EFFECTS OF *Xylopia aethiopica* FRUIT POWDER AS A FEED SUPPLEMENT ON THE GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF THE JAPANESE QUAIL (*Coturnix japonica*)

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Abstract

The present study sought to find out the suitability and efficacy of using Xylopia aethiopica fruit powder (XAFP) as a feed supplement on the growth and carcass characteristics of the Japanese quail (Coturnix japonica). A total of five dietary treatments groups were tested. The experimental treatments differed on the supplementation levels of XAFP. The experimental diets correspond to 0% (T0; control), 0.25% (T1), 0.50% (T2), 0.75% (T3) and 1% (T4) group. The diets were fed to a total of 150 quails of 21 days old and of comparable live weight. The quails were assigned to 15 batches of ten subjects of both sexes. The experimental units were randomly assigned to each cage. Each treatment was replicated three times in a completely randomized design. The quail growth traits and carcass characteristics were collected as an indicator of the suitability and efficacy of using XAFP as a feed supplement. Results revealed that a significant difference ($P \leq 0.05$) were detected in the FI, LW, WG FCR and Carcass yield between and among the treatment groups. Carcass yield had a significantly higher value (73.26±0.26g) in the T4 treatment. The supplementation of XAFP into quail diet led to a significant reduction in feed consumption and increasing the carcass weights of the Japanese quail. However, no significant differences ($P>0.05$) were recorded in the proportions of liver, heart, kidney, gizzard, wings, neck, head, legs and testicle weight. Xylopia aethiopica fruit powder can be used up to 0.25% to reduce production costs.

Key words: *Quail, supplementation, Xylopia aethiopica, growth, carcass*

INTRODUCTION

Quail is a fast-growing animal which is characterized by a short life cycle, small size, early-maturing, have the capacity to produce meat, egg and have good disease resistance [23, 25, 5]. Its meat and eggs are appreciated for their unique flavor [20] and therapeutic properties [37]. The success of quail farming depends on the mastery of its feed, which accounts for over 70% of its production costs [21]. In fact, Nguessan *et al.* [28] showed that supplementing the conventional quail diet with *Moringa oleifera* leaf powders improved the production performance and quail meat quality after the analysis of organoleptic parameters. The same observations were made by Galilet *et al.* [16], Djinandji et al. [11], Moctar *et al.* [20] and Kouatcho *et al.* [20]. Implying that some plant materials use as feed supplements may commonly have an interesting phytochemical composition.

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Nowadays, to mitigated feed production cost, famers are interested in the use of antibiotics additives and synthetic feed supplements [12]. However, consumers awareness regarding the side effect of antibiotic resistance on human health, have increased they preference for animal products raised under natural conditions without chemical inputs [17]. The interest in the use of natural additives and botanical elements in animal feed have grown over the decades [9, 20, 11]. Among local medicinal and aromatic plants substituted as feed additives, there is *Xylopia aethiopica*. This plant, has multiple bioactive compounds [1] which made it emerge as a promising phytobiotic candidate. As such, this tropical plant, due to its use as a spice, its interesting phytochemical composition and its important pharmacological properties [31, 34], appears to be suitable candidate for the supplementation of quail feed. However, reported studies on the use of XAFP as feed supplement are very limited. Therefore, this study was conducted to ascertain the suitability and efficacy of using XAFP as a feed supplement in the Japanese quail growth performance and carcass characteristics.

MATERIAL AND METHODS

Study area

The experiment was carried out in Ngaoundere, capital of the Vina Division, in the Adamaoua region of Cameroon. Located at an altitude of around 1060 m, between 7°19'38' and 7°21'25' north latitude and between 13°33'40' and 13°35'51' east longitude. The town Ngaoundere has a surface area of 17196 km², with a Sudano-Guinean climate characterized by two seasons: a rainy season from April to October and a dry season from November to March [35]. The soils are made up of basalts and granites minerals and ferralitic [13]. They are generally fertile and suitable for agropastoral activities [21]. Vegetation is an arboreal savannah where relative humidity is generally around 70%, average annual rainfall oscillates between 900 and 1500mm and the average temperature is 22°C [4].

