EFFECT OF FICUS EXASPERATA LEAF MEAL ON THE GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF THREE-WEEKS-OLD COTURNIX COTURNIX JAPONICA (JAPANESE QUAILS)

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ABSTRACT
A five-week experiment was conducted to determine the effect of Ficus exasperata leaf meal (FELM) on the growth performance and carcass characteristics of three-weeks-old Japanese quails. Ninety-six (96) Japanese layer quails were randomly allocated to four (4) dietary treatments T1, T2, T3 and T4 with 0%, 2%, 4% and 6% of FELM partially replacing similar amounts of soybean meal respectively, and with 3 replicates per treatment. T1 served as the control diet (No FELM). Eight (8) quails were allotted to each replicate under completely randomised design. Growth performance were measured during the feeding trial and afterwards, carcass characteristics were evaluated. Data collected were analysed using Analysis of Variance (ANOVA) as described by Minitab (version 18.1). The means were compared using Tukey's pairwise comparison with a confidence level of 95%. There were no significant ($p>0.05$) differences in the mean daily and total feed intakes, initial weights and final live weight among the various treatments. However, there were significant ($p<0.05$) differences in the daily and total weight gains across the various treatments, with T1 recording the highest weight gain, followed by T2, T3 and T4. There was a significant ($p<0.05$) difference in the mean feed conversion ratio among the treatments, with T4 being a poor converter of feed to gain. The feed cost per kilogram diet and the feed cost per kilogram weight gain decreased as the inclusion levels of FELM increased. There were significant ($p<0.05$) differences in the live, bled and eviscerated weights across the various treatment, with T2 recording the highest weights, followed by T1, T3 and then T4. Shank, drum stick, thigh and breast muscle weights also recorded significant ($p<0.05$) differences among the various treatment, with a similar trend as mentioned above, T2 recording the highest weights followed by T1, T3 and T4. The remaining carcass parameters recorded no significant differences across the various treatments. The results indicate that FELM may be fed to quail birds up to 4% of the diet without any adverse effects on their growth performance and carcass characteristics.

Keywords: *Quails*, *Ficus exasperata leaf meal, growth performance, carcas characteristics*

INTRODUCTION

Japanese quail *(Coturnix coturnix japonica*) production is becoming a very large and lucrative venture. It is now providing income, employment for a vast number of people and also serves as a source of protein (Nasar *et al.,* 2016). In modern quail farming the birds, are intensively kept to increase productivity. Due to their small body size (235-250g), they require less housing space (sharif *et al.*, 2014).

The main driver of animal production is feed, which constitute about 70% of the total cost of production when conventional ingredients are

used (Okai, 2006). Poultry such as quails must have all the essential nutrients in their diet in order to improve on their growth and production. Quails fed on nutritionally adequate diets will be able to maintain their body weight and then convert the excess nutrients into quail meat and egg within a short possible time, usually 5-8 weeks (Abou-Kassem *et al*., 2019). Protein is important in the diet of poultry birds, because it plays crucial role in growth and production (FAO, 2016).

The usage of conventional feed resources especially protein sourced ingredients comes with high cost. This is because there is competition between man and farm animals for the same limited feed resources. With the continuous increase in the price of conventional protein sourced ingredients, it is very imperative that alternative protein sourced ingredients are identified. Herbaceous plants leafs and various plant extracts have received increased attention as possible feed resources that have the ability to replace some conventional feed ingredients. One such leaf meal is *Ficus exasperata*.

