

## Effects of Probiotic and Antibiotic on Performance and Growth Attributes of Broiler Chicks

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### ABSTRACT

This study was conducted to investigate the effects of commercial probiotic mixtures (Liptosafe-L) via drinking water of broiler chickens in comparison with Antibiotic (Newmycin) on performance of Broiler Chicks and growth attributes. 120 broiler chicks (Ross 308) day old, and average weight of 41 grams, were subjected to a 41-day experimental period. The chicks were randomly divided into three experimental treatment groups; probiotic, antibiotic, and control group. Each group with four replicates (10 chicks per replicate). Birds in the first group were supplied with 0.5 ml of probiotic per one liter of water for the whole growth period while the antibiotic mixture is administered at a rate of 0.20 gm per liter of water along the growth period. In these two cases the growth promoters were stopped at 7- days before slaughtering (safety period). Birds in the control group received water without growth promoter. Results of the experiment showed that there were significant differences ( $p < 0.05$ ) in body weight gain (gm), feed conversion ratio and final body weight (gm). For Feed intake (gm), and mortality rate (%) there is no significant difference between probiotic and antibiotic ( $p > 0.05$ ) but both differ significantly if compared with control ( $p < 0.05$ ). Broilers fed probiotic statistically consumed more feed over the entire experimental periods. In contrast feed conversion efficiency did not improved in different periods in growth promoter supplemented groups compared to control birds. In conclusion the results obtained in this study indicated that dietary inclusion of probiotic and antibiotic supported a superior performance of chicks and can be applied as antibiotic growth promoter substitutions in broilers diet.

**Key words:** Broiler growth performance, Mortality rate, Probiotic

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### Introduction

It is well recognized that gastrointestinal normal flora plays an important role in the health and performance of poultry. Antibiotics and probiotic are substances produced by some species of bacteria and fungi that have the ability to kill or inhibit the growth of bacteria, or microorganisms are minute her ability to counter the growth of other microorganisms, most notably the microbes that cause avian diseases and antibiotics three uses: therapeutic, preventive, additive a feed. Antibiotics continue to be used in the poultry industry as growth stimulants and therapeutic agents. However, due to the fact that continued use of tends to stimulate development of resistance from harmful micro-organisms, there is currently an outcry from the consumer society and health sector to band their use as feed additives in animal and poultry feeds. (Cavazzoni *et al*, 1998; Jin *et al*, 1998; Yeo and Kim, 1997; Mohan *et al*, 1996) prophylactic (Cavazzoni *et al*, 1998; Yeo and Kim, 1997) and hypocholesteremic effects (Jin *et al*, 1998; Mohan *et al*, 1996).

Probiotic is alive microscopic minutes given certain doses and to increase the effectiveness of the body, are usually non-existent bowel as an increase in these neighborhoods over the possibility of digestion and produce immune and reduce the incidence of certain diseases, and reduce the proportion of blood cholesterol, which materials are often certain nutrients given to the animal to stimulate beneficial micro flora.

Today, probiotics are used as health supplements in food and feeds and they are replacing the use of antibiotic growth promoters or chemical supplements. Under the right conditions the claims made for probiotic preparations can be realized. In recent years, antibiotics have not been a major player in most poultry company programs. The use of antibiotics, including chlortetracycline as growth promoters to increase production performance and to decrease mortality, was recommended to be banned by European Union (Perreten, 2003). This because increases in microbial resistance to antibiotics and residues in chicken meat products can be harmful to consumers. The control of infections and enhancement of live performance through a non-antibiotic approach is thus urgently required. Consequently, several alternatives have been investigated to reduce or replace antibiotics. Because of the general problem of increased resistance of bacteria and the decreasing acceptance of the consumers for Antibacterial Growth Promoters (AGPs), different substances, referred to as Natural Growth Promoters (NGPs), have been identified as effective and safe alternatives to AGPs. At present,

there is a large number of NGPs available in the market, including probiotics, prebiotics and immune-modulators. Probiotics are defined as live microbial supplements which beneficially affect the host animal by improving some beneficial functions in its intestinal microbial balance (Fuller, 1989). They have been used in poultry management to enhance production performances (Mohan *et al.*, 1996; Yeo and Kim, 1997; Jin *et al.*, 1998), to develop and stimulate the immune response and to reduce mortality. The use of probiotics has become widely accepted as a natural means to promote health for both humans and animals.