Animal material, housing and feed

A total of 150 quails aged 21 days old (figure 1), with an average live weight of 72 ± 1.87 g, were divided into 15 batches of 10 birds each, to create comparable batches in terms of weight.

Figure 1: 21 Day-old chicks

Animals were house in the battery cages made of wire mesh (Figure 2). Each cage had a surface area of 50 cm² and a height of 15 cm. There was a 10 cm space between the cages. Litter was also provided.

Figure 2: Battery cages

Water was served ad libitum through an automated system, while the amount of feed was weighed before distribution. The basic ration contained 20.18% crude protein and 3013.78kcal of metabolizable energy (table 1). The centesimal feed composition and calculated chemical characteristics of the basal diet are summarized in the table 1. The waterer was located inside the cage, while the feeder was outside, thus limiting wastage.

Table 1: Centesimal feed composition and calculated chemical characteristics of the basal diet (DM%).

Ingredients	Quantity (Kg)
Corn	63
Wheat bran	4
Soybean meal	14
Peanut cake	5
Fish meal	5
Shellfish powder	1
Bone meal	1
Red palm oil	2
Concentrate	5
Total	100
Calculated chemical characteristics (%MS)	
Protein content	20.18
Metabolizable energy (kcal/kg)	3013.78
Energy/Protein	149.34
Fat (%)	5.45
Calcium (%)	1.41
Phosphorus (%)	0.62
Lysine (%)	1.16
Methionine (%)	0.44

Plant material

The dried fruits of *Xylopia aethiopica* (figure 3) were purchased from the Banyo market in Cameroon, then cleaned and free of impurities before being dried at room temperature. The powder used in the formulation is obtained by crushing the dried fruit with a mortar and pestle, followed by sieving through a 1mm mesh.

Figure 3: *Dried Xylopia aethiopica* fruit

Preparation of experimental diet

The different experimental diet were obtained, by adding various inclusion level *of Xylopia aethiopica* fruit powder to the basal diet: 0%; 0.25%; 0.50%; 0.75% and 1% (Fig. 7), which constituted treatments T0, T1, T2, T3 and T4 respectively. Treatments were prepared as often as necessary to ensure that subjects never ran out of food. Experimental diets were prepared on a well-washed and disinfected floor, and stored in well-sealed buckets. Each bucket was labeled. Variable proportions of wheat bran, soy and peanut meal, bone and fish meal, shellfish powder, palm oil and 5% meat. Concentrate is accurately weighed and homogenized with the fractionated corn at the mill

Data collected and parameters studied

Feed Intake (FI)

Throughout the trial, experimental diets were weighed using an SF-400 electronic balance with a capacity of 10,000 g and accuracy of 1 g before being distributed to each batch; the left over (remainder and refusal) were also weighed after seven days, i.e. one week [20].

FI (g) = Amount of feed distributed (g) - (refusal + remainder)](g)

Live Weight (LW) and Weight Gain (WG)

Animals were weighed fasting every seven days using an IPG-Series electronic scale with a capacity of 500g and accuracy of 0.01g to obtain live weight.

Weight gain (g) = Final Weight (g) - Initial Weight (g) Feed Conversion Ratio (FCR)

Food consumption and weight gain over the same period are used to derive the food consumption index [21].

$$\mathbf{FCR}=\frac{\boldsymbol{Feed\ Intake\ (g)}}{\boldsymbol{Weight\ gain\ (g)}}$$

Under each cage, there was a removable tray for the collection and disposal of the animals' faeces.

Carcass weight, carcass yield and organ/part proportion

Carcass characteristics were obtained after euthanized = animals following the method described by Genchev & Mihaylova [18], data were collected on carcass were:

Carcass weight (g) = Live weight (g) – fifth quarter weight (blood + feathers + viscera (g)

$$\textbf{Carcass yield (\%)} = \frac{\textbf{Carcass weight (g)}}{\boldsymbol{Life\ weight\ (g)}}\text{x}100$$

$$\textbf{Proportion of organ part (\%)} = \frac{\textbf{Weight of organ(g)}}{\boldsymbol{Life\ weight\ (g)}}x100$$

proportion of liver, heart, gizzard, kidney, proventriculus, head, abdominal fat, neck, thighs, wishbone, wings, and legs [36].

