

Potentiality of antibiotic free broiler meat production using alternatives to antibiotics in Bangladesh

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ABSTRACT

The current study highlighted the approaches to antibiotic free broiler production using probiotics and herbal extracts. One hundred and twenty-eight day-old broiler chicks of either sex (Cobb-500) were divided into 4 groups with 4 replicates of eight birds such as T₁ (Avigut, 1 g/3L), T₂ (*Lactobacillus spp.*, 5 ml/L), T₃ (0.5 g/3L Avigut + 2.5 ml/L isolated bacteria) and T₄ neither probiotics nor isolated bacteria (control). In another trial, four treatments were T₁ (control, without supplementation/antibiotics), T₂ (neem leaves extract, 3ml/L), T₃ (okra pods extract, 5ml/L) and T₄ (combined extract of neem leaves and okra pods, 1.5ml/L and 2.5ml/L, respectively). The lowest body weight gain was recorded for control groups of both trail whereas significantly ($P < 0.05$) higher body weight gain was recorded in T₂ (2.28 kg, *Lactobacillus spp.*) and T₄ (combined supplementation of aqueous extracts of neem leaves and okra pods, 2116.58±10.5). It was also observed that the mortality of the birds under herbal supplemental groups was minimum with an acceptable range (2 to 4%) whereas in control group the recorded mortality rate was 13%. Therefore, it may conclude that antibiotics free broiler production is possible by using probiotics or suitable herbal extract supplementation.

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Introduction

Currently, the poultry industry is a highly promising and probable sector in Bangladesh and consumer's demands are high towards antibiotic free safe food (Jahirul *et. al.*, 2019). Bangladesh is a densely populated country and the growth rate of the population is increasing day by day. The demand for the protein of this massive population is a great threat to us. More than half of the

people are dependent on agricultural-based live-stock farming for their livelihood in Bangladesh (Rahman *et. al.*, 2015). Although there are so many sources of animal protein, broiler meat can be an alternative potential source to fulfill the huge demand of our native population. Because the duration of broiler rearing is very short and within 36-42 days it is ready for marketing and suitable for human consumption. It also brings a very short time return to the farmer. Broilers meat is popular to all and there is no religious restriction to consume broiler meat (Rahman *et. al.*, 2015). It is reported that about 80% of farmers are not trained for rearing modern high yielding poultry (Sultan *et. al.*, 2016). In veterinary

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practices, antibiotics are used for prophylactic, therapeutic and growth-promoting purposes. The purchase of antibiotics without prescription is a common practice in developing countries like Bangladesh, which lead inadequate treatment course, incorrect antibiotic selection, indiscriminate and excess use of antibiotics as well as residual deposition in animal bodies. The present scenario in Bangladesh says that commercial poultry farmers indiscriminately use antibiotics without any veterinary consultation or advice. The ignorance of the local farmers, lack of proper veterinary service in rural/remote areas and the desire for high profits provoke the farmers to use antibiotics indiscriminately (Saiful *et. al.*, 2016). The causes of using antibiotics in poultry production in Bangladesh as well as globally are many. Antibiotics that are used as antimicrobial growth promoters (AGPs) in broiler feed have been shown to increase meat yield and improve feed efficiency with a substantial reduction in pathogenic bacteria in the host gut (Gaskins *et. al.*, 2002). A recent study with 160 poultry samples from different regions of Bangladesh identified antibiotics in more than 50% of samples (Sarker *et. al.*, 2018). Nowadays consumers are refusing to consume antibiotic-treated chicken meat and demanding antibiotic-free safe meat. Therefore, there is a huge prospect of antibiotic-free chicken production in Bangladesh. Bangladesh is rich in medicinal plants and a large number of medicinal plants were identified for antibacterial activity. There are few guidelines to produce antibiotic-free broilers such as feed additive alternatives, essential oils, probiotics, prebiotics, organic acids, etc. Antibiotic-free broiler production is relatively a new concerned approach in Bangladesh. So, successful rearing strategy data are not much established. Therefore, this report is aimed to highlight antibiotics free broiler production approaches especially using probiotics and herbal extracts.

