

EFFECT OF EFFECTIVE MICROORGANISM (EM) SUPPLEMENTATION ON THE PERFORMANCE OF COMMERCIAL BROILERS AT SHOMPANGKHA BLOCK IN SARPANG DISTRICT

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ABSTRACT: *The study evaluated the effect of Effective Microorganisms (EM) solution supplementation on the production performance of commercial broiler chickens. A total of 408 unsexed broiler chicks were randomly assigned into two groups: control and treatment, with three replications each (n = 68 per replicate). The treatment group received EM via drinking water and bedding spray as a 2% solution for 56 days, while the control group did not receive EM supplementation. The trial aimed to assess the effects of EM on average daily gain (ADG), feed conversion ratio (FCR), and mortality. Body weight and feed intake were recorded daily and then consolidated into a weekly data set to calculate ADG and FCR. At the end of six weeks, the ADG was 60.89 ± 34.07 g in the treatment group and 55.96 ± 32.51 g in the control group. However, the difference was not statistically significant (p = 0.803). Similarly, at eight weeks, the ADG was 55.75 ± 35.09 g (treatment) and 53.91 ± 29.19 g (control), with no significant difference (p = 0.0803). In contrast, the FCR values demonstrated a statistically significant difference between the groups (p = .006). The treatment group consistently exhibited a lower FCR, starting from 0.96 at day 7 to 2.55 at day 56 as compared to the control group, which ranged from 1.43 to 2.64 over the same period. This indicates improved feed efficiency due to EM supplementation. Mortality was higher in the treatment group (7.35%) compared to the control group (3.92%) resulting from heat stress and western-end location of treatment group pens that had direct exposure to sunlight for a longer duration during the trial. The findings suggest that EM supplementation did contribute to better feed efficiency in commercial broilers.*

Keywords: Commercial broiler; Effective microorganism; Feed conversion ratio; Weight gain

1. INTRODUCTION

Agriculture is the main source of livelihood for the majority of the Bhutanese people, and livestock farming forms an integrated part of agriculture sector (Gyeltshen 2011). In Bhutan, six species of livestock farming (poultry, bovine, equine, caprine, ovine, and swine) were recorded and poultry outnumbered the population with 0.924 million poultry in 2024 (National Statistics Bureau [NSB], 2025). Poultry is primarily kept for meat and egg purposes (Penjor and Chhetri 2023). Poultry meat and eggs are cheap sources of high quality protein,

required for growth and development of human body (FAO 2013).

In Bhutan, four poultry species (chickens, ducks, turkeys, and guinea fowl) are reared. However, only chicken is extensively reared. The broiler chicken (meat) constitutes about 27.61% of the total poultry population of one million (NSB 2025). The poultry industry plays a crucial role in providing a reliable and affordable source of protein for human consumption. However, the intensive production practices in commercial broiler farming often lead to

health challenges, reduced growth performance, and poor meat quality (Caffyn 2021). The use of antibiotics as growth promoters has raised concerns about the development of antibiotic resistance (Miles et al. 2006). As an alternative, Effective Microorganism (EM) has gained attention as potential natural solution to enhance broiler performance and health without the risk of anti-microbial resistance (AMR). Considering the economic feasibility, EM supplementation has the potential to improve profitability by reducing feed costs and enhancing growth performance (Ari et al. 2016; Flint and Garner 2009). This research protocol therefore was aimed to investigate the effect of feeding EM on commercial broiler, focusing on production performance.

The commercial broiler industry faces significant challenges related to the optimization of poultry health and performance while reducing the dependence on antibiotics and harmful chemicals. In this context, there was a pressing need to investigate the potential benefits of EM as a feed supplement for commercial broilers in Bhutan. There is a lack of comprehensive research addressing the specific effects of EM on the growth, and overall performance of commercial broilers in Bhutanese context. The objective of the study was to assess the effect of EM supplementation on the production performance of commercial broilers.

2. MATERIALS AND METHODS

2.1 Study area

The study was conducted at Shompangkha block in Sarpang Dzongkhag from July to September 2024, situated in the southern foothills at an altitude of 200-600 metre above sea level (masl) of the country, located at 26.85074° N latitude and 90.29767° E longitude. (Tashi 2019).

Sarpang Dzongkhag experiences an extreme record of a temperature of 35.5°C and average rainfall of about 7220 mm per annum (National Centre for Hydrology and Meteorology (NCHM) (2021).

2.2 Research method

In total 408 unsexed broiler chicks of Vencobb 400Y strains, were randomly divided in control and treatment group with three replications respectively (n=68 in each replicates). A 2 % solution of the effective microorganism activated solution (EMAS) was prepared by dilution in water (2 L EMAS: 98 L water) and provided to broilers for 56 days through drinking water. Additionally, the EMAS was also sprayed on the bedding material as a 2% (Mbaganda and Mgunda 2013) solution on day 0, 1, 2 and then on alternate days till processing. The research was continued till 56 days. Additionally, in the control group, EMAS was not used.

2.3 Data collection

Data collection was carried out over the 56-day experimental period to evaluate the production performances of commercial broilers under the EM treatment. Daily measurements of body weight and feed intake were recorded for each replicate. These measurements were used to calculate average daily gain (ADG), feed conversion ratio (FCR), and total body weight gain. Additionally, daily monitoring was conducted to record any incidences of mortality in both the control and treatment groups.

