

Original Article

The effects of zinc-enriched *Saccharomyces cerevisiae* on the growth and mineral composition of marine rotifer, *Brachionus plicatilis*

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Abstract: Rotifers are important zooplankton in commercial finfish hatcheries. However, due to the limited variety of food available, zinc content of cultured rotifers in artificial environments may not meet the requirements of fish larval. It has been reported that direct addition of soluble zinc to culture media was not effective on the zinc content of rotifer. Thus, in this study, the effect of zinc-enriched *Saccharomyces cerevisiae* was investigated on the growth and mineral composition of rotifer, *Brachionus plicatilis*. Four different food treatments, including (1) yeast without enrichment (control), (2) yeast containing 21.23 mg g⁻¹ of zinc, (3) yeast containing 56.25 mg g⁻¹ of zinc, and (4) yeast containing 132.93 mg g⁻¹ of zinc, were used to produce rotifer for a period of 10 days. Afterwards, specific growth rate (SGR), the total number of rotifers, total eggs attached to rotifers, and the total number of eggs were measured. Finally, the mineral composition of rotifer in different treatments was analyzed. The findings revealed that yeast enriched with 56.25 mg g⁻¹ of zinc significantly improved the growth of rotifers. The maximum number of rotifers (274 ind ml⁻¹), total eggs attached to rotifers (29.3 number ml⁻¹), and the total number of eggs (36 number ml⁻¹) were found in the third treatment. The highest zinc content was observed in the fourth treatment (about 822.5 µg g⁻¹ of rotifers). The maximum values of Fe (13.84 µg g⁻¹ of rotifers) and Mn (15.22 µg g⁻¹ of rotifer) were related to the treatment 4 and control, respectively. However, the amount of Cu did not significantly differ among the treatments. In conclusion, this study found that zinc-enriched yeast improved the growth, reproduction, and body composition of *B. plicatilis*.

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Introduction

Zooplankton such as rotifers are important in the first feeding of fresh and marine fish larvae (Isik et al., 1999). Euryhaline rotifer, *Brachionus plicatilis* is a suitable feed item for the larvae of marine fish and shellfish in terms of their sizes (150-350 µm) and high reproductive rate (Hamre et al., 2008; Lubzens, 1987; Kennari et al., 2008). In marine fish hatcheries, rotifers should be considered not only regarding their density but also their nutritional value, especially mineral composition (Støttrup and McEvoy, 2008). The nutritional value of live feeds affects the growth and survival of fish larvae (Watanabe et al., 1983).

The minerals are responsible for the development of nervous system, growth and survival of aquatic

larvae, bone formation, maintenance and adjustment of the colloidal system and acid-base balance of aquatic organisms (Matsumoto et al., 2009). Moreover, minerals play an important role in hormones and enzymes system (Watanabe et al., 1978b). Apines-Amar et al. (2004) indicated that zinc is an important mineral in fish nutrition and plays a vital role in bone health. Although a small amount of zinc in the body of aquatic organisms is present, it is known as an essential element in the fish feed and as a cofactor for over 300 enzymes (Watanabe et al., 1978b).

It has been demonstrated that the levels of zinc in rotifers were lower than levels found in copepods by five folds (Hamre et al., 2008). The cultured rotifers in

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