Comparative Evaluation of Probiotic Sources Containing Different Bacterial Strains in Diet: Effects On Growth Performance, Immune Responses, And Intestinal Morphology of Broilers Chicken

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ABSTRACT

Poultry production around the world is known profitable industry with spectacular growth rates. Feed costs approximately 70-75% of the production cost and improving the feed conversion ratio can result in a better profit margin. Historically, antibiotics are used to enhance production performance and reduce pathogen risk. However, several developed countries banned antibiotic use in poultry feed as a growth promotor because of residual effects and chances of resistance in humans. Therefore, potential alternatives are required to stimulate growth without a negative impact on health.Several potentiate alternatives like probiotics, prebiotics, synbiotics, and postbiotics are used in poultry feed. Among them, probiotics have gained more attention from researchers as cultured viable direct-fed microbes can ensure sustainable broiler production by improving immune responses and gut health. It is well established that probiotics maintain broiler gut microbial equilibrium through the competitive exclusion of pathogenic microbes. In this way, probiotics decrease the pathogenic bacteria load which eventually results in a better productivity index and immune status of broilers. Former research has revealed that bacterial strains have an extensive range of probiotic actions, including the inhibition of pathogens (Angmo *et al*., 2016). Previous research showed that gut microbes' interaction led to changes in nutrient utilization, immune responses, and physiological parameters of the host. In addition, a dietary supply of direct-fed microbes fosters beneficial microbiota in the gut. Dietary supplementation of probiotics is a promising way to improve the growth performance of broilers. Several studies showed variations in results regarding the effects of probiotic supplementation on broiler performance and gut health. Moreover, research showed that probiotic-associated factors like dosage level, method of administration, rate of administration, adulteration of antimicrobial substances, environmental conditions, and specificity of bacterial strains (Alard *et al*., 2016).As probiotics are strain-specific, this experiment was planned to investigate the comparative effects of different probiotic sources containing varying bacterial strains as feed additives on the performance, immunity, and gut morphometry of broiler chickens.For this, a total of 160 chicks (day-old, Ross-308 breed) were randomized into 16 groups(10 birds/group) and groups were distributed to four dietary treatments (4 groups/treatment) under a completely randomized design. The dietary treatments were basal diet without supplementation (Control), supplemented with citristim (Pichia guilliermondii) @ 1 kg/ton (S-1), protexin (multi-strains of Bacillus and Lactobacillus) @ 100 g/ton (S-2), and zymeyeast-100 (Pichia guilliermondii, Bacillus subtilis) @ 1 kg/ton of the diet (S-3). The chicks were fed *ad libitum* on isocaloric (metabolizable energy 3000 kcal/kg) and isonitrogenous (crude protein 20%) dietary treatments throughout the experiment. The body weight gain was greater ($P<0.05$) in S-1 supplemented groups as compared to the control, S-2, and S-3 groups. Feed intake and feed conversion ratio showed a trend ($P<0.01$), which was greater for S-1 fed groups than for rest

treatments. Antibody titer against Newcastle disease virus was higher ($P<0.05$) in S-1 as compared to the rest treatments. However, villus height, crypt depth, and their ratio were similar ($P>0.01$) across the treatments. Based on the results, a diet supplemented with *Pichia guilliermondi* source improved feed intake, body weight gain, and feed conversion ratio with better immune responses.

Keywords: Feed intake, body weight gain, Antibody titer, morphometric measurements.

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