forms a group with *P. abrensis* and *P. batesiana* in LSU and ITS trees, whereas *P. qiana* is sister to *P. lineola*. When comparing ITS2 secondary structure, five CBCs and seven HCBCs are recognized between *P. chiniana* and *P. abrensis*, and four CBCs and ten HCBCs between *P. chiniana* and *P. batesiana*. Two CBCs and eight HCBCs are found between *P. qiana* with *P. lineola*. The ability of the strains to produce domoic acid was assessed, including a potential toxin induction by the presence of brine shrimps. Results revealed production of domoic acid in six strains belonging to three species. Without presence of brine shrimps, cellular DA (pDA) was detected in four *P. multiseries* strains (1.6 ± 0.3, 26.6 ± 2.7, 68.3 ± 4.2 and 56.9 ± 4.7 fg cell^{-1}, separately), one strain of *P. pseudodelicatissima* (0.8 ± 0.2 fg cell^{-1}) and one strain of *P. lundholmiae* (2.5 ± 0.4 fg cell^{-1}). In the presence of brine shrimps, pDA contents increased significantly ($p < 0.05$) in *P. lundholmiae* (strain MC4218) and *P. multiseries* (strain MC4177), from 2.5 ± 0.4 to 8.9 ± 0.7 and 1.6 ± 0.3 to 37.2 ± 2.5 fg cell^{-1} respectively.

1. Introduction

1.1. Essential information about the Taiwan Strait

The Taiwan Strait (TS) is located between the Chinese mainland and Taiwan Island, and constitutes the southern part of the East China Sea. It covers from northeast to southwest an area of about 80 thousand square kilometers. The strait connecting the East China Sea and the South China Sea, has significant importance to international shipping, especially in East Asian trading with South Asian or Indian Ocean

Abbreviations: TS, Taiwan Strait; ASP, amnesic shellfish poisoning; DA, domoic acid; AIC, Akaike information criterion; BI, Bayesian analysis; CBCs, compensatory base changes; HCBCs, hemicompensatory base changes; fg, femtogram; ITS2, second internal transcribed spacer; ML, maximum likelihood; MP, maximum parsimony; NJ, neighbor joining; NNI, nearest neighbor interchange

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