Effect of *Trichantera gigantea* leaves on growth performance of Ayam Saga

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Abstract

Poultry meat is a crucial source of protein for consumers in Malaysia. There is growing interest in supplementing natural feed additives for production of healthier chicken for consumers. This study delves into the potential for locally produced dried Ketum Ayam leaves (scientifically known as *Trichantera gigantea*), as a feed additive for improving growth performance of Ayam Saga. A total of 120 male Ayam Saga birds, aged 4 weeks, were selected at random and divided into four treatment groups (control, 1%, 3%, and 5% Ketum Ayam leaves) using a completely randomized design. Each treatment consisted of 6 replicates with 5 birds per replicate. They were subjected to an 8-week feeding trial until the birds reached 12 weeks of age. Data on body weight and feed intake were recorded for each group to calculate body weight gain and feed conversion ratio. Carcass yield was also similarly recorded. Results revealed that the Ayam Saga supplemented with 1% Ketum Ayam leaves and control group had significantly higher ($p<0.05$) final body weight and body weight gain compared to the higher inclusion rates of 3% and 5% Ketum Ayam leaves. For the feed conversion ratio, better efficiency was observed for the 1% feed supplementation and control group. Carcass yield showed the similar trend of significantly higher ($p<0.05$) yields for 1% and control group. Further investigations using larger sample groups and lower inclusion rates (<1%) is beneficial to provide further insights into factors influencing the optimal feed supplementation of Ketum Ayam leaves in improving growth performance of Ayam Saga.

Keywords: Ketum Ayam leaves, feed supplement, village chicken, growth performance

Introduction

In Malaysia, poultry meat is a crucial protein source, with a per capita consumption of around 50 kg annually (Zayadi, 2021), ranking the country among the top consumers globally and first in Asia. The poultry farming sector is of great significance in Malaysia. However, there is a growing interest globally in antibiotic-free approaches for producing healthier chicken.

Antibiotic-free approaches not only help reduce the risk of antibiotic resistance but also meet consumer demand for safer and more sustainable food options. In Malaysia, the government and industry stakeholders are increasingly recognizing the importance of antibiotic-free poultry production. Efforts are being made to support the development of novel and natural alternative feed additives to maintain animal health and productivity (Abdul Aziz, 2019).

One notable breed of village chicken developed by MARDI is known as "Ayam Saga," which is a slow growth breed. Male Ayam Saga can reach 1.5 kg, and females 1.3 kg in about 12 weeks (Abdul Razak et al., 2021). In comparison, commercial

broilers can reach 2 kg in about 35 to 42 days, aided by antibiotic growth promoters in their feed (Diarra et al., 2014). This shows that village chicken requires longer time compared to conventional commercial broilers for production. However, Ayam Saga is reported to have denser meat (Farahiya et al., 2022) and is capable to absorb high fiber foods (Halid, 2022). This means that plant-based natural feed additives have higher potential to improve their growth performance.

To meet the growing demand of village chicken farming, novel and natural feed additives like Ketum Ayam leaves, known scientifically as *Trichanthera gigantea*, are being considered to enhance the performance of Ayam Saga. Ketum Ayam is a shrub from the *Acanthaceae* family, typically reaching 5m in height but capable of growing up to 15m. The tree has numerous quadrangular branches, and its dark green leaves have a lighter tone on the underside (Australian Centre for International Agricultural Research, 2020). The plant is native to Central America and Northern Southern America. However, it has been introduced to other tropical regions. Ketum Ayam is popular in the Philippines (Heuze et al., 2017) and widely cultivated in Malaysia due to its nutritional content and adaptability (Supardi, 2022).

Ketum Ayam leaves are also reported to be highly palatable to animals and contain low levels of anti-nutritional factors. Moreover, the high levels of non-structural and storage carbohydrates content coupled with low levels of structural carbohydrates, may contribute to the positive biological outcomes observed in monogastric animals consuming this plant (Rosales, 1997).

