Effects of Ca^{2+}, Mg^{2+} and K^{+} concentrations on survival, growth and physiological indices of *Strongylocentrotus intermedius*.

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Abstract: Abstract: To investigate the effects of Ca^{2+}, Mg^{2+}, and K^{+} concentrations on *Strongylocentrotus intermedius*, experimental groups with Ca^{2+}, Mg^{2+}, and K^{+} concentrations set at 0.5, 1, 1.5, and 2 times those of normal seawater were established for cultivation. The results showed that lower concentrations of Ca^{2+}, Mg^{2+}, and K^{+} significantly reduced the sea urchins' mortality rate ($P<0.05$); the specific growth rate of sea urchins was significantly decreased with the increase of Mg^{2+} concentration; the increase of Ca^{2+} and K^{+} concentration could significantly increase the gonad index of sea urchin, but Ca^{2+} and K^{+} at twice the concentration could significantly reduce the gonad index; Ca^{2+} and Mg^{2+} concentrations had a significant impact on pepsin activity, which increased as ion concentrations rose; the effect of K^{+} concentration on amylase activity was significant. With the increase of K^{+} concentration, amylase activity increased first and then decreased; the activity of acid phosphatase was significantly increased by 2 times concentration of K^{+}. The results showed that Ca^{2+}, Mg^{2+}, and K^{+} had a great influence on the growth, physiological function and enzyme activity of sea urchin, and the ion concentration should be detected and adjusted when carrying out mariculture.

Problem Definition

➢ The effects of different concentrations of Ca^{2+}, Mg^{2+}, and K^{+} on the growth status and some enzyme activities of *Strongylocentrotus intermedius* were studied to determine the most suitable Ca^{2+}, Mg^{2+}, and K^{+} conditions for sea urchin, so as to provide a solid scientific basis for sea urchin to create the most suitable growth environment.

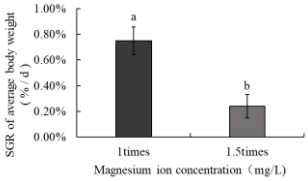
Method & Results

The sea urchins were cultured in Ca^{2+}, Mg^{2+}, and K^{+} experimental groups with 0.5, 1, 1.5 and 2 times of normal seawater concentration, respectively. The survival rate, specific growth rate, gonad index and some enzyme activities of sea urchins were detected and analyzed.

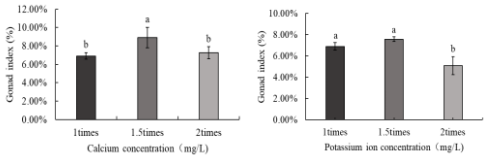
➢ The sea urchins with 2 times concentration of Mg^{2+} and 0.5 times concentration of Ca^{2+}, Mg^{2+}, and K^{+} all died. The decrease of Ca^{2+}, Mg^{2+}, and K^{+} concentration significantly reduced ($P < 0.05$) the survival rate of sea urchins.

Items	Groups					
	1.5times Ca^{2+}	2times Ca^{2+}	1.5times Mg^{2+}	1.5times K^{+}	2times K^{+}	control group
Survival Number	15	13	11	15	15	15
Survival rate	100%	86.7%	73.3%	100%	100%	100%

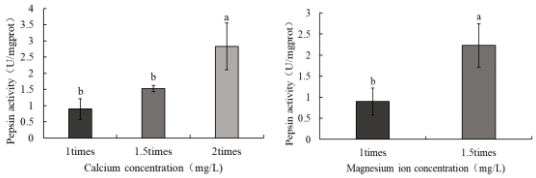
➢ The specific growth rate of sea urchin decreased significantly with the increase of Mg^{2+} concentration.



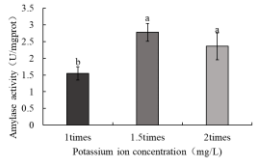
➢ The increase of Ca^{2+} and K^{+} concentration could significantly increase the gonad index of sea urchin, but Ca^{2+} and K^{+} at twice the concentration could significantly reduce the gonad index.



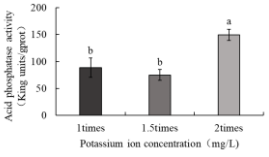
➢ Ca^{2+} and Mg^{2+} concentrations had a significant impact on pepsin activity, which increased as ion concentrations rose.



➢ The effect of K^{+} concentration on amylase activity was significant. With the increase of K^{+} concentration, amylase activity increased first and then decreased.



➢ The activity of acid phosphatase was significantly increased by 2 times concentration of K^{+}.



➢ The results showed that Ca^{2+}, Mg^{2+}, and K^{+} had a great influence on the growth, physiological function and enzyme activity of sea urchin, and the ion concentration should be detected and adjusted when carrying out mariculture.