Influence of Beneficial Microorganisms as Probiotic Drinks in the Performance of Brooding Native Chicken

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Abstract

This study was conducted to find out the influence of beneficial micro organisms as probiotics drinks in the performance of brooding native chicken. The probiotic drinks were mixed in the daily water requirements of chicks during 21 days of the brooding period. The 100 day-old chicks were assigned in Randomized Complete Block Design with 5 treatments and 4 replications. The result of the study reveals no significant differences among treatments in terms of final live-weight, and survival rate of birds. Furthermore, the study also reveals that without antibiotics, the brooder chicks have a good chance of survival, which is statistically comparable with those birds given with antibiotics and / or with probiotics drinks. In other parameters like the gain in weight, feed consumption, and feed conversion ratio, the results reveal significant differences among treatments means during 21 days of brooding. Further analysis using Least Significant Differences test, reveals that birds given pure water only, antibiotic with vitamins, indigenous micro organism serum, and fermented pineapple juice, were comparable. The finding reveals that pure water was enough to influence favorably the growth performance of chicks with good survival rate during 21 days of brooding native chicken.

Keywords: native chicken, microorganisms, probiotic drinks

The poultry industry has become an important economic activity in many countries. In large-scale rearing facilities, where poultry are exposed to stressful conditions, problems related to diseases and deterioration of environmental conditions often occur and result in serious economic losses. In recent decades, prevention and control of diseases led to a substantial increase in the use of veterinary medicines. However, the utility of antimicrobial agents as a preventive measure is questioned, given extensive documentation of the evolution of antimicrobial resistance among pathogenic bacteria. So, the possibility of antibiotics ceasing to be used as growth stimulants for poultry and the concern about the side-effects of their use as therapeutic agents have produced a climate in which both consumer and manufacturer are looking for alternatives. Probiotics are being considered to fill this gap and some farmers use them in preference to antibiotics.

Adding the so-called beneficial bacteria to the digestive tract of poultry is not a new concept; however, a complete understanding of where, when and how to use them still has scholars. A strikingly crucial event in the development of probiotics was the finding that newly hatched chickens could be protected against colonization by *Salmonella enteritidis* by dosing a suspension of gut contents derived from healthy adult chickens. This concept is called competitive exclusion (Kabir, 2009). Defined probiotics (Crawford, 1979) as "a culture of specific living micro-organisms (primarily *Lactobacillus spp.*) which implants in the animal to ensure the effective establishment of intestinal populations of both beneficial and pathogenic organisms. "

According to Fuller (2001), probiotic supplements have been developed for a wide variety of different farm and pet animals; they are particularly relevant to the optimal growth of commercially reared chickens where there is separation of the newly hatched chicken from its mother hen, and the opportunity for transfer of microorganisms is reduced.

Benefits derived from this improved intestinal microbial balance could be reflected in performance or prevention of pathogen colonization. Probiotic micro-organisms use in poultry production has been widely accepted and new opportunities arose from the 2006 EU ban on antimicrobial growth promoters (Vilà, Esteve-Garcia, & Brufau, 2010). Fermented fruits and vegetables can be used as a potential source of probiotics as they harbor several lactic acid bacteria such as Lactobacillus Plantarum, L. pentoses, L. Brevis, L. acidophilus, L. fermented, Leuconostocflax, and L. mesenteries. As a whole, the traditionally fermented fruits and vegetables not only serve as food supplements but also attribute towards health benefits (Swain et. al., 2014).

For several centuries, fermented products derived from plant or animal materials have been an acceptable and essential part of the diet in most parts of the world. Health benefits have also often been associated with them. Probiotics can be defined as fermented food containing specific live microorganisms or a live microbial food or feed supplement, which beneficially affects the human or the host animal by improving its intestinal microbial balance. (Kalantzopoulos, 1997). The mechanisms by which probiotics operate include spatial exclusion, micro environmental alterations, production of antimicrobial (Chichlowski, Croom, J., McBride, Havenstein, & Koci, 2007).

