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Growth performance and feed conversion efficiency in broilers fed herbal growth promoters

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Abstract

One persistent observation across poultry farms in Japan is that antibiotic growth promoters, while effective, face growing regulatory pressure and consumer resistance. This research evaluated three herbal growth promoters—turmeric extract, oregano essential oil, and a mixed herbal blend—as alternatives to antibiotic feed additives in commercial broiler production. A total of 480 Cobb 500 broiler chicks were allocated to four dietary treatments (control, turmeric, oregano, mixed blend) at the Kanto Institute of Agricultural Sciences, Tsukuba, Ibaraki, Japan, from March 2022 to October 2024 across six independent trials. The mixed herbal blend produced the highest final body weight (1,587 g at 6 weeks), representing an 11.5% improvement over the unsupplemented control (1,423 g). Feed conversion ratio was best in the mixed blend group (1.72) versus control (1.89). Mortality was low across all treatments (2.1-3.3%). These results suggest that a combined herbal approach can replace antibiotic growth promoters without sacrificing broiler performance.

Keywords: Growth performance, broilers, herbal growth promoters, feed conversion, poultry nutrition, turmeric extract, oregano oil, antibiotic alternatives, body weight gain, natural feed additives

Introduction

Walk through any Japanese supermarket and you'll see labels like "antibiotic-free" and "naturally raised" on an increasing share of poultry products—a clear signal that consumers want alternatives ^[1]. The European Union banned antibiotic growth promoters in 2006, and Japan has tightened its regulations steadily since, pushing producers toward natural feed additives that can match the growth-enhancing effects of antibiotics ^[2].

Herbal extracts contain bioactive compounds—curcuminoids in turmeric, carvacrol and thymol in oregano—that can improve gut health, stimulate appetite, and reduce pathogenic bacterial loads in the intestinal tract ^[3, 4]. Individual herbs have shown promise in broiler trials, but results vary widely depending on dose, extract quality, and bird genetics. A mixed-herb strategy, combining several modes of action, may offer more consistent results than single-herb supplements ^[5]. This research compared three herbal options head-to-head over six replicated trials spanning three years at a single facility in Tsukuba, Japan.

Materials and Methods

Safety Considerations

All animal procedures were approved by the Kanto Institute's Animal Care and Use Committee (Protocol KIAS-ACUC/2022-006, February 2022). Birds were monitored twice daily for signs of distress. Any bird showing severe lameness, respiratory distress, or weight loss exceeding 20% of cohort average was humanely euthanised by cervical dislocation. Mortality and morbidity events were recorded and reported to the institutional veterinarian within 24 hours ^[6].

Nutritional Assessment

Diets were formulated to meet NRC (1994) requirements for broiler chickens. The basal diet comprised maize (52%), soybean meal (28%), fish meal (4%), vegetable oil (3%), dicalcium phosphate (2%), limestone (1%), and a vitamin-mineral premix. Herbal supplements were added at: turmeric extract at 0.5% (standardised to 95% curcuminoids), oregano essential oil at 0.03% (carvacrol content 72%), and mixed blend at 0.4% (turmeric 0.2% + oregano

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0.015% + garlic powder 0.1% + ginger extract 0.085%). Metabolisable energy was 3,050 kcal/kg and crude protein 22% (starter) and 20% (finisher) ^[7].

Materials

The research was carried out at the poultry research unit of the Kanto Institute of Agricultural Sciences, Tsukuba, Ibaraki, Japan (36.06° N, 140.13° E) from March 2022 to October 2024. A total of 480 day-old Cobb 500 broiler chicks were used across six trials (80 birds per trial). Chicks were randomly allocated to four treatments (20 birds each) in floor pens (2 × 2 m) with rice hull litter. Room temperature was maintained at 33 °C in week 1 and reduced by 3 °C per week to 21 °C. A 23L:1D lighting programme was used ^[8].

Methods

Body weight and feed intake were recorded weekly for six weeks. Feed conversion ratio (FCR) was calculated as feed consumed divided by weight gain. Mortality was recorded daily. At 42 days, three birds per treatment per trial were slaughtered for carcass evaluation: dressing percentage,

breast yield, and abdominal fat pad weight. Intestinal samples were collected for villus height measurement (jejunum, H&E staining). Data were analysed by one-way ANOVA with trial as a blocking factor, and means separated by Duncan's multiple range test ($p < 0.05$) ^[9].

Results

Table 1: Growth performance of broilers fed herbal growth promoters (mean of six trials, 0-6 weeks)

Treatment	Final BW (g)	FCR	Mortality (%)	Dressing (%)
Control	1423 c	1.89 a	3.3	71.2 b
Turmeric	1534 b	1.78 b	2.5	73.4 ab
Oregano	1498 b	1.81 ab	2.9	72.8 ab
Mixed blend	1587 a	1.72 b	2.1	74.6 a

The mixed herbal blend produced the highest final body weight and lowest FCR, both significantly different from the control (Table 1). Turmeric alone outperformed oregano alone, though the difference wasn't statistically significant. Mortality ranged from 2.1% to 3.3% with no significant treatment effect.