Data analysis

The data from the experiment was entered in MS Excel, then processed to remove any errors and inconsistencies and analyzed using IBM SPSS Statistics 25.0 software. The data were subjected to one-way (ANOVA) to evaluate the effect of (XAFP) feed supplement on the growth and carcass characteristics. Duncan, a post-hoc test at less than 0.05 significance level, was used to separate means when there was a significant difference [33].

RESULTS

Growth characteristics

Results on growth performance of Japanese quails fed with diet supplemented with XAFP are summarized in Table 2. Table 2 results revealed a significant difference ($P \leq 0.05$) in the FI, LW, WG and FCR. Though, the experimental diets induced a significant reduction ($P<0.05$) in feed intake (FI) and FCR as compared with controls diet (847.70±6.73g). This reduction increased with the level of incorporation of *Xylopia aethiopica* fruit powder in the feed. In females, LW and WG were comparable ($P>0.05$) independent of the treatment. Nevertheless, in males, the experimental diets induced a significant reduction ($P<0.05$) in live weight and weight gain compared with T0 controls (225.28±5.37g). The lowest live weight (203.33±2.47g) was recorded by T2
Batch dietary treatment.

Table 2: Growth performance of Japanese quails fed with diet supplemented with *Xylopia aethiopica* fruit powder.

Characteristics	Experimental diet	FI (g)	LW (g)	WG (g)	FCR Total (g)
Females	T0		250.78±8.29^{a}	178.03±7.84^{a}	4.76±0.17^{d}
	T1		244.04±1.52^{a}	171.55±2.66^{a}	4.64±0.07^{cd}
	T2		249.25±0.50^{a}	176.68±0.65^{a}	4.49±0.05^{c}
	T3		251.60±4.63^{a}	178.69±4.71^{a}	4.26±0.11^{b}
	T4		246.44±5.49^{a}	174.30±6.57^{a}	3.99±0.14^{a}
	Average		248.42±5.10	175.85±5.15	4.43±0.30
Males	T0		225.28±5.37^{c}	152.53±4.98^{c}	5.56±0.13^{cd}
	T1		209.46±1.78^{a}	136.96±2.69^{ab}	5.81±0.11^{d}
	T2		203.33±2.47^{a}	130.76±2.56^{a}	5.06±0.10^{b}
	T3		217.01±2.47^{b}	144.10±3.29^{bc}	5.28±0.08^{c}
	T4		204.39±4.30^{a}	143.60±12.71^{bc}	4.76±0.42^{a}
	Average		211.89±9.13	142.19±9.58	5.5±0.49
Mixed	T0	847.70±6.73^{d}	235.95±6.40^{a}	163.20±5.92^{a}	5.19±0.14^{c}
	T1	796.63±0.11^{c}	229.58±3.58^{a}	157.08±4.82^{a}	5.07±0.15^{bc}
	T2	793.33±10.53^{c}	235.46±4.11^{a}	162.89±4.42^{a}	4.87±0.18^{b}
	T3	762.02±6.21^{b}	231.55±2.93^{a}	158.65±2.28^{a}	4.80±0.03^{b}
	T4	694.91±2.79^{a}	231.39±5.68^{a}	159.25±5.19^{a}	4.36±0.16^{a}
	Average	778.92±52.22	232.79±4.75	160.21±4.69	4.86±0.31

FI: Feed Intake; LW: Live Weight; WG: Weight gain; FCR: Feed Conversion Ratio; a, b, c : on the same line, values with the same letter are not significantly different (P>0,05)

Carcass characteristics

Results on the carcass characteristics of Japanese quails fed with diet supplemented *Xylopia aethiopica* fruit powder are highlighted on Table 3. They show a significant difference (P<0.05) in the carcass yield, breast, thigh, head, back and abdominal among and between the treatment diet. Independent of the sex, carcass yield was comparable (P>0.05) in every treatment diet. Though there was a relative increase in carcass yield in the diet supplement with XAFP as compared with the controls diet T0 (66.83±4.32g). The proportion of thigh was also comparable (P>0.05) in females and independent of sex, while it increased significantly (P<0.05) in males, with the highest value (17.30±0.34%) noted in the batch supplemented with 1%.

