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Effects of Addition of *Saccharomyces cervisae* and *Bacillus subtilis* in Diet on Selected Hematological and Biochemical Parameters in Common Carp (*Cyprinus carpio*)

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Abstract: The aim of the present study was to evaluate the effects of oral administration of *Saccharomyces cervisae* and *Bacillus subtilis* on common carp (*cyprinus carpio*) plasma haematological and biochemical parameters. A total number of 30 fish was divided in three groups. Groups include: 1) standard diet (Control), 2) standard diet + 10 g probiotics per kg diet and 3) standard diet + 15 g probiotics per kg diet. Blood samples were drawn via the caudal vessels or a cardiac puncture with a heparin-coated needle and syringe on 30th day. Five fish from each group were randomly selected for hematological and biochemical tests. hematological and biochemical parameters including RBCs, Hb, PCV, Total WBCs, DLC Total protein, Albumin, Globulin, ALT and AST. The total leukocyte count, as compared to the control group, was significantly higher in probiotics groups. The serum protein content was significantly higher in the probiotics treated groups while it was lowest in the control group. Significant differences ($p > 0.05$) in the serum albumin content between control and probiotics treated groups was recorded. The mean serum globulin content was significantly higher in the probiotics treated groups. The results of this study revealed that *B. subtilis* and *S. cerevisiae* able to improve the hematological and biochemical parameters of common carp that could be resulted in higher health values. Finally, these probiotics could provide healthy and safe fish production from aquaculture replacing the Xinobiotics (antibiotics) for both fish and fish consumers.

Key words: *Saccharomyces cervisae* · *Bacillus subtilis* · *Cyprinus carpio* · Haematological parameters · Biochemical parameters

INTRODUCTION

Probiotics, which are beneficial microorganisms, or their products that provide health benefits to the hosts have been used in aquaculture as disease control agents, as supplements to improve growth and in some cases as a means of replacing antimicrobial compounds [1]. The concept of using probiotics in animal feed, particularly poultry and aquaculture, is slowly becoming popular [2]. Common organisms in probiotic products are *Aspergillus oryzae*, *Lactobacillus acidophilus*, *L. bulgaricus*, *L. plantarum*, *Bacillus sp.*, *Bifidobacterium bifidium*, *Streptococcus lactis* and *Saccharomyces cerevisiae* [3]. These products can be administered through water or incorporated in the feed.

Multiple ways exist in which probiotics could be beneficial and these could act either singly or in combination for a single probiotic. These include: inhibition of a pathogen via production of antagonistic compounds, competition for attachment sites, competition for nutrients, alteration of enzymatic activity of pathogens, immunostimulatory functions and nutritional benefits such as improving feed digestibility and feed utilization [4,5]. It is often reported that a probiotic must be adherent and colonize within the GIT, it must replicate to high numbers, it must produce antimicrobial substances and it must withstand the acidic environment of the GIT [6,7]. However, these descriptions are misleading. These beliefs are based on the understanding that a probiotic must become a permanent member of the intestinal flora. While bacteria with this capacity are common and much probiotic research focuses on attachment capacity of bacteria, it has actually been demonstrated that transient bacteria can also exert beneficial effects [8]. Additionally, contrary to the requisite of being able to attach to mucus and produce

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