Materials and Methods

Experimental birds

One hundred and twenty-eight (128), day-old “Cobb-500” broiler chicks of either sex were collected from the nearby reputed hatchery, Advance A+ Rajshahi, Bangladesh. The chicks were divided equally into 4 groups with 4 replicates of eight birds in each. Chicks were housed in open-sided pens from day old to 35

days. No antibiotics were used during the experimental period but vaccination was done during the brooding stage.

Design of the experiments

Probiotics as an alternative to antibiotics

The birds were *ad-libitum* fed with the available ready-made pellet (starter and finisher, RRP feed, Rajshahi, Bangladesh). *Lactobacillus spp.* was selected from locally available yogurt (sour and sweet) which was collected from the nearby market at Rajshahi University campus. There was four water supplementation with yogurt and probiotic such as T₁-*Bacillus subtilis* (3×10⁹ CFU, Avigut, 1 g/3L) probiotic powder, T₂-isolated bacteria (*Lactobacillus spp.* from sweet and sour yogurt, 5 ml/L), T₃-combination of Avigut and isolated bacteria (0.5 g/3L Avigut + 2.5 ml/L isolated bacteria) and T₄ neither probiotics nor isolated bacteria (control).

Herbal extracts as an alternative to antibiotics

Chicks were randomly divided into 4 groups with 4 replicates where T₁ was considered as the control without any treatment, T₂ was treated with neem leaves extract (3ml/L), T₃ was treated with okra pods extract (5ml/L) and T₄ was treated with combined extract of neem leaves and okra pods (1.5ml/L and 2.5ml/L, respectively). Isolation of *Lactobacillus spp.* from yogurt and herbal extracts preparation was performed by following the standard method.

Statistical Analysis

The data obtained from this study were analyzed by one-way analysis of variance (ANOVA) technique in completely randomized design (CRD) using Kaleida Graph (Synergy Software, Reading, PA, USA). All data were presented as means ± standard deviation (SD). Test results are marked with * ($P < 0.05$) for significant and ** ($P < 0.001$) for highly significant differences or correlations.

Results and Discussion

Probiotics as an alternative of antibiotics in broiler production

In this current study, probiotics (Avigut) and *Lactobacillus spp.* isolated from yogurt was solely or combined supplemented to experimental birds to produce antibiotic-free broiler. The average body weight gain of the experimental birds is presented in Fig.1. The statistical analysis revealed that total body weight gain was significantly higher in T₂ (2.28 kg) when compared to T₃, T₁, and T₄; 2.15 kg, 2.12kg and 1.91 kg, respectively (Fig.1). The probiotics include live bacteria, yeast, their metabolites, and pH adjusters, which contribute to maintaining balance in intestinal microflora (Islam et al., 2004). Probiotic effects are due to great efficiency in the utilization of feed, resulting in improvement of the growth. Therefore, the significant higher meat yield in T₂ was assumed to be for an excellent probiotic effect of *Lactobacillus spp.* isolated from yogurt. It is reported that probiotics have digestion stimulating properties and antimicrobial establishing ability due to the multiplications of beneficial microorganisms in the gut (Ahmed et al., 2017).

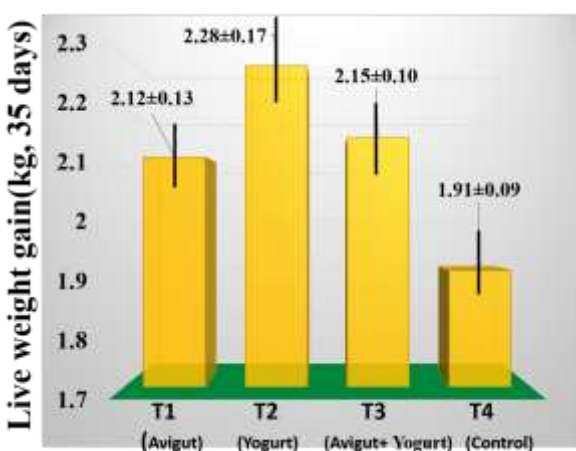


Fig. 1. Effect of yogurt and probiotics supplementation in antibiotics free broiler production (live weight gain at 35 days of age).