Despite its potential, there is limited scientific research on this plant's benefits. Therefore, this study aims to assess the impact of dried Ketum Ayam leaves as a feed additive on the growth performance in the grower phase of Ayam Saga. The knowledge of the optimal inclusion rate can help enhance the production of these superior and highly nutritional Ayam Saga as a source of protein in Malaysia, and further reduce reliance on commercial broilers.

Materials and Methods

Proximate Analysis of Feed Samples

The Ketum Ayam leaves harvested from the plant (Figure 1) was oven-dried at 60°C for three days or more until it reached a constant weight. It was then ground and subjected to proximate analysis based on standard methods described in AOAC (2010). The chemical composition of each Ketum Ayam leaf meal is presented in Table 1.

Figure 1: Ketum Ayam plant

Table 1: Chemical composition of *Trichantera gigantea* leaf meals

Parameters	Chemical Composition
Dry matter (DM)	18.40% ± 0.92
Crude protein	15.40% ± 0.93
Crude fibre	17.63% ± 0.65
Ash	13.95% ± 0.54
Crude fat	1.19% ± 0.26
Gross energy	15.37 MJ/kg DM ± 0.65

Animal ethics

It is confirmed that MARDI Animal Ethics Committee approved this study (20220418/R/MAEC00109).

Experimental Design and Data Collection

A total of 120 male Ayam Saga birds, aged 4 weeks, were randomly selected and divided into four treatment groups (control, 1%, 3%, and 5% Ketum Ayam leaves) using a completely randomized design. Each treatment group consisted of 30 birds, with each treatment composed of 6 replicates, and 5 birds per replicate. Initially, the birds were raised in a deep litter flooring system until they were 4 weeks old. They were fed a starter commercial feed (21% protein and 12 MJ/kg energy) for the initial 4 weeks.

For this study, grower feed (19% protein and 11 MJ/kg energy) containing dried Ketum Ayam leaves, was mixed into the feed and provided throughout the 8-week feeding trial until the birds reached 12 weeks of age (Figure 2). The feed was in mash form and formulated to be iso-caloric and iso-nitrogenous. Feed and water were available *ad libitum.* The formulation of the experimental feed ingredients for each treatment group (Control, 1%, 3% and 5% Ketum Ayam leaves) are presented in Table 2.

Data on body weight and feed intake were recorded for each of the treatment group to calculate body weight gain and feed conversion ratio to assess the growth performance of Ayam Saga subjected to the various Ketum Ayam leaves inclusion rates. Feed conversion ratio measures how efficiently livestock transform the feed intake into the desired output. The calculation for body weight gain and feed conversion ratio were as follow:

$$\text{Body Weight Gain (kg)} = BW_f - BW_o$$

Where BW_f = final body weight of Ayam Saga
BW_o = initial body weight of Ayam Saga

$$\text{Feed Conversion Ratio} = \frac{\text{Total Feed Intake (kg)}}{\text{Weight Gain (kg)}}$$

Meanwhile, for carcass analysis, a bird in each replicate was weighed and slaughtered according to Halal slaughter method. Based on this method, the birds intended to be slaughtered were alive at the point of slaughter and God's name was evoked prior to the incision cut (Sazili et al., 2023). The carcass weight was obtained after the feathers have been removed. The dressed

weight refers to eviscerated carcass weight which includes head and leg.

$$\text{Dressing \%} = \frac{\text{Dressed weight (kg)}}{\text{Live weight (kg)}} \times 100\%$$

The data obtained were statistically analyzed with analysis of variance (ANOVA) using SAS 9.3. Duncan's Multiple Range Test was used to separate means among treatments at significance level of $p<0.05$.

Figure 2: Male Ayam Saga at 12 weeks

Results

Growth Parameters

The growth parameter results of the study are presented in Table 3. Significantly higher results ($p<0.05$) were observed for the final body weight and body weight gain of the birds supplemented with 1% Ketum Ayam leaves and the control group. The total feed intake did not show any significant difference between control and treatment groups ($p>0.05$).