Table 3 : Carcass Characteristics of Japanese quails fed with diet supplemented with *Xylopia aethiopica* fruit powder

Traits (% of live weight)	Sex	Expérimental diet				
		T0 (0 %) (n=6)	T1 (0,25 %) (n=6)	T2 (0,50 %) (n=6)	T3 (0,75 %) (n=6)	T4 (1 %) (n=6)
Carcass yield	Females	63.65±3.77^{a}	66.82±3.99^{a}	64.77±4.45^{a}	63.42±5.66^{a}	62.67±4.38^{a}
	Males	70.00±1.44^{a}	70.27±3.15^{ab}	71.13±0.76^{ab}	70.91±0.59^{ab}	73.26±0.26^{b}
	Mixed	66.83±4.32^{a}	68.54±3.73^{a}	67.95±4.50^{a}	67.16±5.46^{a}	67.97±6.43^{a}
Brest	Females	24.88±1.52^{b}	23.99±2.31^{ab}	25.47±2.54^{b}	25.18±2.48^{b}	20.61±1.24^{a}
	Males	26.87±1.34^{b}	26.94±1.77^{b}	25.22±1.83^{ab}	26.44±1.60^{b}	23.31±1.03^{a}
	Mixed	25.87±1.68^{b}	25.46±2.45^{b}	25.34±1.99^{b}	25.81±1.99^{b}	21.96±1.80^{a}
Thigh	Females	13.79±0.60^{a}	13.78±2.44^{a}	13.97±0.40^{a}	13.43±0.42^{a}	13.75±1.57^{a}
	Males	15.39±0.56^{a}	16.29±1.49^{ab}	16.24±0.95^{ab}	15.37±0.58^{a}	17.30±0.34^{b}
	Mixed	14.59±1.02^{a}	15.04±2.28^{a}	15.11±1.40^{a}	14.40±1.15^{a}	15.53±2.19^{a}
Wings	Females	5.53±1.15^{a}	5.11±0.50^{a}	5.68±0.25^{a}	5.27±0.54^{a}	5.03±0.54^{a}
	Males	6.61±1.03^{a}	6.29±0.14^{a}	6.20±0.10^{a}	5.92±0.77^{a}	6.18±0.31^{a}
	Mixed	6.07±1.14^{a}	5.70±0.72^{a}	5.94±0.33^{a}	5.60±0.69^{a}	5.60±0.74^{a}

Head	Females	1.72±0.15^{b}	1.72±0.10^{ab}	1.56±0.17^{a}	1.63±0.19^{ab}	1.68±0.09^{ab}
	Males	4.05±0.58^{a}	3.99±0.69^{a}	4.05±0.23^{a}	3.99±0.06^{a}	3.83±0.32^{a}
	Mixed	3.72±0.57^{a}	3.47±0.72^{a}	3.44±0.71^{a}	3.47±0.58^{a}	3.46±0.48^{a}
Neck	Females	5.95±0.64^{a}	7.74±2.34^{a}	7.22±1.54^{a}	6.64±0.75^{a}	6.02±0.77^{a}
	Males	5.47±0.54^{a}	6.78±1.75^{a}	6.17±1.23^{a}	6.61±1.42^{a}	7.26±1.89^{a}
	Mixed	5.71±0.59^{a}	7.26±1.92^{a}	6.70±1.37^{a}	6.62±1.02^{a}	6.64±1.46^{a}
Back	Females	13.13±0.68^{a}	14.19±1.76^{a}	15.06±0.57^{ab}	13.78±0.95^{a}	16.81±0.65^{b}
	Males	15.26±1.48^{a}	13.15±6.40^{a}	17.11±0.47^{a}	16.35±1.22^{a}	17.33±1.34^{a}
	Mixed	14.20±1.56^{ab}	13.67±4.24^{a}	16.08±1.22^{ab}	15.07±1.71^{ab}	17.07±0.99^{b}
Legs	Females	1.72±0.15^{a}	1.72±0.10^{a}	1.56±0.17^{a}	1.63±0.19^{a}	1.68±0.09^{a}
	Males	1.97±0.15^{a}	2.00±0.18^{a}	1.99±0.22^{a}	2.07±0.12^{a}	1.84±0.07^{a}
	Mixed	1.85±0.19^{a}	1.86±0.20^{a}	1.77±0.29^{a}	1.85±0.28^{a}	1.76±0.11^{a}
Abd. fat	Females	2.15±0.23^{a}	1.91±0.86^{a}	2.20±1.14^{a}	1.13±0.21^{a}	1.57±0.48^{a}
	Males	1.68±0.30^{abc}	2.30±0.44^{c}	1.19±0.27^{a}	1.54±0.37^{ab}	2.15±0.38^{bc}
	Mixed	1.91±0.35^{a}	2.11±0.64^{a}	1.70±0.93^{a}	1.33±0.35^{a}	1.86±0.50^{a}