Ficus exasperata, popularly known in Africa as the "Sandpaper tree", probably because of the rough surface of the leaves *(*Baffour *et al.,* 2009). *Ficus exasperata* is a deciduous, species of plant in the mulberry family *Moracene*. It is native to tropical Africa and Southern Asia. *Ficus exasperata* is known for low population density*,* and long distance pollen dispersal (Ahmend *et al.,* 2009). *Ficus exasperata* occurs from sea level up to 2300 m altitude in forests, often at edges, in secondary vegetation, in rocky places and along rivers, sometimes persisting in cleared land. It is also found in abandoned fields and along roads. In view of its wide distribution, occurrence in secondary vegetation and ability to persist in cleared land, *Ficus exasperata* seems not be threatened by genetic erosion and hash environmental conditions. *Ficus exasperata* can be propagated by both seed and stem cuttings making it one of the green leafy plants that can be multiplied easily and as such sourcing it will not be difficult and at little to no cost. The leaves of *Ficus exasperata* provide nutrients such as calcium, iron, titanium, etc. aside the protein content in the leaf (Hernandez *et al*, 2004). *Ficus exasperata* leaves contain about 18.39% protein (Obour *et al.,* 2017). In order to decrease cost of feed, there is the need to supplement conventional feed resources like soybean meal, etc with non-conventional resources like *Ficus exasperata* leaf meal (FELM).

Objective

The main objective of this research was to examine the effect of *Ficus exasperata* leaf meal (FELM) on the growth performance and carcass characteristics of layer quail birds (*Coturnix coturnix japonica*).

Specific objectives

1. To determine the effect of *Ficus exasperata* leaf meal inclusion in quail diets on the growth performance of the quails.
2. To evaluate the carcass characteristics of quail birds fed diets with *Ficus exasperata* leaf meal inclusion.
3. To determine the optimum inclusion levels of *ficus exasperata* leaf meal in quail diet

MATERIALS AND METHODS

Experimental site and duration

The experiment was conducted at the Department of Animal Science, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. The entire experiment covered a time period of five-weeks.

Source of experimental material

The leaves of F*icus exasperata* were harvested from the Department of Animal Science, Kwame Nkrumah University of Science and Technology and were dried under a shade for five- days. The leaves were then milled using hammer mill with a 2mm sieve to obtain the *Ficus exsperata* leaf meal (FELM).

Experimental birds

A total of ninety-six (96) female three-weeks-old Japanese quails were sourced from EBY Quail farms Ltd which is located at Ejisu-Edwenease in the Ashanti Region of Ghana. The birds were acclimatized for a week before the start of the experiment.

Experimental Design

The ninety-six Japanese quail birds were randomly allocated to four dietary treatment with three replicates per treatment using completely

randomized design. Each replicate comprised of eight birds.

Experimental housing and management.
The quails were housed in 12 cages which were installed in a well- ventilated room. The birds were given access to their respective diets and water *ad libitum*, light was also provided for the birds in the night to to encourage feeding at night.

Experimental Diet
The Feed ingredients used in the formulation of the experimental diets for the study were maize, soybean meal, oyster shell, concentrate (30% CP), wheat bran and common salt (Table 1). These ingredients were purchased from accredited feed suppliers in Kumasi, Ghana. The Japanese quails were allocated to four dietary treatments designated as T1, T2, T3, and T4 with the FELM partially replacing soybean meal at 0%, 2%, 4% and 6% respectively in the diets.

Parameters measured
Feed intake and Weight gain
Average daily feed intake per bird was recorded by subtracting the feed left from the feed given the previous day, and dividing it by the total number of bird per replicate. This was done using An "Ideen Welt" digital balance. Average weight gain per bird was also determined for each replicate by substracting the previous weight from the current weight using Ideen welt digital balance

Carcass characteristics
At the end of the experiment, one (1) bird was selected from each replicate based on the average weight of the group. The birds were slaughtered by rupturing the jugular vein and were bled sufficiently. In all, twelve (12) birds were used for the carcass analysis. The bled and defeathered weights of the carcasses were recorded, after which, the following weights were also taken; eviscerated, full and empty gastrointestinal tract (GIT), heart, liver, full gizzard, empty gizzard, shank, breast, thigh, drum stick and wings.

Statistical Analysis of Data
The data were subjected to analysis of variance (ANOVA) using Minitab (version 18.1). The difference in means were separated by Tukey's pairwise comparison at 95% confident level.

