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Efficacy of two multistrain probiotic preparations on growth, morbidity and mortality in Kaveri poultry under backyard system

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Abstract

The present study evaluated the effects of two multistrain probiotic formulations on growth performance, morbidity, and mortality in Kaveri chickens reared under field conditions. A total of 1,200 birds were allocated to three groups: A control group (T₀), a group receiving a probiotic powder premix (T₁), and a group supplemented with an enteric-coated multistrain probiotic (T₂). Initial body weights at 6 weeks did not differ significantly among groups, confirming uniform allocation. By 12 and 20 weeks, both probiotic treatments resulted in significantly higher body weight gain compared to controls, with the T₂ group showing the greatest improvement ($p < 0.05$). Morbidity and mortality rates were also markedly reduced in the probiotic-treated groups, particularly in T₂, which exhibited the lowest and most consistent health-related outcomes ($p < 0.001$). The enhanced performance associated with the enteric-coated formulation is likely attributable to improved delivery and stability of probiotic organisms, leading to better gut microbial balance, reduced pathogen colonization, and enhanced nutrient utilization. This study demonstrating the beneficial effects of probiotics in poultry and highlight the potential of enteric-coated formulations as an effective strategy to improve productivity and health in improved backyard poultry under extensive and semi-intensive systems of rearing.

Keywords: Kaveri, Chicks, Probiotic, Probad EC, Morbidity rate, Mortality rate

Introduction

The poultry sector plays a pivotal role in supporting rural livelihoods, enhancing nutritional security and contributing to national economic growth. In particular, rural backyard poultry systems provide substantial benefits to landless, marginal, and smallholder communities by serving as an accessible and resilient source of income and nutrition. Characterized by extensive or semi-intensive management practices, backyard poultry has emerged as one of the fastest-growing components of the agricultural sector. Indigenous and backyard poultry breeds are especially valued for their adaptability to local environments, resilience to harsh climatic conditions, innate disease tolerance, and the high nutritional quality of their products. Moreover, these systems require minimal infrastructure and low managerial inputs, making them a sustainable and economically viable option for resource-constrained households.

In commercial poultry production, birds are typically maintained under intensive rearing systems, conditions that can facilitate the rapid spread of infectious diseases. Historically, sub-therapeutic antibiotics have been incorporated into poultry and livestock feed to prevent illness and enhance productivity. However, increasing global concerns regarding antimicrobial resistance (AMR) and the presence of antibiotic residues in meat and eggs have led to strict regulations governing their use, prompting researchers and feed manufacturers to explore alternative strategies ^[1, 2]. Over time, numerous studies have underscored the potential of probiotics to mitigate antibiotic resistance in pathogenic bacteria affecting poultry. More recently, a broad range of non-specific immunomodulatory agents, including prebiotics, probiotics, postbiotics, symbiotic, essential oils, polysaccharides, enzymes, and organic acids have emerged as promising and safe substitutes for conventional antibiotics, demonstrating

considerable efficacy in enhancing gut microbiota health and overall poultry performance [3-6].

The mechanisms through which probiotics exert their beneficial effects are multifaceted. They include the production of antimicrobial compounds, inhibition of pathogen adhesion, enhancement of nutrient absorption and feed conversion efficiency, and competition with pathogens for available nutrients. Probiotics also reduce toxin bioavailability, limit superoxide generation and lipid peroxidation, and modulate host immune responses by influencing HSP70 expression, cytokine levels such as IL-4 and IL-2, and lymphocyte proliferation [7, 8].

The application of probiotics in improved backyard poultry systems under field conditions remains limited. Therefore, the present study was undertaken to evaluate the efficacy of a multistrain probiotic powder premix administered through feed, along with Probead EC, an enteric-coated multistrain probiotic, in reducing morbidity and mortality and enhancing growth performance in Kaveri chicks under field conditions.

Materials and Methods

Kaveri birds aged 5-6 weeks were procured from the Department of Poultry Science, MARS, University of Agricultural Sciences, Dharwad. A total of 1,200 birds were randomly allocated to 60 beneficiaries (20 birds per beneficiary; 1:1 male-to-female ratio) across Sirsi, Siddapur, and Yellapur taluks. Within each cluster, the birds were divided into three treatment groups: T₀, T₁, and T₂.

The T₀ group served as the control and consisted of 300 birds managed by 20 farmers, receiving only a commercial poultry diet (30-40 g/bird/day). The T₁ group included 300 birds under 20 farmers and received the commercial poultry diet supplemented with a multistrain probiotic powder at 250 ppm, containing *Bacillus coagulans*, *Bacillus licheniformis*, *Bacillus subtilis*, and *Lactobacillus acidophilus* (4 billion CFU/g). The T₂ group, comprising 300 birds under 20 farmers, was provided the commercial diet (30-40 g/bird/day) along with enteric-coated probiotic beads at a dosage of 5 beads/bird/day. The Probead EC formulation contained *Bacillus subtilis*, *Bacillus firmus*, *Lactobacillus* spp., and the yeast *Saccharomyces cerevisiae* (10⁶ CFU/bead). Probiotics were supplemented for a period of 45 days. All the birds were reared under semi-intensive system of management with 4-5 hours of scavenging.