a, b, c : on the same line, values with the same letter are not significantly different (P>0

On the other hand, the proportion of wishbone in the 1%-supplemented batch (21.96±1.80%) was significantly lower (P>0.05) than in the control batch (25.87±1.68%), which was otherwise comparable to the other treatments. No significant differences (P>0.05) were observed in neck, wing and leg proportions. In females, irrespective of sex, the experimental diets induced a significant increase (P<0.05) in the proportion of back compared to controls, with the highest value (17.07±0.99g) noted in the 1%-supplemented batch, while the proportion of back was comparable in males (P>0.05).

Relative weights of selected organs

Table 4 presented the relative weights of Japanese quails fed with diet supplemented with *Xylopia aethiopica* fruit powder. |Results from table 4 shows that the experimental diets induced no significant differences (P>0.05) in the relative weights of the various organs (gizzard, proventriculus, heart, kidneys and liver). However, there was a relative increase (P>0.05) in liver weight compared with controls (2.06±0.63%), and a non-significant decrease (P>0.05) in kidney weight as compared with the controls T0 (0.47±0.23%).

Table 4: Relative weights of Japanese quails fed with diet supplemented with *Xylopia aethiopica* fruit powder

Characteristics (% PV)	Sex	Experimental Diets				
		T0 (0 %) (n=6)	T1 (0,25 %) (n=6)	T2 (0,50 %) (n=6)	T3 (0,75 %) (n=6)	T4 (1 %) (n=6)
Liver	Females	2,60±0,18^{a}	2,81±0,84^{a}	2,69±0,44^{a}	2,73±0,74^{a}	2,65±0,51^{a}
	Males	1,51±0,24^{a}	1,61±0,14^{a}	1,57±0,17^{a}	1,42±0,30^{a}	1,76±0,21^{a}
	Mixed	2,06±0,63^{a}	2,21±0,85^{a}	2,13±0,68^{a}	2,08±0,88^{a}	2,20±0,60^{a}
Kidneys	Females	0,59±0,24^{a}	0,43±0,10^{a}	0,50±0,13^{a}	0,52±0,10^{a}	0,44±0,03^{a}
	Males	0,35±0,18^{a}	0,49±0,14^{a}	0,46±0,05^{a}	0,49±0,12^{a}	0,42±0,07^{a}
	Mixed	0,47±0,23^{a}	0,46±0,11^{a}	0,48±0,09^{a}	0,50±0,10^{a}	0,43±0,05^{a}
Heart	Females	0,61±0,06^{a}	0,81±0,14^{a}	0,80±0,16^{a}	0,72±0,14^{a}	0,72±0,06^{a}
	Males	0,88±0,03^{a}	0,84±0,11^{a}	0,92±0,10^{a}	0,88±0,18^{a}	0,88±0,08^{a}
	Mixed	0,75±0,15^{a}	0,82±0,11^{a}	0,86±0,13^{a}	0,80±0,17^{a}	0,80±0,11^{a}
Gizzard	Females	1,96±0,20^{a}	1,76±0,44^{a}	2,11±0,40^{a}	1,99±0,40^{a}	1,68±0,09^{a}
	Males	2,15±0,58^{a}	2,15±0,37^{a}	2,17±0,26^{a}	2,01±0,17^{a}	1,84±0,07^{a}
	Mixed	2,06±0,40^{a}	1,96±0,42^{a}	2,14±0,30^{a}	2,00±0,28^{a}	1,76±0,11^{a}
Proventriculus	Females	0,33±0,06^{a}	0,33±0,01^{a}	0,37±0,10^{a}	0,42±0,19^{a}	0,38±0,11^{a}
	Males	0,34±0,06^{a}	0,33±0,05^{a}	0,28±0,02^{a}	0,28±0,03^{a}	0,33±0,06^{a}
	Mixed	0,34±0,05^{a}	0,33±0,03^{a}	0,33±0,08^{a}	0,35±0,14^{a}	0,36±0,08^{a}

a, b, c : on the same line, values with the same letter are not significantly different (P>0,05)

