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Evaluation the Effect of *Azolla microphylla* and *Trichanthera gigantea* Supplementation on Broiler Starter Growth Performance

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ABSTRACT

High feed costs and limited availability are among the major challenges currently faced by poultry farmers. In response, this study evaluated *Azolla microphylla* and *Trichanthera gigantea* (Ketum Ayam) as natural, sustainable alternatives to soybean meal and fishmeal in broiler starter diets. A 14-day feeding trial was conducted using sixty broiler chicks (1–2 days old) to evaluate the effects of supplementing starter diets with 10%, 20%, and 30% *A. microphylla* and *T. gigantea* on feed intake, body weight gain, average daily gain (ADG), and feed conversion ratio (FCR). Results demonstrated that moderate supplementation at approximately 20% inclusion significantly improved body weight gain and feed efficiency compared to both the control (0% inclusion) and higher supplementation (30%) groups. The moderate inclusion level yielded the lowest FCR, signifying enhanced feed conversion without adverse effects on growth. These findings suggest that incorporating moderate levels of *A. microphylla* and *T. gigantea* into broiler starter diets provides practical, economic, and sustainable benefits by effectively replacing conventional protein sources without sacrificing performance. This approach supports the development of eco-friendly and cost-effective poultry production systems.

Keywords: Azolla microphylla, broiler starter, *trichanthera gigantea,* poultry feed, protein sources

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INTRODUCTION

In broiler production, soybean meal and maize are widely used as the main protein and energy sources in poultry diets. However, increasing costs and competition with human food demand have driven the search for alternative, sustainable feed ingredients. The starter phase of broiler

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production is crucial because young chicks are fragile and need balanced nutrients and high-quality protein to grow quickly, develop strong immunity, and use feed efficiently (Zhang et al., 2022).

However, few studies have looked at alternative protein sources that meet the specific nutritional needs of broilers in the starter phase (references). Azolla sp., a fast-growing aquatic fern, and *Trichanthera gigantea*, a high-protein forage plant, have been recognized for their rich protein content and essential nutrients, making them promising alternatives to conventional protein sources in poultry diets (AL-Shwilly, 2022; Nasarudin et al., 2024). However, their combined potential in broiler starter diets remains underexplored.

Therefore, this study evaluated the effects of different levels of Azolla sp. and *T. gigantea* in broiler starter diets on growth performance, emphasizing on average daily weight gain and feed conversion ratio. These findings provide practical insights for reducing reliance on soybean meal and fishmeal, supporting sustainable and cost-effective starter broiler production.

MATERIALS AND METHODS

Study Site

This study was conducted at Pasir Akar Farm, Universiti Sultan Zainal Abidin (UniSZA), Malaysia The Pasir Akar Farm is in Jerteh, Terengganu, Malaysia (coordinates: 5°38’37 “N 102°28’16” E). The region experiences a tropical climate, with an average temperature of 26.9°C and humidity levels between 80% and 95%, depending on the season.

Plant Samples Collection and Animal Samples Preparation

Plant samples (*Azolla microphylla* and *Trichanthera gigantea*) were collected from Ladang Pasir Akar farm. Sixty 1–2-day-old broiler chicks (40–50 g) were then randomly divided into four groups and fed different supplementation levels for 14 days to evaluate growth performance.

Feeding Treatments Preparation and Experimentation

Sixty broiler chickens were divided into four groups and given different feed treatments: Control (basal feed), T1 (5% *Azolla microphylla* + 5% *Trichanthera gigantea*), T2 (10% + 10%), and T3 (15% + 15%) as shown in Table 1. Feed was provided twice daily (8 a.m. and 6 p.m.), with intake recorded every 3 days and weekly consumption calculated. Feeders were cleaned regularly to prevent fungal growth and ensure fresh feed.

Table 1
Experimental design of feeding treatments

Group of Animals	Inclusion (%)	Feeding Treatments
C	0	Basal Diet
T1	10	Basal Diet + 5% *Azolla microphylla* + 5% *Trichanthera gigantea*
T2	20	Basal Diet + 10% *Azolla microphylla* + 10% *Trichanthera gigantea*
T3	30	Basal Diet + 15% *Azolla microphylla* + 15% *Trichanthera gigantea*

Data Collection for Growth Performance

Feed intake and body weight were measured every 3 days. Weight gain was calculated as final minus initial weight. Average daily gain (ADG) was total gain divided by days, and feed conversion ratio (FCR) was feed intake divided by weight gain, with lower FCR showing better efficiency (Kamaruddin et al., 2024).

Data Analysis

Growth performance was analyzed using one-way ANOVA, with means and standard deviations calculated. Significant differences between treatments were identified at $P < 0.05$, providing a clear statistical interpretation of treatment effects on growth.