The health promoting effect of probiotic in the gastrointestinal tract has been mainly associated with their capacity to stimulate the immune response and to inhibit the growth of pathogenic bacteria (Barnes *et al.*, 1972). Substitution of conventional and prohibited AGPs with probiotics has received much attention in the recent years. One of the major reasons for increased interest in the use of probiotics is because they are natural alternatives to antibiotics for growth promotion in poultry.

The objectives of this study were to investigate the effects of a commercial probiotic mixture (Liptosafe-L) supplementation to the diet of broiler chickens in comparison with Antibiotic and with use of control (no treatment) on the growth performance of broiler chickens.

## Materials and Methods

Total of 120, one-day old unsexed Ross 308 broiler chicks, with the average weight of about 41 grams, were subjected to a 41-day experimental period. The chicks were randomly divided into three experimental groups; group one as probiotic, group two as antibiotic treatment group, and group three as control treatment group. Each group with equal numbers included 4 replicates (10 chicks per replicate).

The basal diet fed to the chicks in all groups was the same and were formulated to meet the NRC (1994) recommendations for broiler chickens. The birds in three groups were reared under the optimum environmental conditions and feeds were provided ad-labium. Based on a local vaccination program, chicks in all groups were vaccinated against Gumboro D78 disease (IBD) at 10 days old.

The birds in group one was fed basal diet supplemented with 0.5 ml of commercial probiotic mixture per one liter of water for the whole growth period. The commercial probiotic was used according to the manufacturer instructions. For birds in group two the antibiotic mixture is administrated at a rate of 0.20 gm per liter of water along the growth period. In these two treatments the growth promoters were stopped at 7- days before slaughtering (safety period).

During the experiment, birds were weighed bi-weekly and feed intake per pen was recorded at the same time. The measured performance parameters includes: final body weight (g), body weight gain (g), feed intake (g), feed conversion ratio, and mortality rate (%). All collected data were analyzed by ANOVA using SPSS Inc. (1999) program.

## Results and Discussion

### *Overall performance:*

Results obtained f experimental broiler chicks were shown in table (1). Results of the experiment showed that there were significant differences ( $p < 0.05$ ) in body weight gain (gm), feed conversion ratio (FCR) and final body weight (gm). For Feed intake (gm), and mortality rate (%) there is no significant difference between probiotic and antibiotic ( $p > 0.05$ ) but both differ significantly if compared with control ( $p < 0.05$ ). Broilers fed with probiotic statistically consumed more feed over the entire experimental periods. In contrast, feed conversion efficiency did not improved in different periods in growth promoter supplemented groups compared to control birds. In conclusion, the results obtained in this study indicated that dietary inclusion of probiotic and antibiotic supported a superior performance of chicks and can be applied as antibiotic growth promoter substitutions in broilers diet.

However, many investigators Bafundo *et al* (2003), Ferket (2004), and Lindsey (1985) reviewed the various benefits of feeding antibiotic growth promoters and reported that antibiotics may control and limit the growth and colonization of a variety of pathogenic and nonpathogenic species of bacteria in chicks gut.

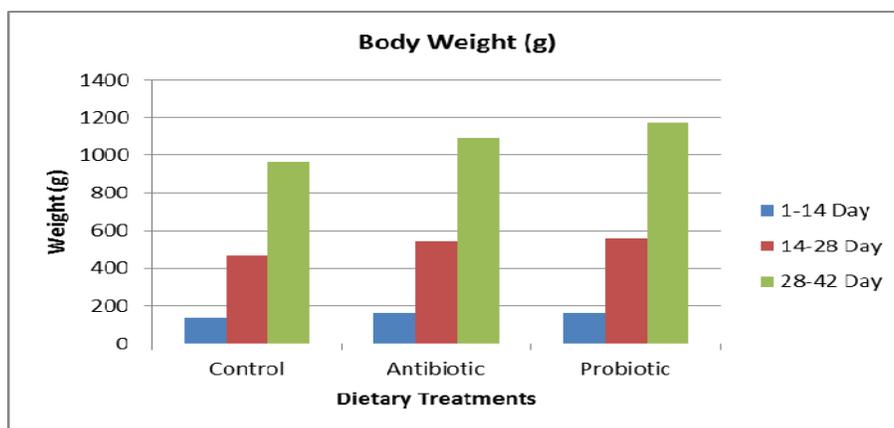
### *Impact of growth promoters on final body weight (g):*

The performance indices of control and supplemented chicks are detailed in Table 1. Diet supplementation with probiotic statistically increased chicks body weight at 28 and 42 days of age relative to the control chicks ( $P < 0.05$ ) and similar to antibiotic group. As given in figure 1 and during growing and finishing periods, the average final live weight of broiler chickens was found to be significantly higher ( $P \leq 0.05$ ) for Probiotic (Liptosafe-L) supplemented with diets (group 1) than those chicks in Antibiotic (Newmycin) (Group 2 )or control group (group 3).

