

Original Article

Isolation and characterization of lactic acid bacteria from the fish intestine for application as probiotics in young common carp *Cyprinus carpio* L. diet

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Abstract: The current study was conducted to investigate the possibility of using Lactic acid bacteria LAB isolated from the intestines of common carp, *Cyprinus carpio*, as dietary probiotics to enhance the nutrition and growth of common carp juveniles. The bacteria were cultured on MRS agar and their cultural and biochemical characteristics were confirmed. The isolated probiotic bacteria were used as dietary supplements at concentrations of 10⁶, 10⁷, and 10⁸ and their effect on the nutrition and growth of common carp fingerlings was evaluated. The results showed clear positive effects of adding the probiotic Lactobacilli in fish feed, with a relative growth increase from 105.26 to 178.14% with increasing probiotic concentration compared to the control. The feed conversion ratio also improved from 2.94 to 1.83 with increasing levels of probiotics compared to the control. In addition, all other indicators improved, including weight gain, specific growth rate, protein efficiency ratio, digestibility, and beneficial intestinal flora, with increasing probiotic concentration in the feed compared to the control, with a significant difference. It was concluded that LAB isolated from the intestines of common carp can be effectively used as probiotics in common carp *C. carpio* fingerlings feed, with positive results.

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Introduction

Fish culture, especially in space-limited systems such as floating cages and earthen ponds with high densities, faces problems such as crowding, competition, oxygen depletion, and deteriorating water quality, which in turn exposes fish to stress, inhibition of the immune system and growth, and the increase in the spread of disease infections (Beiwi and Al-Hisnawi, 2020). Therefore, to reduce stress, control disease outbreaks, and improve growth performance, aquafeeds were widely supplemented with a variety of additives to obtain high-quality diets (Singh et al., 2021). Many fish feed supplements are well-known for supporting growth rates, feed and protein conversion efficiency, improving diet digestibility, reducing mortality, and increasing disease resistance (Kord et al., 2021; Amit et al., 2022).

Probiotics and prebiotics are two classes of

modern feed supplements that gain increasing significance for their safety and positive influence on general animal health (Xiong, 2018; Lund, 2021). Many probiotic species are applied effectively in aquaculture nutrition which contributed significantly to improving nutrient availability, feed efficiency, growth, and feed conversion rates (Shao et al., 2019; Watts et al., 2020), as well as enhancing the immune response, disease control and health promotion (Al-Hassani and Mustafa, 2022). The probiotic mechanism of action in the digestive system includes modifying the metabolism of pathological bacteria by changing their paths, and stimulating the body's cellular immunity and disease resistance, by occupying receptors, which leads to the inhibition of colonization by harmful organisms (Goran et al., 2017; Chizhayeva et al., 2022). Probiotics could be consisting of a single species or mixture of live microorganisms that positively affect the health of

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