PHYTOPLANKTON SPECIES COMPOSITION IN SEAWATER AND TISSUE OF GREEN MUSSELS (*PERNA VIRIDIS*), AT KALI BARU-CILINCING, NORTH JAKARTA

Riani Widiarti, Yasman, Mulyani, Nita Kurnia and Fachrul Razi

Biology Department, Faculty of Mathematics and Natural Sciences
University of Indonesia, Depok–West Java, Indonesia
E-mail: rianiwid@sci.ui.ac.id

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ABSTRACT

Species composition and abundances of phytoplankton in the shellfish farming area in Jakarta Bay, Kali Baru-Cilincing, were examined in order to identify harmful algae species. Phytoplankton contained in the shellfish was also observed to detect the presence of toxic species, as well as the phycotoxin contained in visceral of green mussel (*Perna viridis*) collected from the farming area using brine shrimp lethality test (BSLT). We detected the presence of *Alexandrium* spp. (PSP causing species), *Dinophysis caudata*, *D. miles* and *D. rotundata* (DSP causing species), and *Pseudo-nitzschia* spp. (ASP causing species). The last mentioned species was also detected in the stomach content of green mussel. The toxicity of green mussels tested was recorded $LC_{50} \leq 1{,}000$ ppm and indicated the presence of an active compound in the green mussel viscera. Meanwhile, preliminary PSP test of shellfish did not showed any toxin.

Keywords*:* brine shrimp lethality test, harmful algae, phycotoxin, Jakarta Bay.

INTRODUCTION

Jakarta Bay is known as a productive area for fishery aquaculture, especially green mussel (*Perna viridis*), which is mainly cultured at farming area of Kali Baru-Cilincing, North Jakarta. However, phenomena related to harmful algal bloom (HAB) species have commonly occurred in Indonesian waters (Praseno, 1995; Praseno et al., 1999). Kali Baru-Cilincing is also known to have high eutrophication levels and occurrences of HAB responsible species. For safe seafood production and prevention of economic loss due to HAB events, it is important to conduct routine monitoring on phytoplankton composition and detection of toxin contamination in green mussel that produced by toxic phytoplankton. This is the case of North Jakarta, because the area is the main green mussel farming sites in Jakarta, and also the main source of livelihood for the surrounding society. The objectives of the study are to detect the presence of toxic phytoplankton in the waters and inside the green mussel viscera, and to detect the presence of phycotoxin contamination in green mussel viscera using brine shrimp lethality test (BSLT) method and Jellet Rapid PSP Test.

MATERIAL AND METHODS

Nine sampling stations were set up in the green mussel farming area of Kali Baru-Cilincing, North Jakarta (Fig. 1). Samples of phytoplankton and green mussels were collected on 27 May 2012. Plankton samples were taken vertically from 3 meter in depth using a plankton net (mesh 20 μm). For identification and cell number numeration, 1 ml of each sample was put on Sedgewick-Rafter cell counting chamber and observed under a light microscope (Nikon SE, Japan).

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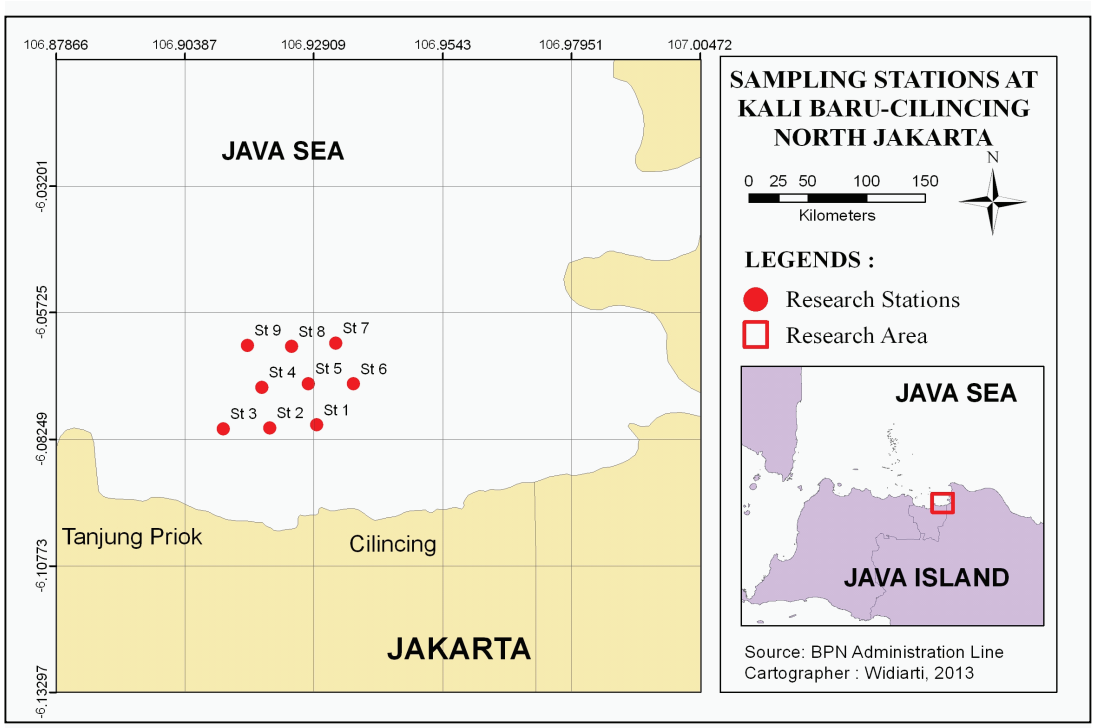

