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Feasibility of Probiotics Supplementation in Caged Broilers

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

As part of the Sam Higginbottom University of Agriculture, Technology and Sciences in Prayagraj, this experiment was carried out at the Small Animal Lab which is part of the research unit. We investigated the "economic cost of including probiotics in the feed of caged broilers". We used a total of 96 day-old chicks and were randomly assigned four groups of 24 chicks (T_0, T_1, T_2, and T_3) and eight replicates each, these groups. T_0 control group was fed the (BD), T1 was fed Bacillus coagulans at 40 ppm in BD, T_2 was fed *B. subtilis* at 50 ppm in BD, and T_3 was fed *B. licheniformis* and *B. coagulans* 20 ppm in BD. After a 35-days trial period, an analysis of the economic effects of the probiotics supplementation was calculated. The results revealed a decrease in FCR as birds achieved more weight, leading to increased body weight and resulting in a higher price per kg. Adding probiotics to the feed doesn't increase the variable cost than the control group. It was found

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that the maximum profit was obtained in T3 (Rs. 5771.32), T_0 (Rs. 5297.3), and T_2 (Rs. 5074.92), whereas the T1 group had the least revenue. Mixing probiotics in poultry feed increases profit without much affecting the production cost.

Keywords: Cost; economics; FCR; probiotics; profit; revenue.

1. INTRODUCTION

Among the agricultural and veterinary industries, poultry is experiencing rapid expansion. Poultry production spends a significant amount on feed, which accounts for 70% of the total. Poultry growers are seeing a decline in their profit margins due to the ever-increasing cost of compounded feed and other poultry feed additives [1]. Consequently, the most crucial requirement for optimal genetics for economically viable chicken production is balanced and effective feeding. Some feed additives, including growth promoters, synthetic hormones, and antibiotics, have been widely utilized to increase poultry output. Nevertheless, antibiotic growth promoter (AGPs) used in poultry have the potential to impact human health through residues in chicken products and the development of antibiotic-resistant microorganisms [2]. Using AGPs in chicken feed is illegal in many European nations. As a result, a lot of studies have focused on finding alternatives that can meet the needs of consumers and international markets without compromising production or being hazardous to animals or humans. One of these approaches that stands out is probiotics. Feed additives containing probiotics reduce the risk of gastrointestinal diseases by increasing the immune response, secreting antimicrobial compounds, and exerting a competitive exclusion of harmful bacteria [3]. These products have been shown to have no residue in animal products and have been found to enhance animal performance and health. This has been supported by various studies [4-8]. The reason behind this improvement is that these products enhance the digestibility of the animal's diet, [9]. This leads to better utilization of nutrients and, consequently, higher productivity, as indicated [10-12]. Probiotics can be administered to chickens either by mixing them with feed or by adding them to drinking water [13]. The growth of pathogens including *Escherichia coli* and *Salmonella sp.,* can be inhibited by lactic acid bacteria probiotics, which have been shown to have a favorable effect [14-18]. In addition to producing lactic acid and bacteriocins, lactic acid bacteria can colonize the intestines and survive [19]. The probiotic and antimicrobial properties of *Lactobacillus casei* make it a promising candidate for use as a functional probiotic in animal feed [20]. You can treat your birds/animals with probiotics in both feed and water, but it's important to note that probiotics in water can make them gain weight and reduce the feed conversion value. Investigating whether it's more profitable to give broiler probiotics in water should be carried out by doing an economic study. Thus we aimed to explore how much money broiler farms make by switching from (AGPs) to probiotics like *B. Subtilis*, *B. Coagulans* and *B. licheniformis* to increase feed conversion and weight was the main motivation for this research.

2. MATERIALS AND METHODS

As part of the Sam Higginbottom University of Agriculture, Technology and Sciences in Prayagraj, this experiment was carried out at the Small Animal Lab which is part of the research unit. We investigate the "economic cost analysis of including probiotics in the feed of caged broilers". We used a total of 96 day-old chicks and were randomly assigned four groups of 24 chicks (T_0, T_1, T_2 and T_3) and eight replicates each into these groups. The groups were as follows; T_0 control group was fed the basal diet (BD). T_1 was fed *Bacillus coagulans* at 40 ppm in BD, T_2 was fed *B. subtilis* at 50 ppm in BD, and T_3 was fed *B. licheniformis* and *B. coagulans* at 20 ppm in BD. After a 35-days trial period, an analysis of the economic effects of adding probiotics in feed was calculated.

3. RESULTS AND DISCUSSION

The provided table outlines the breakdown of costs associated with different treatments (T_0, T_1, T_2, and T_3), along with T_0 (control group), across various categories. Here's a detailed explanation of each category:

Transport (Rs): Represents the cost of transportation for each treatment group as well as the control group. The cost of transportation was consistent across all groups.