Some probiotic (direct-fed microbial) and plant-derived (photogenic) feed additives are gaining market presence. Hesitation by nutritionists to incorporate these feed additives are due in part to 1) unfamiliarity, 2) the overselling of plausible effects by industry, 3) product inconsistency, 4) a lack of documented physiological and microbiological effects in vivo, and, in the case of probiotics, 5) a lack of documentation of persistence (Applegate, Klose, Steiner, Ganner, & Schatzmayr, 2010). A feeding trial was conducted to investigate the effects of dietary supplementations of symbiotic and probiotic on broiler performance, carcass yield, organs weights, and histomorphological measurements of the small intestine. This indicates that the synbiotic and probiotic can be used as a growth promoter in broiler diets and can improve the gut health. (Awad, Ghareeb, Abdel-Raheem & Böhm, 2009). It is concluded that probiotic inclusion level had a significant effect on broiler growth responses, nutrient ADC, AME (n), and cecalmicroflora composition. (Mountzouris et. al., 2010). Consumers are more aware and concerned about their lifestyle than ever before. Thus, the development of non-dairy probiotic products, including food matrices based on fruit, vegetables, and cereals, has been widely studied (Martin et. al., 2013).

The objectives of this study are to determine the effectiveness of naturally made probiotics from the fermentation of organic materials in the nutrition and survival rate of native chicken at brooding stage.

Materials and Methods

The materials used in the study were the following: 100 heads chicks, four (4) brooder cages, twenty 5 watts electric bulbs, feeds, feeders, drinking jars, sack curtains, probiotic drinks, digital weighing scale, cleaning tools, antibiotics and vitamins, ball point pen, record book and laptop.

The experimental method of research was used in the study, assigned in Randomized Complete Block Design. There were 100 brooder chicks used as experimental animals assigned randomly in the designated cages constructed for the purpose. Each treatment has 20 birds with 5 birds per replicate. The study started on July 25, 2015, and ended on August 18, 2015. The experimental layout and treatment are shown in Figure 1.

Experimental Layout and Treatments

Block I	Block II	Block III	Block IV
A	C	C	D
B	A	A	E
C	B	D	A
D	F	F	B
E	D	B	C

Figure 1. The experimental layout and treatments in RCBD. A= water only (control); B= water with commercial antibiotics and vitamins; C= probiotics drinks 1 – (lactic acid serum); D= probiotics drinks 2 (indigenous microorganism); E= probiotics drinks 3 (fermented fruit juice-pineapple).

Data Gathering Procedures

The following data were collected. The initial weight was determined 12 hours after hatching. Determining the gain in weight was done weekly for 3 weeks of brooding. The Final Live weight was determined at 21 days old. The feed consumption was recorded every day until 21 days of brooding, and cumulative feeds consumption was used as the total feed consumption for the 3 weeks of brooding. The Feed Conversion Ratio was derived by dividing the feed consumption over the gain in weight. In this computation, the average cumulative feed consumption was divided by an average cumulative gain in weight. The Water Consumption- was determined by adding all water consumption from day 1 until day 21; the end of the brooding period and the water consumption was measured in a milliliter. The Survival Rate was done by counting the live chicks after the brooding period of 21 days.

Preparing the Probiotic Drinks

For the Lactic Acid Serum (LABS) preparation, the materials were rice washing, crude sugar, and fresh milk. The first washing was saved and placed in a jar for almost 7 inches deep, settled for 7 days period in a cool and shaded place, then drained, transferred it to a clean jar and added fresh milk at about 20 times the quantity of water, covered it with a clean sheet of paper and stored for another 10 days and drained saving the yellowish substance. The same amount of crude sugar or half a liter of molasses was added and the mixture was ready for use as probiotic drinks for chicken. The benefits for chicken are for protection against virus and fungus, and the drinks also act as asterilizer.