Carcass Yield

The carcass yield data is presented in Table 4. The results show that significantly higher ($p<0.05$) weights of carcass, dressed, thigh and drumstick, breast and wing were from the group treated with 1% Ketum Ayam leaves and control group. The weights of liver, gizzard, abdominal fat and dressing % did not show any significant difference between control and treatment groups ($p>0.05$).

Table 2: Formulation of the experimental feed ingredients

Ingredients	Experimental feed composition (%)			
	Control Group	1% Ketum Ayam	3% Ketum Ayam	5% Ketum Ayam
Maize	40.75	40.61	40.40	40.20
Soya bean meal (44%)	18.00	18.00	18.00	18.00
Wheat pollard middlings	20.00	20.00	20.00	20.00
Rice bran	9.36	8.62	6.53	4.45
Palm Kernel Expeller	1.70	1.70	1.70	1.70
Maize gluten meal (60% crude protein)	5.25	5.12	4.98	4.81
Palm oil	1.10	1.10	1.50	1.90

Lysine HCl	0.51	0.52	0.53	0.55
Methionine	0.14	0.14	0.15	0.16
Threonine	0.01	0.01	0.03	0.04
Dicalcium phosphate, 20%P	1.06	1.06	1.06	1.06
Limestone	1.53	1.53	1.53	1.53
Salt	0.40	0.40	0.40	0.40
Vitamin premix	0.03	0.03	0.03	0.03
Mineral premix	0.10	0.10	0.10	0.10
Choline chloride (60%)	0.07	0.07	0.07	0.07
Trichantera gigantea (%)	0	1.00	3.00	5.00

Table 3: Growth parameters of Ayam Saga

Parameters	Control	Ketum Ayam			p-Value
		1%	3%	5%	
Initial body weight at week 4 (kg)	0.32±0.004	0.33±0.005	0.32±0.003	0.33±0.005	0.7273
Final body weight (kg)	1.84±0.026^{a}	1.84±0.019^{a}	1.74±0.039^{b}	1.72±0.025^{b}	0.0097
Weight gain (kg)	1.51±0.024^{a}	1.51±0.017^{a}	1.42±0.036^{b}	1.39±0.023^{b}	0.0042
Total feed intake (kg)	5.62±0.193	5.74±0.213	5.60±0.161	5.71±0.164	0.9309
Feed conversion ratio	3.72±0.166	3.81±0.171	3.96±0.150	4.13±0.179	0.3628

Note: 1. Values of the growth parameters are tabulated as mean ± standard error of the mean
2. ^{abc} means with different superscripts within the same row differ significantly ($p<0.05$)

Table 4: Carcass yield of Ayam Saga

Parameters	Control	Ketum Ayam			p-Value
		1%	3%	5%	
Live weight (kg)	1.96±0.042^{a}	1.97±0.030^{a}	1.83±0.044^{b}	1.73±0.051^{b}	0.0017
Carcass weight (kg)	1.74±0.029^{a}	1.77±0.023^{a}	1.62±0.042^{b}	1.56±0.050^{b}	0.0023

Dressed weight (kg)	1.54±0.033[a]	1.55±0.027[a]	1.41±0.037[b]	1.35±0.037[b]	0.0007
Thigh and drumstick weight (kg)	0.44±0.012[a]	0.44±0.009[a]	0.40±0.010[b]	0.39±0.011[b]	0.0012
Breast weight (kg)	0.30±0.006[a]	0.31±0.006[a]	0.28±0.013[ab]	0.26±0.008[b]	0.0110
Wing weight (kg)	0.18±0.005[ab]	0.19±0.006[a]	0.17±0.003[bc]	0.17±0.003[c]	0.0080
Liver weight (kg)	0.03±0.004	0.03±0.003	0.03±0.003	0.03±0.002	0.9303
Gizzard weight (kg)	0.05±0.004	0.05±0.007	0.05±0.003	0.05±0.005	0.5923
Abdominal fat (kg)	0.09±0.006	0.01±0.004	0.02±0.007	0.01±0.005	0.5898
Dressing percentage (%)	78.41	78.98	77.33	78.00	0.2642