Figure 1. Sampling locations in Kali Baru-Cilincing, Jakarta, Indonesia.

Species composition of phytoplankton contaminated in shellfishes, were examined from the viscus of a green mussel after being separated from other organs, and the stomach content was homogenized in 100 ml seawater. The solution was filtered through series of sieves (125 µm and 20 µm), and phytoplankton included in the residue on 20 µm mesh were identified under the same microscope mentioned above.

Toxicity in green mussel contents was tentatively checked by brine shrimp lethality test (BSLT). A concentration series of crude extract, which was already extracted from samples, were subjected to 10 individuals of *Artemia salina* nauplius, and the lethality of nauplii was recorded. Forty individuals of green mussel from three sampling stations were used for the test. Values of median lethal concentration (LC_{50}) were obtained from probit analysis. Extract was recognized to be toxic when LC_{50} values were below 1,000 ppm (Harmita and Radji, 2004).

Paralytic Shellfish Poisoning (PSP) toxin contamination in green mussel was discerned by Jellet Rapid PSP Test for PSP (Jellet Biotek Ltd, Nova Scotia, Canada). Homogenized 100 µl of green mussel puree was suspended into buffer solution, then dropped onto the test strip. After 35 min, positive PSP contamination (single line) or negative (double lines) were judged.

RESULTS

The results showed 9 genera of harmful algae potentially blooming collected from the green mussel farming area at Kali Baru-Cilincing (Table 1). Nine species caused red tide: (*Ceratium furca*, *C. fusus, C. tripos, Gonyaulax polygramma*, *G. spinifera*, *Phaeocystis* sp., *Prorocentrum micans*, *Thalassiosira mala*, and *Trichodesmium* spp.) and five species were toxin producers (*Alexandrium* spp., *Dinophysis caudata*, *Dinophysis miles*, *Dinophysis rotundata* and *Pseudo-nitzschia* spp.).

Two diatoms *Thalassiosira mala* and *Pseudo-nitzschia* spp. (Fig. 2) were found abundantly in seawater of farming area, (423–3,457 cells/ml and 4,802–15,766 cells/ml, respectively) (Table 2). *Thalassiosira mala* was well known as a red tide forming species, while *Pseudo-nitzschia* spp. might contain toxic species responsible for amnesic shellfish poisoning (ASP).

The stomach content analysis revealed the presence of 6 phytoplankton genera inside green mussel gut, namely *Ceratium furca, Chaetoceros* sp., *Coscinodiscus* sp., *Pseudo-nitzschia* spp.,

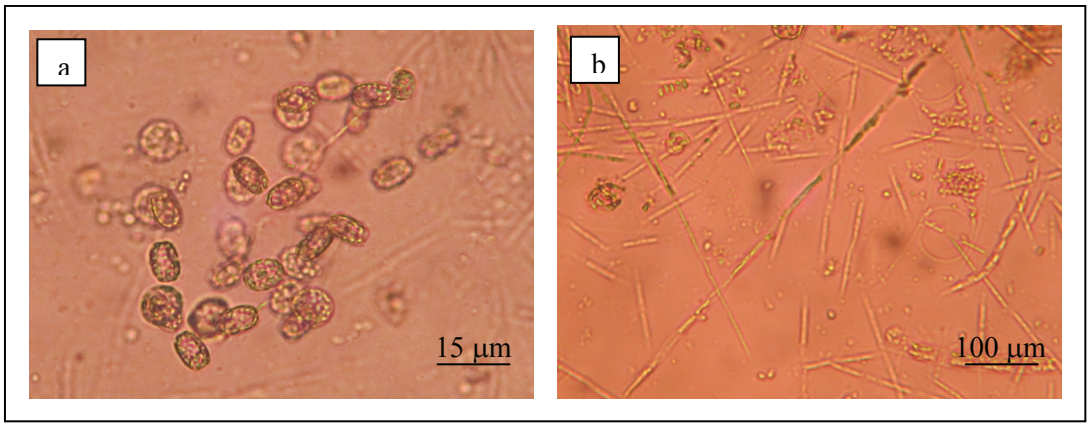

Figure 2. Light microscopy of two phytoplankton found abundantly, at Kali Baru-Cilincing, north Jakarta. (a) *Thalassiosira mala* and (b) *Pseudo-nitzschia* spp.