The average body weight of the 20 birds per beneficiary was recorded at 6, 12, and 20 weeks of age. Similarly, morbidity and mortality rates were assessed at 12 and 20 weeks. Morbidity included both specific and nonspecific infectious conditions, while mortality represented the number of birds that died due to specific or nonspecific infectious diseases.

Statistical analysis

Data was analysed using SPSS ver.25, one way ANOVA employed to compare the means of three groups and statistical significance of the means of three groups is tested by | F-test.

Results and Discussion:

In the present study, we evaluated the effects of two forms of multistrain probiotic supplementation on growth performance, morbidity, and mortality in Kaveri chickens. The initial mean body weight recorded at 6 weeks of age did not differ significantly among the groups (F=0.51, P=0.60), confirming that birds were randomly and uniformly allocated.

By 12 and 20 weeks of age, birds in both the T₁ (874.70±123.14 g; 1353.25±138.20 g) and T₂ groups

(905.40±104.92 g; 1419.10±122.10 g) exhibited significantly greater body weight gains compared to the T₀ control group (806.10±134.31 g; 1263.90±203.59 g), respectively. ANOVA revealed a significant effect of treatment on body weight at 12 weeks (F=3.51, P=0.04) and at 20 weeks (F=4.82, P=0.01), demonstrating that probiotic supplementation enhanced growth performance. Among the treatments, birds in the T₂ group achieved the highest body weight gains, followed by those in the T₁ group, indicating superior efficacy of the enteric-coated probiotic formulation (See details Table-1, Figure-1).

Previous studies have documented enhanced body weight gain in backyard poultry, dual-purpose chickens, and broilers supplemented with powdered probiotics incorporated into feed [8-10]. Consistent with these findings, several field and controlled studies on improved backyard poultry breeds in India have reported significantly improved growth performance particularly body weight gain and feed conversion ratio (FCR) following supplementation with Probead EC compared to unsupplemented control groups [11-13]. These improvements have been attributed to enhanced nutrient utilization, reflected in increased villus height, greater crypt depth, and a higher abundance of beneficial gut microbiota [12, 14]. The superior performance observed with the enteric-coated probiotic formulation (Probead EC) in the present study may be due to its improved stability and efficient delivery of viable probiotic organisms to the intestine, enabling them to bypass the acidic environment of the proventriculus and exert maximal activity within the gut.

Morbidity data at 12 and 20 weeks shows that control group exhibited the highest morbidity (28.75±7.76, 40.75±9.36), reflecting both a greater frequency of illness and higher variability among birds. In comparison, the T₁ group showed a markedly lower morbidity level (14.25±3.73, 21.25±7.59), while the T₂ group recorded the lowest and most consistent morbidity outcomes (12.25±4.72, 17.75±6.97). ANOVA confirmed a highly significant difference among groups (F=47.50, p<0.001), indicating that probiotic supplementation particularly the enteric-coated formulation in T₂ substantially reduced morbidity and contributed to improved flock health.

The mortality data at 12 and 20 weeks showed that the control group had the highest mortality (14.25±3.73, 21.75±7.83), reflecting both increased losses and greater variability within the flock. Birds in the T₁ group exhibited a substantial reduction in mortality (10.25±3.02, 13.75±4.55), indicating improved health stability. The T₂ group demonstrated the lowest and most consistent mortality outcomes (9.00±2.05, 11.25±3.58). ANOVA confirmed significant differences among the groups (F=19.04, p<0.001), indicating that probiotic supplementation particularly the enteric-coated formulation in T₂ (Probead EC) markedly reduced mortality in growing poultry (See details in Table-1, Figure-2).

Previous challenge studies using pathogenic bacteria such as *Escherichia coli* and *Salmonella Typhimurium* have demonstrated that probiotic supplementation in broilers significantly reduces pathogen colonization, decreases the concentration of harmful bacteria, and lowers disease incidence and mortality rates [4, 10, 14]. Similarly, improved backyard poultry supplemented with Probead EC have shown higher survival rates (87.21%) and reduced colonization of *E. coli* and *S. Typhimurium* [11-13]. The reduced morbidity and mortality observed in probiotic-treated groups in the present study may be attributed to multiple mechanisms, including suppression of pathogenic bacteria, increased abundance of beneficial gut microbiota, production of organic acids that

lower intestinal pH, synthesis of antimicrobial metabolites, enhanced oxidative stability and immune function, modulation of gut metabolic activity to support digestive

enzyme production, and improvements in feed intake, digestibility, and nutrient absorption [4, 15].