2.4 Data analysis

The collected data were initially organized and processed using Microsoft Excel 2016 for preliminary calculations. Subsequently, the data were exported to SPSS version 23 for statistical analysis. Prior to conducting parametric tests the data were assessed for

normality using the Shapiro-Wilk test. Upon confirming the assumptions of normality, an independent samples t-test was applied to compare the means between the control and treatment groups for key performance indicators such as average daily gain (ADG) and feed conversion ratio (FCR). A p-value of less than 0.05 was considered statistically significant.

3. RESULTS AND DISCUSSION

3.1 Average daily gain in broilers

The figure 1 box and whisker plot shows the mean weight between control and treatment group. The ADG was 60.89 ± 34.07 g and 55.96 ± 32.51 g in treatment and control group respectively at the end of six weeks. There was no significant ($p = .803$) difference observed in the weight gain at the end of six weeks. The ADG recorded at the end of eight week was 55.75 ± 35.09 g and 53.91 ± 29.19 g in treatment and control group respectively. The statistical analysis revealed that EM supplementation has no significant difference on ADG between control and treatment group ($p=0.0803$). Similarly, a study done by Jayathilaka et al. (2017) revealed that providing EM to broiler through drinking water had less effect on carcass yield. According to Miadu et al. (2025) revealed that broiler supplemented with EM had minor improvement in ADG. Additionally, the high variability observed between treatment and control group may have attributed to non-significant differences. Similar results was also revealed by FAO (2016), which stated that probiotic effects on weight gain in poultry are often unpredictable and subjective by

managing and environmental aspects.

3.2 Feed conversion ratio in broilers

The data in table 1 shows that the FCR in broilers differed significantly between the Control and Treatment groups, with a p-value of .006 indicating statistical significance. The Control group exhibits a consistent increase in FCR from 1.43 at 7 days to 2.64 at 56 days indicating higher feed requirement for weight gain. In contrast, the Treatment group maintains a lower FCR across all ages, starting at 0.96 at 7 days and reaching 2.55 at 56 days, indicating greater feed efficiency. This suggests that the Treatment group required less feed for the same weight gain, demonstrating the effectiveness of the EM supplementation in improving feed conversion. This aligns with study done by Jwher et al. (2013) where EM fed broiler had better FCR and further, Ali et al. (2013) revealed that better FCR has better economic viability in broiler farming.

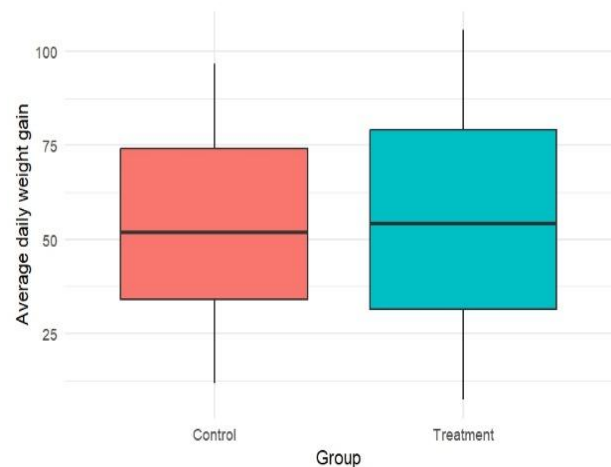


Figure 1: Average daily weight gain.

Table 1: Table showing FCR in control and treatment group.

Group	Age in days								p-value
	7	14	21	28	35	42	49	56	
Control	1.43	1.50	1.88	1.89	1.85	2.00	2.35	2.64	0.006
Treatment	0.96	1.28	1.53	1.81	1.74	1.84	2.26	2.55	

3.3 Health care and mortality

The vaccination of broilers in both control and treatment group was carried out. The broilers were vaccinated against Marek's disease, Infectious bursal disease, and New castle disease. The biosecurity protocol such as footpath in entry gate and visitors' restriction was applied.

The mortality was observed in both the control and treatment group. The mortality percentage was 3.92% and 7.35% in the control group and treatment group respectively. The higher mortality coincidentally in treatment group could be attributed to the heat stress; a common phenomenon in Sarpang district at the onset of autumn, a transition from moist summer to dry autumn season. Further, the position of the treatment group pens in the western end of the open sided shed had access to direct sunlight till late evening. According to study done by Esatu (2011) revealed no significant difference in mortality in EM fed through feed and drinking water.

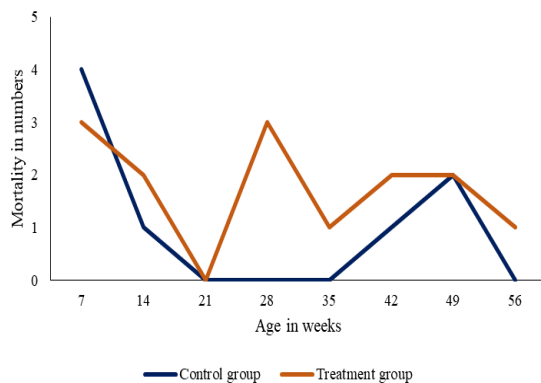


Figure 2: Weekly mortality trend in EM fed and non-fed group.

4. CONCLUSION AND RECOMMENDATION

The study concluded that supplementation of EM in commercial broiler production had a statistically significant improvement in

FCR, indicating better feed efficiency and overall profitability. Feed conversion efficiency is the most vital parameter contributing to farm efficiency. Thus, through this study, it is recommended to use EM solution for farm efficiency.

However, there was no statistically significant effect on the ADG. This suggests that EM could be a valuable natural additive for improving feed utilization, potentially offering economic benefits by reducing feed costs without compromising growth performance. Based on these findings, it is recommended that future research should include a comprehensive economic analysis, larger and longer trials, and trial in summer and winter seasons.

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