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Impact of Ocean Acidification on Biochemical Components in Tropical Oyster, *Crassostrea belcheri*

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Ocean Acidification, Present & in the Future

Ocean Acidification (OA) occurs as the seawater absorbed the atmospheric CO_2 and the pH of ocean dropped. Normal seawater ranges from pH 8.1 to 8.3. Fig 1 showed the map of our present and future ocean pH (with/ without CO_2 reduction). Since the industrial revolution, seawater has dropped from pH 8.2 to 8.1. Even a decline in small amount of pH, it can altered the ability of the marine organism to form their shells. According to Karr *et al.* (2014), most shells would quickly dissolved at pH 7.6. A lot of previous studies have tested the effects of pH on the marine calcifiers growth and shell formation, but there is no study conducted on the effects of pH on tropical oyster biochemical components. Therefore, this study integrates impact of ocean acidification on the biochemical components in tropical oyster, *Crassostrea belcheri*.

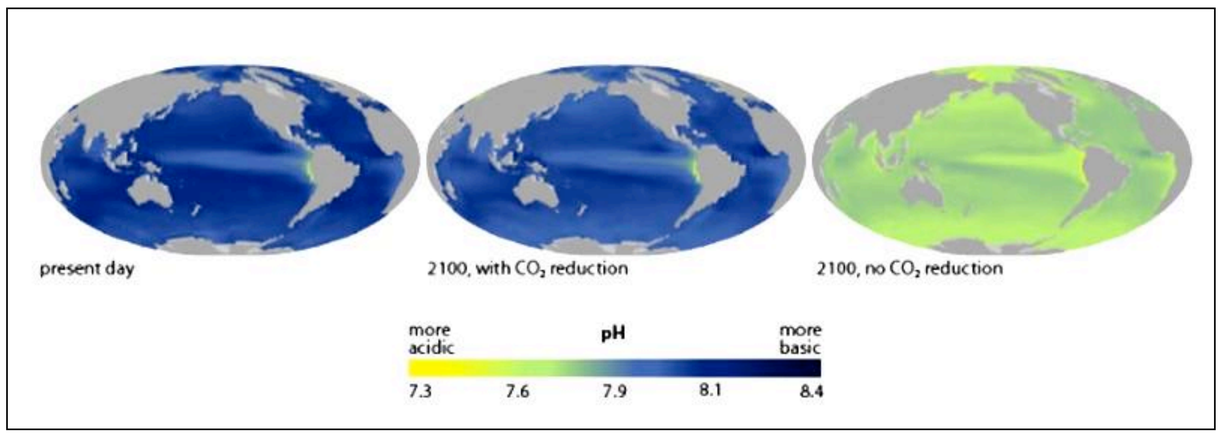

Fig 1: Ocean pH in present (left), year 2100 with CO_2 reduction (middle) and year 2100 without CO_2 reduction (NOAA, 2014)

Objectives:
1) To investigate the impact of the Ocean Acidification on biochemical component in tropical oyster, *Crassostrea belcheri*.
2) To compare the biochemical components of tropical oyster, C*rassostrea belcheri* of different gender.

Experimental Design

Sample collection & Preparation

- Oysters were collected from two sampling sites, one with normal sea condition (pH 8.0) and OA condition (pH 7.3).
- The size and weight of the oysters were measured.
- Oysters were divided into indeterminate, developing, ripe and spawning.
- Oyster flesh were underwent freeze dry process and stored

Chemicals Preparation

Biochemical Tests

Biochemical Analysis

- Total Carbohydrates Analysis (Dubios, 1956)
- Total Lipid Analysis (Bligh & Dyer, 1959)
- Total Protein Analysis (Bradford, 1976)

Statistical Analysis

- Independent t-test was used to evaluate two population

Results

Biochemical Components in Female Oysters

Total carbohydrate of female *Crassostrea belcheri* cultured at two sites shown significant different (Fig 2a). The female oysters at OA condition had lower total carbohydrate (5.03 ± 0.82 %), total lipid (3.09 ± 1.47 %) and total protein (17.75 ± 3.24 %) than the female oysters at normal seawater condition (carbohydrate: 6.94 ± 0.61 %; lipid: 3.72 ± 1.01 %; protein: 19.51 ± 2.99%)

The male oysters at OA condition have the same trend as female oysters, they have lower carbohydrate, lipid and protein content (5.07 ± 0.33%, 2.77 ± 0.97 % and 16.56 ± 2.05%). The male oysters cultured at normal sea condition had higher biochemical contents (carbohydrate: 6.64 ± 0.85 %; lipid: 4.04 ± 0.82%; protein: 21.78 ± 1.56 %) (Fig 2b).