Note: 1. Values of the carcass yield parameters are tabulated as mean ± standard error of the mean
2. [abc] means with different superscripts within the same row differ significantly ($p<0.05$)

Discussion

Weight Gain

Significantly higher ($p<0.05$) weight gain observed for the 1% Ketum Ayam leaves feed supplementation and control group show that a small amount of Ketum Ayam leaves enables positive effect on the body weight gain. However, with increasing level of Ketum Ayam leaves (beyond 1%), a decreasing trend is observed. This is in line with the findings of Morbos et al. (2016), who noted that slow-growing chicken strains have lower muscular DNA concentration than their fast- growing counterparts, which explains the slow response of native chicken genotype. Additionally, the decreasing trend at higher concentrations may also be due to presence of non-nutritional factors such as tannin in Ketum Ayam leaves. Presence of higher level of tannins leads to poor nutrient absorption resulting in lower body weight gain (Calislar, S., 2017). Wan Salman (2022) suggested that Ketum Ayam leaves may contain tannins which are of the hydrolysable type, instead of the condensed type. Yuen Hwa et al. (2023) reported that inclusion of Ketum Ayam leaves mixed with premium starter feed suggests improvement in organically farmed chicken body weight gain. However, further research with larger feed sample and investigation with even lower dosage (e.g. 0.25% and 0.5% Ketum Ayam) may potentially provide more optimal supplementation dosage for maximizing growth in Ayam Saga.

Feed Conversion Ratio

The amount of feed required to produce a unit of weight gain is associated with the feed conversion ratio, wherein a lower feed conversion ratio value shows better efficiency. Similar to the trend observed for body weight gain, the group supplemented with 1% Ketum Ayam leaves and control group result in the lower feed conversion ratio, although the results were not significantly different among the experimental diets ($p>0.05$). This is in line with the findings of Morbos et al. (2016), who observed that body weight gain showed a decreasing trend with increasing treatment concentration of dried Ketum Ayam leaves. Likewise, Paguia et al. (2024) who studied the effect of fermented dried Ketum Ayam leaf meal on free-range chickens, also observed no significant

difference on the feed conversion ratio across the various treatment levels.

Carcass Yield

Based on the carcass yield data, 1% Ketum Ayam leaves supplementation and control group provided significantly higher ($p<0.05$) carcass yield. Also, there were no significant difference on the weights of liver, gizzard and abdominal fat, as well as dressing percentage. Hence, this shows that supplementation of Ketum Ayam leaves at the various levels did not affect the internal organs, correlating with the results of Libatique (2021) who used dried Ketum Ayam leaves mixed with home-mixed feed for broilers. The findings on dressing percentage also align with those of Jonna et al. (2018), who observed no significant effect on the inclusion of dried Ketum Ayam leaf meals (mixed with commercial ration) at various treatment levels on the dressing percentage of broilers and noted that dressing percentage is positively genetically correlated with pre-slaughter live weight.

Conclusion

In conclusion, this study dived into the impact of Ketum Ayam leaves supplementation as feed additives for Ayam Saga. Notably, the results showed that supplementation of up to 1% Ketum Ayam show significantly higher ($p<0.05$) improvement in the growth performance and carcass yield of Ayam Saga. This finding shows that incorporation of only a small amount of Ketum Ayam as a natural feed additive shows promise in improving the growth parameters of Ayam Saga or village chicken. As this is a preliminary study, future investigations using larger sample group and lower inclusion rate (<1% of Ketum Ayam leaf supplementation) could provide further insights into the optimal levels to maximize Ayam Saga growth performance.

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Conflict of interest

The authors declare that there are no conflicts of interest.

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