Table 1. Abundance of HAB related phytoplankton (cells/ml) at each station (Station 1–9) in green mussel farming area at Kali Baru - Cilincing, North Jakarta

Species	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	St. 7	St. 8	St. 9
Alexandrium spp.	0	0	0.88	0	2.06	0	0	0	0
Ceratium furca	5.59	7.35	2.65	15.58	1.47	48.22	41.75	16.46	40.57
Ceratium fusus	0	0	0	0	0	0	0.59	1.47	0.59
Ceratium tripos	0	0	0	0	0	1.18	0.29	2.65	0.59
Dinophysis caudata	5.59	3.59	4.70	14.11	0.59	2.65	18.23	11.47	13.23
Dinophysis miles	0	0	0.88	0.88	0	0	0.88	0.29	2.35
Dinophysis rotundata	0	0	0.29	0.29	0	0	0	0	0
Gonyaulax polygramma	2.06	0.88	2.94	0	1.47	0	0	0	0
Gonyaulax spinifera	0	0	0.29	0.59	0.29	7.94	7.06	2.06	8.23
Phaeocystis sp.	1.18	2.65	2.94	7.35	2.06	3.53	10.29	24.99	5.88
Prorocentrum micans	1.76	5.88	1.76	10.29	1.47	14.99	6.17	3.82	9.70
Pseudo-nitzschia spp.	13622.49	6032.88	4802.49	15765.75	12356.82	13509.30	10830.96	12121.62	9468.27
Thalassiosira mala	3457.44	934.92	2205.00	1058.40	1790.46	423.36	1693.44	1293.60	1922.76
Trichodesmium spp.	0	0	0	0	0	0	0	0	23.52

Thalassiosira sp. and *Skeletonema costatum*. Cells of *Pseudo-nitzschia* spp. were found abundant inside gut samples (600 cells/ml).

The BSLT result by probit analysis showed that the green mussels contained active compounds with toxic properties, and LC_{50} with values 116.3, 125.2 and 96.3 ppm, respectively.

The Jellet Rapid Test for PSP toxin in green mussels indicated a negative result or there was no saxitoxin detected inside green mussel viscera.

DISCUSSION

At Jakarta Bay, the DSP causative species (*Dinophysis* spp.) and the ASP responsible species (*Pseudo-nitszchia* spp.) have long been detected (Praseno and Sugestiningsih, 2000). Several species of potentially toxic phytoplankton were also identified in the present study, i.e. *Alexandrium* spp., *Dinophysis* spp. and *Pseudo-nitzschia* spp., of which *Pseudo-nitzschia* spp. were abundantly found in samples (98,511 cells/ml in average). For *Alexandrium* spp. and *Pseudo-nitzschia* spp., we could not identify to species level. Since some species in these genera have been known to be toxin producer, while others not, species identification of *Alexandrium* spp. using thecal plate observation,

and of *Pseudo-nitzschia* using electron microscopy were required to record the exact HAB related species composition in Jakarta Bay.

Crude extracts of green mussel viscera from Kali Baru-Cilincing was considered to contain toxic compounds, at least for nauplii of *A. salina*. Possible origin of the active compound in green mussels viscera was toxic phytoplankton found in seawaters around the shellfish farming area. Toxin produced by the phytoplankton was accumulated in green mussel tissues, and poisonous when being consumed (Tait and Dipper, 1998; Anderson et al., 2001). Since toxic phytoplankton found in the area were *Alexandrium* spp. (PSP causatives), *Dinophysis* spp. (DSP causatives), and *Pseudo-nitzschia* spp. (ASP causatives), the saxitoxin, okadaic acid and domoic acid produced by these HAB species were one of the possible source of active compound in green mussels. However, Jellet PSP Rapid Test showed negative results, indicating absence of saxitoxin in green mussel. Cell concentrations of *Alexandrium* spp. in water column were also found low (2.94 cells/ml). Phytoplankton cells abundantly contained in shellfish tissue were *Pseudo-nitzschia* spp., whereas cells of *Dinophysis* spp. were not detected in green mussel viscera. Based on the results, it was likely that the active compound in green mussel might be domoic acid produced by *Pseudo-nitzschia*. In any cases, detailed toxin analysis will be required for the safety seafood production in Jakarta Bay.

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