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ORIGINAL ARTICLE

Physiological and gene expression responses of diploid and triploid Pacific oyster (*Crassostrea gigas*) to heat acclimation

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Abstract

High temperature is considered to be one of the important causes of mass mortality of diploid and triploid oysters in summer. In order to compare the tolerance adaptability of diploid and triploid oysters to heat stress, the activities of superoxide dismutase activity (SOD), catalase activity (CAT) and contents of malondialdehyde (MDA) and the expression of Hsp70 and metallothionein (MT) genes in diploid and triploid oysters under acute and chronic heat stress were studied. The results showed that the survival rate of diploid oysters was significantly higher than that of triploid oysters under acute and chronic heat stress (<0.05). Under acute heat stress, the SOD levels in gills of both diploid and triploid oysters increased significantly from hour 3 (<0.05), but there was no significant difference in SOD levels between diploid and triploid oysters at all time points. The SOD level in hepatopancreas of triploid oysters was significantly higher than that of diploid oysters at all time points except 48 h (<0.05). The CAT level of diploid and triploid oysters decreased sharply at 48 h and that of diploid oysters was significantly higher than that of triploid oysters (<0.05). Under acute heat stress, the increase in MDA content in triploid oysters was significantly higher than that in diploid oysters (<0.05). Under acute heat stress, the expression levels of Hsp70 in the gills and hepatopancreas were significantly increased in diploid and triploid oysters (<0.05), but increased varies between gills and hepatopancreas. The expression levels of MT in the gills and hepatopancreas were significantly decreased in diploid and triploid oysters (<0.05). The results obtained in this study provide physiological and immunological evidence to explain differences in high-temperature tolerance between diploid and triploid oysters and help us better understand the mass mortality of oysters that occurs during high temperatures in summer.

KEYWORDS

, diploid, enzymatic activities, expression analysis, triploid

1 | INTRODUCTION

The Pacific oyster ( ) is native to China, Japan and Korea and has been introduced worldwide as aquaculture species due to its rapid growth and wide tolerance to different environmental conditions (Ruesink et al., 2005). Due to its sterility, triploid oysters tend to have a higher growth rate, which increases the yield of oysters and the marketability of oysters throughout the year. Triploid oysters are welcomed by the majority of farmers and account for a rapidly increasing proportion in the oyster cultivation industry. Oyster is one of the largest farmed shellfish in the world. is one of the important breeding species of oyster, playing an important role in world food security and high-quality animal protein supply. Oyster farming has faced some difficulties, among which the most prominent is the mass mortalities of oysters in summer (Ashton et al., 2020; Cotter et al., 2010; Huvet et al., 2004;

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