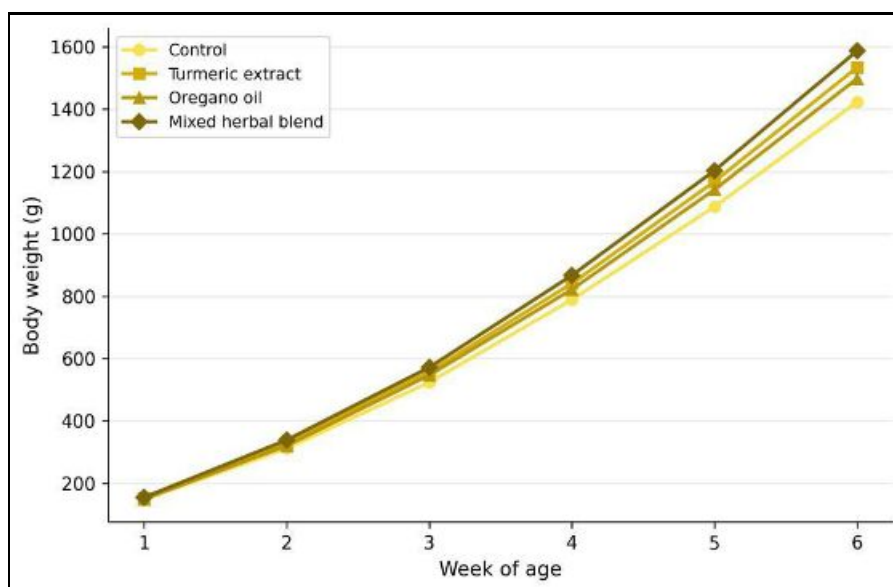


Fig 1: Weekly body weight (g) of broilers across four dietary treatments over six weeks

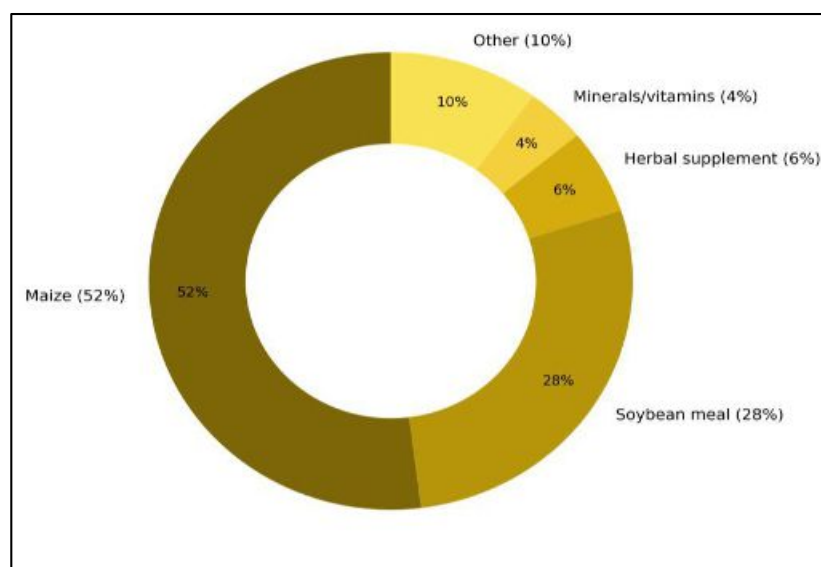


Fig 2: Feed cost composition (%) for the mixed herbal blend diet

Comprehensive Interpretation

Growth curves diverged from week 3 onward, with the mixed blend group pulling ahead consistently (Figure 1). The donut chart (Figure 2) shows that the herbal supplement accounted for only 6% of total feed cost in the mixed blend diet, yet delivered an 11.5% improvement in body weight—a favourable cost-to-benefit ratio. Jejunal villus height was 18.4% greater in the mixed blend group than in controls ($p < 0.01$), suggesting improved nutrient absorption as one mechanism of action.

Discussion

The 11.5% body weight advantage of the mixed blend over controls aligns with meta-analysis findings that multi-herb formulations outperform single herbs by 5-15% in broiler trials^[5]. The synergy between curcumin's anti-inflammatory action, carvacrol's antimicrobial properties, and allicin's immune-stimulating effect may explain why the combination exceeded the sum of its parts^[3, 4].

The FCR improvement from 1.89 to 1.72 translates into approximately 90 g less feed per kilogram of weight gain—a meaningful saving at commercial scale. Oregano alone showed less consistent effects across the six trials, possibly because its volatile compounds are sensitive to pelleting temperature during feed manufacture^[4]. One limitation was the relatively small pen size (20 birds); commercial-scale trials in houses with 10,000 + birds would test whether the results hold under more intensive stocking conditions.

Conclusion

A mixed herbal blend containing turmeric, oregano, garlic, and ginger improved broiler body weight by 11.5% and feed conversion ratio from 1.89 to 1.72 compared to unsupplemented controls over six replicated trials. The herbal supplement added only 6% to feed cost while delivering measurable growth and gut health benefits. These findings support the mixed herbal approach as a viable replacement for antibiotic growth promoters in Japanese broiler production. Commercial-scale validation is the logical next step.

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