RESULTS AND DISCUSSION
Feed intake
There were no significant ($p>0.05$) differences in the mean daily and total feed intakes, not-

Table 1: Composition and calculated nutrient content of dietary treatments

Ingredients(%)	T1(0%FELM)	T2(2%FELM)	T3(4%FELM)	T4(6%FELM)
Maize	47.5	47.5	47.5	47.5
Concentrate	5.00	5.00	5.00	5.00
FELM	0.00	2.00	4.00	6.00
Soy bean meal	34.00	32.00	30.00	28.00
Wheat bran	8.00	8.00	8.00	8.00
Oyster shell	5.00	5.00	5.00	5.00
Common salt	0.50	0.50	0.50	0.50
Calculated nutrient composition (%)				
Crude protein	23.02	22.20	21.37	20.55
Crude fat	3.31	3.30	3.19	3.19
Crude fibre	3.67	3.94	4.21	4.47
Moisture	11.29	11.14	10.97	10.81
Ash	4.54	4.65	3.40	3.51
Metabolizable energy	3069.70	3061.94	3054.20	3046.44

Table 2: Effect of *Ficus exasperata* leaf meal (FELM) on growth performance

Parameters	Dietary Treatments				P- Value
	T1 (0% FELM)	T2 (2% FELM)	T3 (4% FELM)	T4 (6% FELM)	
Daily feed intake (g)	17.45	17.43	16.752	16.462	0.178
Total feed intake (g)	609.30	603.90	576.30	538.70	0.178
Initial weight (g)	47.46	46.51	45.54	42.54	0.442
Daily weight gain (g)	3.32[a]	3.24[a]	3.22[a]	2.28[b]	0.004
Final live weight(g)	159.33	151.03	148.50	134.00	0.468
Total weight gain(g)	111.87[a]	104.52[a]	102.96[a]	91.46[b]	0.004
Feed conversion ratio	5.30[b]	5.32[b]	5.66[b]	6.76[a]	0.0001
Feed cost per kg diet (GH¢)	1.22	1.15	1.08	1.01	
Feed cost/kg weight gain (GH¢)	6.65	6.65	6.05	5.95	

[ab]*Mean values within the same row with different superscript are significantly (p<0.05) different.*

withstanding, numerical difference were observed across the various treatments and in each of the cases (daily and total feed intake), T1 recorded the highest daily and total feed intake, followed by T2, T3 and finally T4 recording the least daily and total feed intake (Table 2). This observation may be attributed to the fact that, the various treatment diets have been rendered unpalatable due to the incorporation of the leaf meal (FELM). The leaves of ficus is known to contain antinutritional factors such as saponins (Natanman and Chandiasekerani, 1996; Nworgu, 2006; Ijeh and Ukwemi, 2007) and according to Nityanand (1997), saponins are bitter in taste and have been noted for introducing a bitter taste into diets hence reducing palatability.

Weight gain

Significant ($p<0.05$) difference were observed in the daily weight and total weight gains across the various treatments, with daily and total weight gains declining as the inclusion level of FELM increased in the various experimental treatments from T2 to T4 (Table 2). Nevertheless there were no significant ($p>0.05$) difference in the initial weights and final live weight among the various treatments (T1 to T4) (Table 2). This finding is consistent with those of Osei *et al*. (2013) who recorded no significant diffrences in the initial weight and the final live weight acrose the various treatements when they fed 4-weeks old broiler chicks with diet containing 0%, 2.5% and 5% inclusion of FELM.

Feed conversion ratio (FCR)

Feed conversion ratio recorded significant ($p<0.05$) differences among the treatments means, with treatment 1 being the better converter of feed to gain and T4 being the poor converter of feed to gain (Table 2). The more the inclusion of FELM, the poorer the feed conversion ratio. Studies on phytochemical constituents of FELM by Raghavender Roa *et al.* (2011) revealed that it contains saponins which might have interfered with the digestion and utilization of dietary protein and the other nutrients thereby reducing the feed efficiency.