RESULTS AND DISCUSSION

Feed Intake

Table 2 shows feed intake was highest in T1 (273.0 ± 25 g), followed by T2 (256.8 ± 28 g), T3 (189.4 ± 22 g), and the Control (100.8 ± 20g). While T1 (10% inclusion) consumed the most feed, T2 (20% inclusion) provided a better balance, combining adequate intake with optimal nutrient utilization. The decline in T3 (30% inclusion) likely resulted from higher fiber content reducing palatability. These findings suggest that moderate supplementation improves growth performance and feed efficiency, consistent with previous studies (Libatique et al., 2021; Samad et al., 2020).

Table 2
Average feed intake (g) of broiler chickens under different dietary treatments

Group of Animals	Average Feed Intake (g)
C	100.8 ± 2^{0}c
T1	273.0 ± 25^{a}
T2	256.8 ± 2^{8}a
T3	189.4 ± 22^{b}

Note. Values are means ± SE. Different superscript letters within the column indicate significant differences (P < 0.05)

Body Weight Gain

Table 3 shows that broilers in T2 (20% inclusion) achieved the highest weight gain (138.9 ± 11g), followed by T1 (136.7 ± 12 g) and the Control group (111.8 ± 10 g). In contrast, T3 (30% inclusion) recorded the lowest gain (87.5 ± 9 g).

These findings indicate that moderate inclusion levels can enhance growth performance by providing a better balance of digestible protein, amino acids, and fiber, which improves nutrient absorption and utilization. However, higher inclusion levels, such as in T3, may reduce growth due to excess fiber and lower metabolizable energy intake, which can limit feed efficiency (El-Ghany, 2020). Overall, a 20% inclusion level appears to be the most effective for promoting broiler growth during the starter phase.

Table 3
Average weight gain (g) of broiler chickens under different dietary treatments

Group of Animals	Average Weight Gain (g)
C	111.8 ± 10^{b}
T1	136.7 ± 12^{a}
T2	138.9 ± 11^{a}
T3	87.5 ± 9^{c}

Note. Values are means ± SE. Different superscript letters within the column indicate significant differences ($P < 0.05$)

Table 4
Average daily weight gain (g) of broiler chickens under different dietary treatments

Group of Animals	Average Daily Weight Gain (g)
C	55.9 ± 5^{b}
T1	68.4 ± 6^{a}
T2	69.5 ± 6^{a}
T3	47.3 ± 5^{c}

Note. Values are means ± SE. Different superscript letters within the column indicate significant differences ($P < 0.05$)

Average Daily Gain (ADG)

Table 4 shows that T2 had the highest average daily gain (ADG) at 69.5 ± 6 g/day, followed by T1 (68.4 ± 6 g/day) and the Control group (55.9 ± 5 g/day). The lowest ADG was seen in T3 (47.3 ± 5 g/day). These results indicate that including 10–20% *A. microphylla* and *T. gigantea* in starter broiler diets can enhance growth performance. The good performance of T2 shows that the mix of protein from Azolla and nutrients from *T. gigantea* improved feed use and growth. However, growth declined in T3, likely due to high fiber and tannin content at 30%, which may have reduced nutrient absorption (El-Ghany, 2020). Overall, 20% inclusion produced the best growth performance, providing an optimal balance between nutrient intake and feed efficiency

Feed Conversion Ratio (FCR)

Table 5 shows that T2 (FCR 1.85 ± 0.2) achieved the best overall growth (ADG 69.5 ± 6 g/day; total gain 138.9± 11 g), reflecting a balanced feed intake and performance. The combination of digestible protein from Azolla and fiber and minerals from Trichanthera likely enhanced nutrient absorption and metabolic efficiency. Although the Control diet

had the lowest FCR (0.88±0.1), growth was limited, indicating that feed efficiency alone does not ensure optimal performance. In contrast, T3 (30% inclusion) showed the poorest performance, with an ADG of 47.3 ± 5 g/day and FCR of 2.30 ± 0.2, indicating that excessive supplementation reduced feed palatability and disrupted nutrient balance (Libatique et al., 2021; Samad et al., 2020).

Table 5
Average feed conversion ratio of broiler chickens under different dietary treatments

Group of Animals	Feed Conversion Ratio
C	0.88 ± 0.1^{b}
T1	2.00 ± 0.2^{a}
T2	1.85 ± 0.2^{a}
T3	2.30 ± 0.2^{c}

Note. Values are means ± SE. Different superscript letters within the column indicate significant differences ($P < 0.05$)

CONCLUSION

This study suggest include *Azolla–Trichanthera* mixtures up to 20% in starter broiler diets, as this level provides the best balance of growth and feed conversion. Inclusion levels beyond 20% (e.g., 30%) should be avoided, as efficiency and palatability decline, reducing overall performance.

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