**Table 1:** Performance values of experimental broiler chick for control, antibiotic and probiotic dietary treatments at different ages.

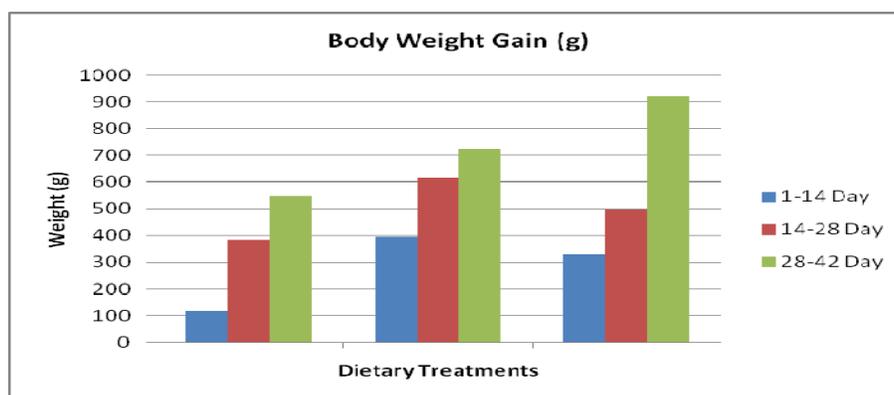
Performance Parameters	Dietary Treatments		
	Control	Antibiotic	Probiotic
Body weight (g)			
1-14 Day	135.77	160.22	164.81
14-28 Day	466.05	545.29	560.3
28-42 Day	962.96c	1092.42b	1175.01a
Feed intake (g/d)			
1-14 Day	170.52	192.92	194.81
14-28 Day	435.33	473.06	474.74
28-42 Day	1008.42	1098.79	1119.72
1-42 Day	1614.27	1765.17	1789.33
FCR (g feed/g meat)			
1-14 Day	1.8	1.62	1.57
14-28 Day	1.32	1.23	1.2
28-42 Day	2.03	2	1.82
1-42 Day	1.75c	1.68b	2.45a
Body weight gain (g)			
1-14 Day	119.23	395.49	330.28
14-28 Day	385.07	614.71	496.91
28-42 Day	547.13c	725.4b	920.96a
Mortality rate %	15.0 b	5.a	2.5 a

In the table mean within the same row with same scripts are not significant ( $p > 0.5$ ).

**Fig. 1:** Impact of growth promoters on final body weight (g).

*Impact of growth promoters on body weight gain (g):*

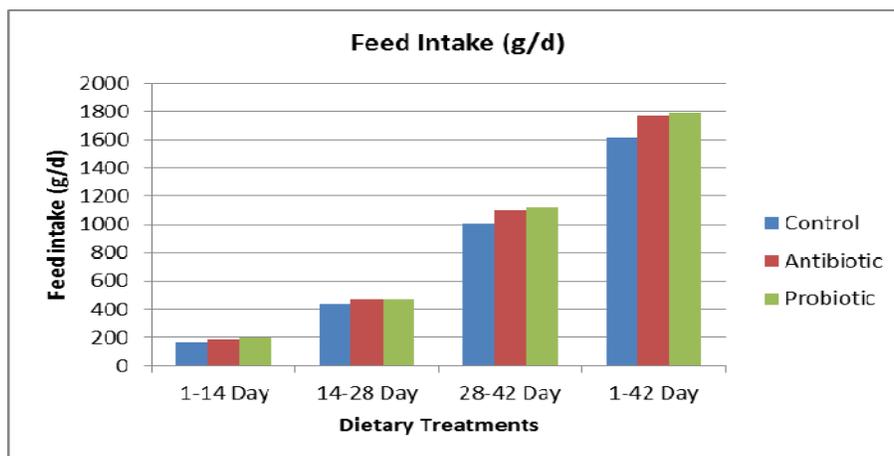
As shown in figure 2 body weight gain in general improved with time. The increase in body weight gain is ranked in descending order of probiotic, antibiotic, and control. These results are in agreement with that given by Alloui, *et al.*, (2011) and Mehdi *et al.*, (2011). In line with Panda *et al.* (2005) figure 2 indicate that application of probiotics in broilers diet increased final body weight gain and improved FCR at week 6 of age.