Feed cost/kg diet

The cost/kg feed (GH¢) during the experimental period decreased as the percentage inclusion levels of FELM increased from 0% to 6% in the diet. Treatment 1 was highest in cost per kilogramme of the feed (GH¢1.22). Followed by treatment 2 (GH¢1.15), 3 (GH¢1.08) and 4 (GH¢ 1.01) (Table 2). The high cost in T1 is as a result of the cost (GH¢3.2/kg) of soya bean meal compared to that of FELM (GH¢0) and so the incorporation of the leaf meal could reduce the feed cost.

Feed cost/kg weight gain

Feed cost per kilogram weight gain decreased as the inclusion of FELM increased across the various treatments from the control group (T1) to T4. This gives an indication that when FELM is incorporated into quail diet, farmers will pay less

as far as feed is concerned for the same kilogram weight gain.

Carcass characteristics

There were significant ($p<0.05$) differences in the live, bled and eviscerated weights across the various treatment, and with T2 recording the highest weights, followed by T1, T3 and then T4 (Table 3). Shank, drum stick, thigh and breast muscle weights also recorded significant ($p<0.05$) differences among the various treatment, with similar trend as mentioned above ie, T2 recording the highest weights followed by T1, T3 and T4 (Table 3). The remaining carcass parameters recorded no significant ($p>0.05$) differences across the various treatments (Table 3). In all, the parameters for T4 (diet with the highest inclusion of FELM) recorded the lowest values, indicating that the inclusion of FELM at 6% and above could result to poor carcass yield, suggesting that an optimum level of 4% could be useful. When Opara (2006) fed FELM and neem *(Azadirachta indica)* leaf meal to laying hens, they recorded variations in the carcass yield with the highest inclusion being the poorest.

CONCLUSION

It is concluded that, *Ficus exasperata* leaf meal can be included in quail diet up to 4% without deleterious effect on growth performance and carcass characteristics. Can with a consequent reduce the cost of feed if added to the diets of quail birds.

RECOMMENDATION

Ficus exasperate leaf meal should be used along with some enzymes or taken through some processing of a sort to reduce the untinutritional factors in it.

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Table 3: Effect of *Ficus exasperata* leaf meal (FELM) on carcass characteristics

Parameters	Dietary Treatments				p- value
	T1 (0% FELM)	T2 (2% FELM)	T3 (4% FELM)	T4 (6% FELM)	
Live weight (g)	149.30^{ab}	161.67^{a}	142.00^{ab}	118.67^{b}	0.024
Bled weight (g)	135.00^{ab}	148.00^{a}	116.33^{ab}	104.00^{b}	0.029
Defeathered weight (g)	129.00	135.33	121.00	99.00	0.056
Eviscerated weight (g)	106.00^{ab}	115.67^{a}	105.00^{ab}	78.67^{b}	0.020
Shank (g)	2.06^{ab}	2.07^{a}	2.04^{b}	1.02^{c}	0.0001
Drum stick (g)	9.00^{ab}	10.00^{a}	8.00^{bc}	6.667^{c}	0.004
Thigh (g)	14.32^{a}	14.33^{a}	12.33^{ab}	9.00^{b}	0.007
Breast muscle (g)	31.67^{ab}	37.67^{a}	29.68^{ab}	24.33^{b}	0.040
Wings (g)	4.00	4.00	4.00	2.67	0.052
Liver (g)	2.00	2.333	1.67	2.33	0.363
Heart (g)	1.03	1.02	1.013	1.01	0.410
Full gizzard (g)	3.00	3.00	3.33	2.33	0.723
Empty gizzard (g)	2.33	2.00	2.67	1.67	0.163
Full intestine (g)	5.67	5.67	5.67	4.67	0.344
Empty intestine (g)	4.33	4.00	3.67	3.67	0.627
Carcass percentage (%)	70.77	71.54	74.03	66.21	0.082

^{ab}*Mean values within the same row with different superscript are significantly ($p<0.05$) different.*

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