The Fermented Fruit Juice (FFJ) preparation, used 1kg ripe fruit (pineapple, banana, avocado), and 1 kg crude sugar or 0.5 li of molasses. Chosen fruit (exclude the peeling) was chopped and mixed with sugar or molasses. The mixture was placed in a jar and covered with a clean sheet of paper and fermented for 7-10 days. The mixtures were strained and the juice was used as Probiotics for chicken. They are a source of potassium and sweets/sugar.

The Indigenous Microorganism (IMO) preparation was prepared by using 1 kg of cooked rice, and 1 kg crude sugar or half a liter of molasses. The cooked rice was placed in a in a perforated tray and covered with paper and tie. The plastic sheet was covered to keep off rainwater and crawling insects, then buried under forest/ bamboo leaves. It was removed after 3 days and placed in jar mixed with crude sugar or molasses and added one-half a litre of water. It was covered with a clean sheet of paper and fermented for 7-10 days, then drained and reserved muddy juice for probiotic drinks for chicken. The mixture will enhance the resistance of crop and livestock against external parasites/pathogens.

Management Procedures

Experimental animals. The 100day-old chicks were acquired from the Darag Research Project of WVSU-Calinog Campus. They were given anti-stress drinks (multivitamins with electrolytes). Treatments were given on the second day by adding them to the drinking water of birds.

Feeding of birds. Feeding was spontaneous for the entire 3 weeks of the experiment. The feeding of probiotics drinks was started in the second day given twice a day; that is, one in the morning and one in the afternoon synchronized with the giving of water to birds. The homemade probiotic drinks were diluted with water at a ratio of 10 ml of probiotic drinks in every 1 liter of water. Love-Feeds were the commercial feeds used for the entire 21 days of experimental study.

Statistical Analysis

Data gathered were recorded, tabulated and analyzed using analysis of variance in Statistical Tool for Agricultural Research (STAR) software. Significant differences were further analyzed using Least Significant Differences (LSD) test.

Results and Discussion

The average final live weight of brooder chicks did not show a significant difference. The result implies that giving of water only (Treatment A), water plus antibiotics & vitamins (Treatment B), lactic acid serum (Treatment C), indigenous microorganism (Treatment D), and fermented fruit juice-pineapple (Treatment E) were comparable in term Final Live Weight of brooder chicks.

The result of the experiments indicates that the highest average gain weight was 98.30g obtained by treatment B – given with antibiotics and vitamins. The analysis of variance reveals significant differences among the treatments because the computed *F* value = 3.81 is more than the tabular F value (4, 12) =3.26 at 5% level of significance. The Least Significant Differences (LSD) test indicates that birds given with antibiotics and vitamins (Treatment B) were comparable with treatment A given with water only and also comparable to treatment C given with probiotic drinks (indigenous microorganism). It implies that probiotics drinks are comparable with antibiotics and vitamins to enhance the gain in weight of chicks in 21 weeks of brooding.

According to (Kalantzopoulos, 1997) probiotic as fermented food containing specific live microorganisms or a live microbial food or feed supplement beneficially affects the human or the host animal by improving its intestinal microbial balance. The present study proved that probiotics drinks (IMO) are effective in the weight gain of native chicken during 21 days of the brooding period.

In the average, cumulative feed consumptions Treatment C (lactic acid serum) obtained the highest feed consumption of 254.70 g. The analysis of variance revealed significant differences among the treatments because the computed *F* value = 11.59 is greater than the tabulated *F* value (4, 12) =3.26 at 5% level of significance. The Least Significant Differences (LSD) test revealed that poultry in Lactic Acid Serum consumed more feeds, while Treatment E (fermented pineapple fruit juice) consumed less feeds with 148.065 g. This implies that nutrient present in the pineapple juice supplies additional nutrients specifically carbohydrates; this is the reason why the birds eat less amount of feeds.

Chicks consumed less feeds when pineapple fruit juices are added to the daily water requirement. Fermented fruits and vegetables not only serve as food supplements but also have attributes of health benefits (Swain, Arandharaj, Ray, & Parveen Rani, 2014). The present study supports the statement of Swain et al, 2014: fermented fruits and vegetables serve as food supplements that enhance nutritional requirement of birds, result to less consumption of feeds when fermented pineapple juice is added in the drinking water of chicks.