**Fig. 2:** Impact of growth promoters on body weight gain (g).

*Impact of growth promoters on Feed intake (g):*

Chicks in probiotic group significantly exhibited a higher feed intake over 14-28 d and entire period compared to control chicks ( $P < 0.05$ ). Feed efficiency of birds receiving the supplemented diets improved over different periods in comparison to control birds.

The results depicted in figure 3 are in accordance with the findings of Chiang and Hsieh (1995). However, these results disagree with the findings of Santoso *et al.* (2001) who reported that 0.5% fermented product from *Bacillus subtilis* inclusion reduced feed consumption. *Lactobacillus* administration has been shown to improve growth rates and feed conversion ratio in broiler chickens (Kalavathy *et al.*, 2003).



**Fig. 3:** Impact of growth promoters on Feed intake (g).

*Impact of growth promoters on Feed conversion ratio:*

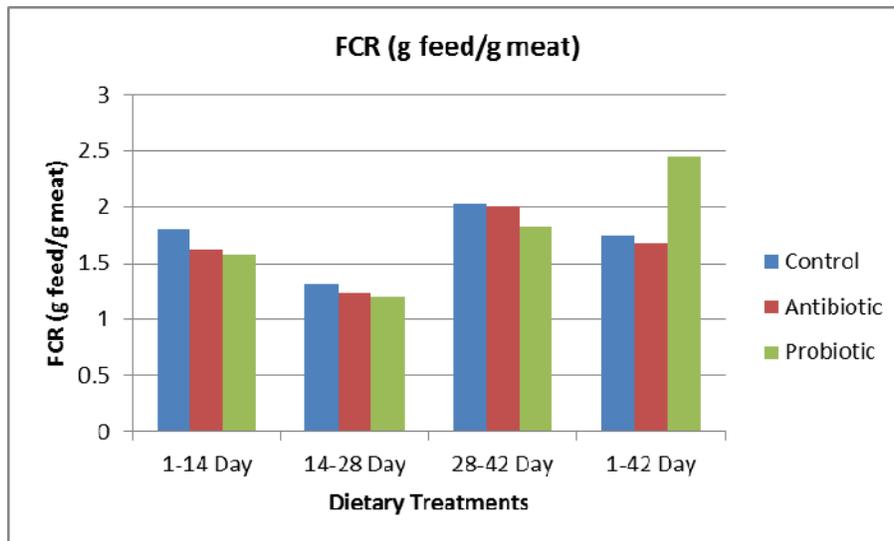
As shown in table 1 results of Feed intake (gm), reflect that there is no significant difference between Probiotic and Antibiotic ( $p > 0.05$ ) but differ significantly if compared with control ( $p < 0.05$ ). However, feed conversion ratio (FCR) was significantly lower ( $P \leq 0.05$ ) in chicks which had received Probiotic (Liptosafe-L) supplemented diets from third weeks of age up to the end of experiment. Feed conversion ratio in group 2 was significantly higher ( $P \leq 0.05$ ) than that of group 1 during overall experimental period. The results shown in figure 4 agree with the findings of Yeo and Kim (1997) and Anjum *et al.* (2005) who reported that the use of probiotic in broiler chicks diet significantly improved the daily body weight gain and feed efficiency. This may be attributed to increases in microbial resistance to antibiotics and residues in chicken (Perreten, 2003).

According to Bedford (2000) and Choudhari *et al.* (2008) a more balanced micro flora population in gut is expected to lead to a greater efficiency in digestibility and utilization of food, which consequently, resulting in an enhanced growth and improved FCR. The significant benefits of antibiotic supplementation observed on chick growth and food conversion in this study, were in agreement with Mehdi (2011) who reported that the percentage mortality was less than the non-treated group. Cross (2002) indicated that some probiotic could stimulate a protective immune response sufficiently to enhance resistance to microbial pathogens. The gut and its resident microbiota play an essential role in shaping the immune system (Noverr and Huffnagle, 2004). Germ-free animals have less developed gut-associated lymphoid tissue, but gut colonization in these animals by members of commensal gut microflora results in the enhancement and diversification of the antibody-mediated immune response. Lee *et al.*, (2004) reported that probiotic-treated birds had significantly more serum antibody than the birds that were not treated with probiotics. However, due to the fact that continued use of tends to stimulate development of