The lowest body weight gain was recorded under the birds in the control group (T₄) assumed to be due to the less immunity and reduced multiplications of beneficial microorganisms in the gut. Rahman et al. (2013) reported that probiotic microorganisms are responsible for the production of vitamin B complex and digestive enzymes for stimulation of intestinal immunity, increasing protection against toxins produced by pathogenic organisms. It was also supported by another study that the probiotic feeding assists in preventing colonization of pathogens in the

intestinal tract and in producing certain enzyme-like substances (growth promotor) to enhance the production performance in broilers (Rosin et al., 2007). Therefore, it is assumed that supplementation of drinking with commercial probiotics and yogurt enhanced gut microflora activities and finally improved the performance of experimental birds.

Herbal extracts as an alternative of antibiotics in broiler production

The body weight gain of the birds is an important parameter, especially for the broiler. The average final body weight gain at different stages of growth from 7 to 35 days of age are presented in Fig. 2. The results indicated that the average body weight gain of the experimented birds at all stages of growth from 7 to 35 days of age was higher under T₄ (2116.58±10.5) followed by T₂ (2001.98±10). On the other hand, the final average body weight gain is almost similar in T₁ and T₃. The difference among the means under all the treatments was found to be statistically highly significant ($P < 0.001$) at all stages of growth. The lowest body weight gain was recorded for T₁ (1834.34±21.01) whereas the highest body weight gain was found under the T₄ group where the birds were supplied the combined supplementation of neem leaves aqueous extracts with okra pods aqueous extracts (2116.58±10.5).

The present finding is supported by Rahman et al. (2015) where the authors reported the maximum weight gain obtained under combined supplementation of neem leaf and ginger group (I₃) where birds were treated with 3ml of combined herbal extract/liter drinking water for consecutive six weeks. Neem plays a role as free radical scavenging properties due to a rich source of antioxidants. It was reported that neem leaves contain ingredients such as nimbin, nimbanene, 6-desacetylnimbinene, nimbandiol, nimbolide, ascorbic acid, n-hexacosanol, and amino acid, 7-desacetyl-7benzoylazadiradione, 7-desacetyl-7-benzoylgedunin, 17-hydroxyazadiradione, and nimbiol (Ali 1993, Hossain et al. 2011, Kokate et al. 2010). Yerima et al. (2012) experimented to evaluate the antibacterial activity of the bark, leaf, seed, and fruit extracts of *Azadirachta indica* (neem) on bacteria isolated from adult mouth and results revealed that bark and leaf extracts showed antibacterial activity against all the test bacteria used. Therefore, it is assumed that the

combined effects of neem leaves and okra pods extracts accelerated the body weight gain of the experimental birds.

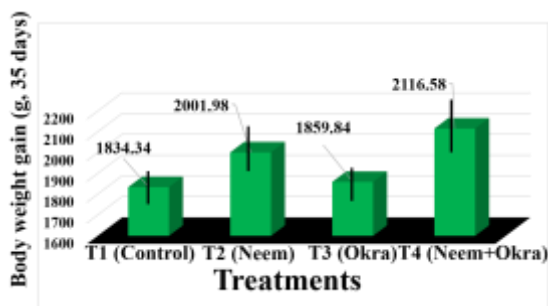


Fig. 2. Effectiveness of various herbal extracts on antibiotics free broiler production (live weight gain at 35 days of age)

It was also noticed that the mortality of the birds under supplemental groups was minimum (2, 4 and 2 % for neem, okra and neem + okra, respectively) whereas in control groups mortality was very much higher (13±0.8%) due to the lack of immunity (Table1).

Table 1. Effect of herbal extract supplementation on mortality to produce antibiotics free broilers.

Mortality (%) (Mean±SD)	Treatments			
	T ₁	T ₂	T ₃	T ₄
	13±0.8	2±0.1	4±0.3	2±0.1

Conclusion

In this current study, probiotic (Avigut), yogurt, neem leaves, and okra pods aqueous extracts solely and in combination were supplemented to the experimental birds through drinking water to produce antibiotics free broilers. The obtained findings revealed that the overall performance of the experimental birds was enhanced in probiotic, yogurt or herbal extracts supplemented groups in comparison to the control group (non-supplemented). An acceptable range of mortality rate (2 to 4%) was recorded in birds under supplementation groups even without any antibiotics. Therefore, it may conclude that antibiotic-free broiler production is possible with the utilization of suitable probiotics and herbal extracts as an alternative to antibiotics.

Competing Interests

The authors are declaring no conflicts of interest.

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