The efficient feed conversion was obtained by Treatment B with chicks/ poultry given antibiotics and vitamins. The analysis of variance reveals significant differences among the treatments because the computed *F* value=16.52 is greater than the tabular *F* value (4,12) =3.26 at 1% level of significance. The Least Significant Differences (LSD) test indicates that antibiotic and vitamins were comparable to probiotics drinks (IMO and pineapple fruit juice) and also to Treatment A (water only). The result implies that poultry given of antibiotic and vitamins and or probiotics and/ or pure water were comparable in terms of feed conversion ratio.

The highest average cumulative water consumption was 786 ml among birds given with water only. However, the differences in treatment means do not show significant differences among the five treatments. It implies that the effect of the different organic probiotic drinks given to brooder chicks was comparable in terms of their water consumption for 21 days.

The survival rate of birds was not significant. The result reveals that beneficial microorganisms as probiotic drink are comparable to antibiotics and vitamins (Treatment B). Water is just enough for good survival rate of chicks during brooding since strong resistance against diseases of chicks is inherited from the mother hen natural immunity.

Kabir (2009) claim that a strikingly crucial event in the development of probiotics is when newly hatched chickens are protected against colonization by *Salmonella enteritidis* by dosing a suspension of gut contents derived from healthy adult chickens. This concept is called competitive exclusion.

The mechanisms by which probiotics operate include spatial exclusion, micro environmental alterations, and production of antimicrobial (Chichlowski et. al., 2007). The present findings support the statement of Kabir (2009): that newly hatched chicken have parental natural immunity which provides protection against pathogenic infections and that immunity makes them survive in 21 days of brooding even without supplements of antibiotics and vitamins or probiotics.

Table 1

Summary of Results

Treatments	Treatment Means of Gathered Data					
	Final LW (g)	Gain in WT (g)	Cumulative (g) Feed Consumption	FCR (g)	Cumulative (ml) Water Consumption	Survival Rate Rate
Water only	113.65	89.45^{a}	196.00^{b}	2.20^{b}	786.90	4.75
Water + Antibiotics and Vitamins	121.80	98.3^{a}	199.70^{b}	2.02^{b}	763.54	4.75
Lactic Acid Serum	93.25	66.3^{b}	254.70^{a}	3.89^{a}	570.13	4.50
Indigenous Microorganisms	111.85	86.3^{ab}	183.28^{bc}	2.151^{b}	757.78	4.75
Fermented Pineapple Fruit Juice	96.35	65.8^{b}	148.065^{c}	2.331^{b}	702.60	4.50
ANOVA	Not Significant	Significant	Significant	Significant	Not Significant	Not Significant
Summary of Results C.V. %	13.67	18.33	10.51	15.22	15.99	11.94

Note: Mean with the same letter is not significantly different

Conclusions

The performance of chicks during 21 days of brooding was significantly influenced by a beneficial microorganism present in the probiotic drinks given as nutritional supplements to brooding native chicken in terms of gain in weight, feed consumption and feed conversion ratio. The birds consumed less feeds if fermented pineapple juices (FFJ), were given to brooder chicks. This was probably due to the sugar (carbohydrates) content present in FFJ that supplied additional nutrient requirements for the birds. Feed conversion efficiency (FCR) was significantly different, however, the LSD test reveals that giving water, during the entire brooding period, is just enough to influence the good FCR of chicks. The survival rate was statistically comparable to birds given with probiotics, antibiotics and vitamins and also given with water which is probably due to parental natural immunity of newly hatched chicken which provides protections against pathogenic infection.

Recommendation

The researcher recommends the use of beneficial microorganism as probiotic drinks in the daily water requirements of birds during 21 days of brooding. The probiotic drinks derived from the fermented pineapple juice is recommended with a mixing ratio of 10 ml per a liter of water. The addition of antibiotic and vitamins in the drinking water of native chicken is not anymore needed during the brooding period.

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