Feed additive (Rs): Displays the cost of feed additives (probiotics) for each treatment group and the control group as shown in the Table 1.

DOC broiler (Rs): Indicates the cost associated with Day Old Chicks (DOC) for each treatment group and the control group. The cost of DOC broiler remained constant across all groups (Table 1).

Feed (Rs): Represents the cost of feed for each treatment group and the control group. The cost of feed varies across treatments as shown in Table 1.

Total (Rs): Is the sum of the total variable costs for each treatment group and the control group. It included the costs of transportation, feed additives, DOC broiler, and feed. The total cost varies across treatments as shown in Table 1.

Each row in the table provides a detailed breakdown of the variable costs associated with transportation; feed additives, DOC broiler, feed, and the total cost for each treatment group and the control group. This breakdown allows for a comprehensive comparison of costs across different treatments and the control group.

Final body weight production (kg): Shows the average final body weight production in kilograms for each treatment group at the end of the treatment period. It indicates the weight gain achieved by the broiler chickens (Table 2).

Final body weight sell/kg (Rs): The selling price per kilogram of broiler chickens remains constant across all treatment groups (Table 2). This indicates the price at which the broiler chickens are sold.

Total Revenue (Rs): Represents the total revenue generated from selling broiler chickens for each treatment group. It is calculated by multiplying the final body weight production by the selling price per kilogram.

Total Cost (Rs): Displays the total cost incurred for treating 96 broiler chickens in each treatment group. The costs include transportation, feed additives, DOC broiler, and feed.

Profit (Rs): Shows the profit generated from the sale of broiler chickens for each treatment group. It is calculated by subtracting the total cost from the total revenue, indicating the financial gain from the broiler chicken treatment.

Each row in the table provides detailed information about the final body weight production, revenue, cost, and profit for each treatment group, facilitating comparison and analysis of the effectiveness and profitability of different treatments.

Discussion: Probiotics of the type T2, T3, T4, and T5 administered by feed or water can enhance body weight while decreasing feed conversion [21]. Adding 0.25 g probiotic/liter through drinking water yields the highest production performance results and the most profitable economic analysis. Therefore, for optimal agricultural performance and profit, farmers can administer 0.025 g probiotic/liter through water, and study by Pant et al. [22] during the study period, 60% of broiler farms were found to be in operation. When it came to economic losses, broiler flocks were the worst hit, except for two farms (B1 and B6), caused by factors such as reduced body weight gain, increased feed conversion ratio (FCR), mortality, chemotherapy, and chemoprophylaxis. There was no subclinical form of coccidiosis documented in farm B6, loss due to chemotherapy was higher compared to poor FCR, whereas in farm B6 no subclinical form of coccidiosis was recorded. Chemotherapy was higher than low FCR in farm B2, and mortality was the main cause of loss in farm B1 due to concomitant infection of inflammatory bowel disease.

Table 1. Variable cost of treatments

Description	T_0	T_1	T_2	T_3
Transport (Rs)	12.5	12.5	12.5	12.5
Feed additive (Rs)	0	0.18	1.58	0.30
DOC broiler (Rs)	768	768	768	768
Feed (Rs)	1533.6	1440	1382.76	1313.88
Total (Rs)	2314.1	2220.68	2164.08	2094.68

T0 control group was fed the basal diet (BD). T1 was fed Bacillus coagulans at 40 ppm in BD, T2 was fed B. subtilis at 50 ppm in BD, and T3 was fed B. licheniformis and B. coagulans at 20 ppm in BD.

Table 2. Total of revenue and profit for 96 broiler chickens treatment

Description	T_0	T_1	T_2	T_3
Final of body weight production (kg)	40.06	34.40	38.10	41.40
Final of body weight sell/kg (Rs)	190	190	190	190
Total of Revenue (Rs)	7611.4	6536	7239	7866
Total of cost (Rs)	2314.1	2220.68	2164.08	2094.68
Profit (Rs)	5297.3	4315.32	5074.92	5771.32

T0 control group was fed the basal diet (BD). T1 was fed Bacillus coagulans at 40 ppm in BD, T2 was fed B. subtilis at 50 ppm in BD, and T3 was fed B. licheniformis and B. coagulans at 20 ppm in BD.

4. SUMMARY AND CONCLUSION

It was found that the maximum profit was obtained in T_3 (Rs. 5771.32), T_0 (Rs. 5297.3) and T_2 (Rs. 5074.92) whereas the T_1 group had the least revenue. The major difference was noted due to a decrease in FCR as birds achieved more weight leading to increased body weight and resulting in more price per kg. Adding probiotics to the feed doesn't increase the variable cost and treatment groups had variable cost less than the Control group.

Mixing probiotics in poultry feed increases the profit/revenue without much affecting the production cost. Hence, probiotics can be included in poultry feed however large-scale studies in the future are recommended.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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