Table 1: Body weight, morbidity and mortality rates of Kaveri Chicks

Group	Body weight (g)			Morbidity rate (%)		Mortality rate (%)	
	6 weeks	12 weeks	20 weeks	12 weeks	20 weeks	12 weeks	20 weeks
T ₀	291.25±24.16	806.10±134.31	1263.90±203.59	28.75±7.76	40.75±9.36	14.25±3.73	21.75±7.83
T ₁	288.50±21.53	874.70±123.14	1353.25±138.20	14.25±3.73	21.25±7.59	10.25±3.02	13.75±4.55
T ₂	295.45±19.67	905.40±104.92	1419.10±122.11	12.25±4.72	17.75±6.97	9.00±2.05	11.25±3.58

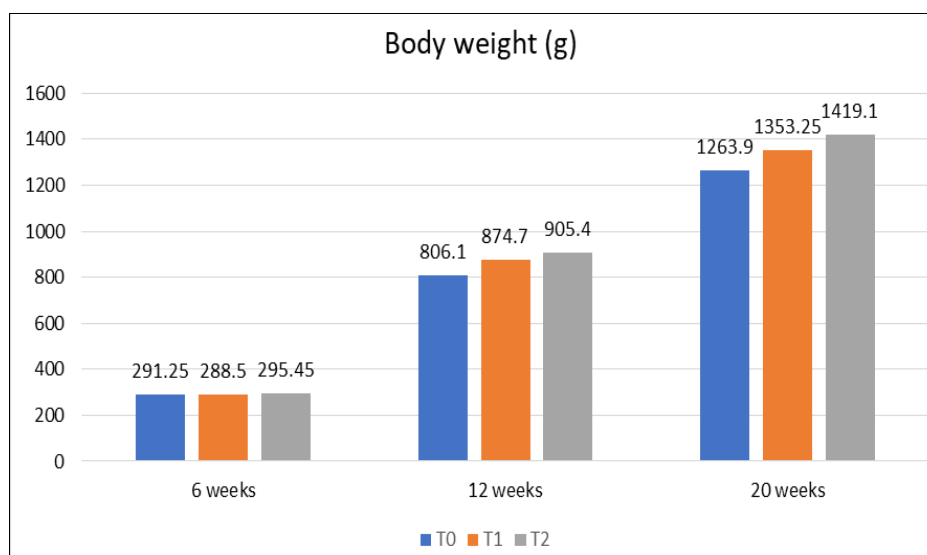


Fig 1: Body weight comparison

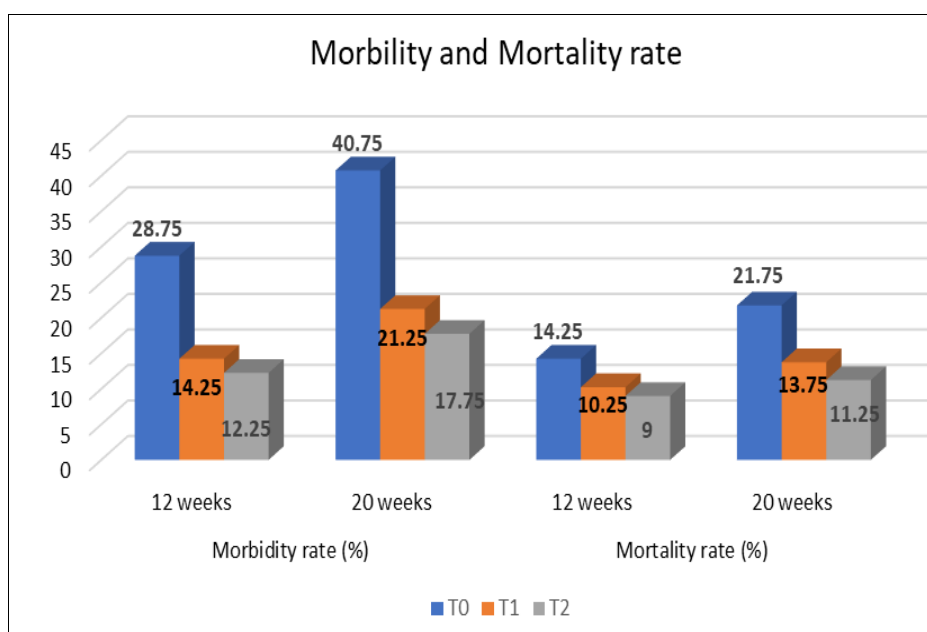


Fig 2: Morbidity and mortality comparison

Conclusion

Both forms of multistrain probiotic supplementation significantly improved growth performance and reduced morbidity and mortality in Kaveri chickens under field condition. The enteric-coated formulation (Probead EC) demonstrated superior efficacy, likely due to enhanced stability and targeted delivery of beneficial microbes to the intestine. These results support the use of enteric-coated probiotics as an effective strategy to improve productivity and health in improved backyard poultry systems.

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Conflict of Interest

Not available

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