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The effect of quorum quenching probiotics on modulated digestive enzymes activity, growth performance, gut microfora and biochemical parameters in Common carp (*Cyprinus carpio*)

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Abstract

In this study, two main bacteria with probiotic ability (*Citrobacter freundii* and *Bacillus foraminis*) with autochthonous quorum quenching (QQ) were isolated from the intestine of *Cyprinus carpio* and their effects on growth performance, gut microbial flora, biochemical indices and digestive enzymes activities (i.e., α-amylase, lipase, trypsin, chymotrypsin, and alkaline phosphatase) of *C. carpio* were determined. Juveniles of *C. carpio* (n=450, weighing 50±10 g) were randomly divided into 6 equal groups (with 3 replications) and fed on diets containing 1×10^9 cfu g^{-1} of *C. freundii* (QQ1, G1), *B. foraminis* (QQ2, G2), *Lactiplantibacillus plantarum* (without characteristics QQ, WQQ, G3), QQ1 + QQ2 (G4), QQ1 + QQ2+WQQ (combine, G5), and a control diet (without probiotic) for 60 continuous days. Results showed that probiotic supplementations had generally significant effects on growth performance. The G5 and G3 had the best effect on specific growth rate (SGR) and feed utilization efficiency in *C. carpio* at days 30 and 60, respectively. The trypsin, protease, and chymotrypsin activities, on day 30 after feeding, significantly increased in G5 when compared with those in the control and the other groups. Significant changes in bacterial intestinal flora were observed in all probiotic groups compared with the control. These results highlighted the potential use of *Bacillus foraminis* (QQ2, G2) alone or in combination with other probiotics (G5) as additive in *C. carpio* diets but are not recommended in the long term. The results indicated that supplementation of isolated bacteria from the intestine of *C. carpio* (i.e., G3) can efficiently improve growth performance, intestinal microbiota and some digestive enzyme activities in juvenile *C. Carpio* in the long term culture. Therefore, it can be used as a growth enhancer like the commercial probiotics.

Key words: *C. carpio*, Intestine bacteria, Growth performance, Digestive enzyme activity, Microbial flora

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