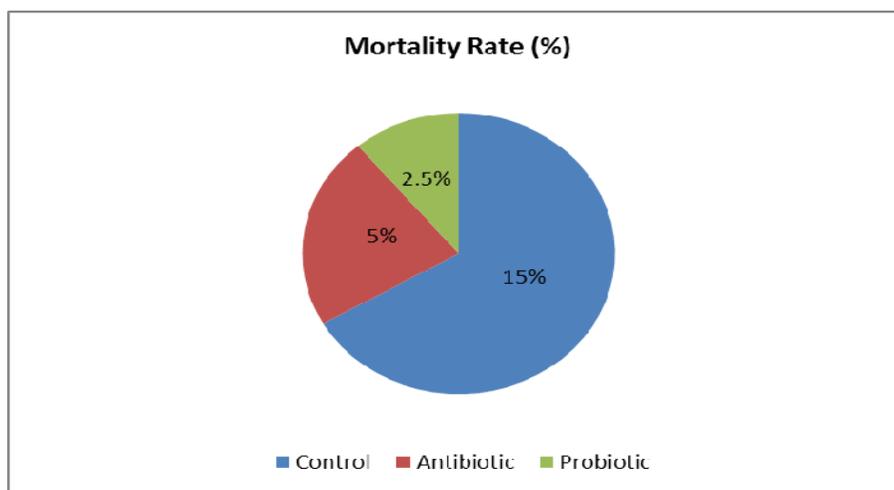
*Impact of growth promoters on Mortality rate (%):*

As given in figure 5 Mortality rate was not influenced by experimental treatments over any phases. In reference to table 1 statistical analysis of the data obtained for mortality rate (%) indicate that there is no significant difference between probiotic and antibiotic ( $p < 0.05$ ) but it differ significantly if compared with control treatments. This result is in agreement with Mehdi (2011) who reported that the percentage mortality was less than the non-treated group. Cross (2002) indicated that some probiotic could stimulate a protective immune response sufficiently to enhance resistance to microbial pathogens. The gut and its resident microbiota play an essential role in shaping the immune system (Noverr and Huffnagle, 2004). Germ-free animals have less developed gut-associated lymphoid tissue, but gut colonization in these animals by members of commensal gut microflora results in the enhancement and diversification of the antibody-mediated immune response. Lee *et al.*, (2004) reported that probiotic-treated birds had significantly more serum antibody than the birds that were not treated with probiotics. However, due to the fact that continued use of tends to stimulate development of

resistance from harmful micro-organisms, there is currently an outcry from the consumer society and health sector to ban their use as feed additives in animal and poultry feeds. (Cavazzoni *et al*, 1998; Jin *et al*, 1998; Yeo and Kim, 1997; Mohan *et al*, 1996) prophylactic (Cavazzoni *et al*, 1998; Yeo and Kim, 1997) and hypocholesteremic effects (Jin *et al*, 1998; Mohan *et al*, 1996).



**Fig. 4:** Impact of growth promoters on Feed conversion ratio.



**Fig. 5:** Impact of growth promoters on Mortality rate (%).

#### Conclusion and Recommendations

The obtained results of the current study suggest that probiotic exerted beneficial effects on performance parameters of broiler chicks even in some periods superior to antibiotic. Therefore, this probiotic may be used as an alternative to replace the adverse effect of antibiotic. From results of the study it is inferred to use the natural growth promoters in gradual manner due to their clear impact on raising the performance of the birds. It is necessary to apply steroids natural growth as additive to diets, rather than being added to the water due to its difficulty of application when added with water and also for its merits of going directly and quickly through it the digestive system. However, if it is used with water the steroids take longer time than if used by diets. As such, it is strongly advised not to exceed the recommended dose specified by the manufacturer, because if the recommended dose is exceeded there will be a vital disturbance inside the intestines and it starts secretion of toxins. Finally, it is important to apply the probiotic at one day old so as to occupy the epithelial cells lining the gut in order to close the receptors against pathogenic microbes. Further studies are needed to identify eventual

differences among the commercially available probiotics in each country. To sum up, it could be concluded that the foregoing additives have the potential to be applied as effective substitutes for in-feed antibiotics.

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