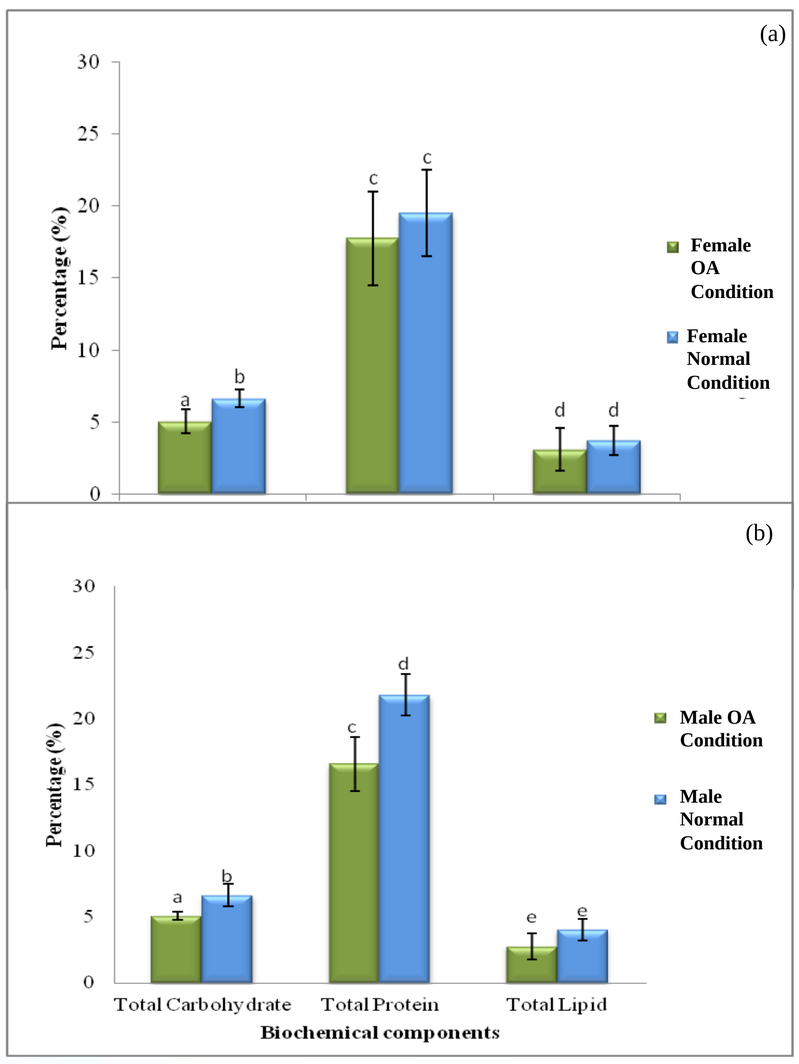

Fig 2: Comparison of biochemical components of (a) Female and (b) Male tropical oyster, *Crassostreai belcheri* cultured at OA condition (pH 7.3) and normal sea condition.(pH 8.0)

Discussion

The absorption of anthropogenic CO_2 into ocean is altering the ocean carbonate system and consequently decreased the pH in ocean. Poorly calcified larval shell may make shell prone to dissolution, early mortality, predators and may ultimately lead to low metamorphosis success. However, most of the study about ocean acidification impact on oysters was done on shell formation and growth (Barton *et al.,* 2012; Gazeau *et al.,* 2011; Ginger Ko *et al.,* 2013; Hettinger *et al.,* 2012; Parker *et al.,* 2011; Watson *et al.,* 2009).

Adult bivalves have fluctuation in the amount of storage and mobilization of energy reserve (carbohydrate) which are related to their reproduction and food availability in the environment (Dridi *et al.,* 2007). Environmental parameters are the main factor contributing to the differences in the biochemical components of oysters in this project. Environment conditions like salinity, pH, temperature, food availability (level of nutrients) are affecting many life events of the bivalves like sexual maturation, reproduction cycles, growth, and maintenance (Choi *et al.,* 1994; Matthiessen, 2008; Ruiz *et al.,* 1992). The results are indicating that the environmental conditions at both culture sites have significant effects on the biochemical constituents in the each species of oysters. The location of the culture sites, one is at estuarine (Sungai Merbok) and another is the open sea condition (Pulau Betong) are generally different in pH, salinity and temperature. The most obvious differences between the two sites are the pH and the salinity. Salinities are related with the feeding activities and also the metabolic activities of the marine bivalves (Chestnut, 1946; Ganapathi Naik & Gowda, 2013). Temperature may have effects on the temperate species of oysters on their metabolic rate, but less effect on the tropical species of oysters where they are able to adapt to wide range of temperature. Besides the environmental parameters, these differences in locations have different food quantity, and also quality (species of the marine algae) (Pazos *et al.,* 1996).

CONCLUSION:

- Tropical Oyster, *Crassostrea belcheri* reared in low pH had **LOWER BIOCHEMICAL VALUE.**
- Biochemical Components for both female and male showed no significant different.

Acknowledgement

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