DISCUSSION

Growth performances

In the present study, feed consumption of batches supplemented with *Xylopia aethiopica* fruit powder was significantly lower than that of control batches. *This reduction in FI could be due to the* pronounced, pungent taste of *Xylopia aethiopica* fruit [14], leading to reduced appetite. This observation mirrors the results of obtain by Okon *et al.* [30], who evaluated the growth performance of weanling rabbits fed diets containing *Xylopia aethiopica* seed meal and observed a drop-in food consumption in the supplemented batch compared with the control batch. trials by Ndelekwute and Enyenihi [27], which evaluated the antibacterial and growth-promoting potential of *Xylopia aethiopica* on three-day-old broilers and observed an increase in feed intake by the supplemented batches throughout the start-up phase. These differences could be explained by the fact that the present trial was carried out on adult animals in the finishing phase.

Three-day-old chicks are just beginning to consume feed, and can therefore easily become accustomed to the pungent taste of the fruit, whereas adult animals having consumed a different-tasting feed for several weeks before being supplemented with *Xylopia aethiopica* fruit powder would directly and easily notice its pronounced taste in the feed, and consume less.

Our results show that, irrespective of sex, final live weight and weight gain were comparable across treatments. This similarity between treatments, despite the lower feed consumption of the batches supplemented with *Xylopia aethiopica* fruit powder compared with the control batch, could be explained by the influence of certain elements contained in *Xylopia aethiopica* fruit in the assimilation process and the valorization of ingested feed. Indeed, *Xylopia aethiopica* fruits are rich in vitamins A, B2, B12 and D, which are important elements in the process of converting food into energy and in the absorption of certain nutrients in the small intestine [15, 7]. This observation is similar to the results of work by Akpomiemie [3], who evaluated the effect of aqueous extract of *Xylopia aethiopica* grains as an additive in the drinking water of broilers in the finishing phase and found that final live weight was comparable between treatments, but they contradict the conclusions of trials by Salomon *et al,* [32] who evaluated the effect of dietary supplementation with *Xylopia aethiopica* fruit powder on broiler growth performance and found that supplementation with *Xylopia aethiopica* fruit powder increased liveweight compared with controls. This difference could be explained by variations in feed intake. In the work of Salomon *et al,* [32], feed consumption in supplemented batches was higher than in controls, whereas in this study it was lower than in controls. Thus, the more the animal consumes, the more it makes available to its body the nutrients needed to maintain and build muscle tissue [22].

This study showed that the consumption index of batches supplemented with *Xylopia aethiopica* fruit powder was significantly lower than that of the control batch. This low recorded feed conversion index corroborates with the low feed intake coupled with high weight gain for the same period, highlighting the potential of *Xylopia aethiopica* fruit to increase the bird's ability to convert feed [6]. Muhammad *et al.* [26] evaluated the effect of *Xylopia aethiopica* fruits on the growth performance of Udah rams, noting an increase in feed conversion. This difference could be explained by the ratio of incorporation rate to subject weight. Indeed, the greater an animal's muscle mass, the greater its physiological surface area [22]. As a result, the concentration of the product needs to be increased to optimize its distribution in the biological environment.

Carcass characteristics

Although the males in the batch supplemented with 1% *Xylopia aethiopica* fruit powder had a significantly lower live weight than the control batch, their carcass yield was significantly ($P<0.05$) higher than that of the controls. This superiority in live weight of the control batch would therefore inevitably be due to the weight of the fifth quarter. The proportions of head, legs, wings and neck were comparable ($P>0.05$) whatever the treatment. This similarity could be explained by the fact that there is less muscle tissue in these parts. In fact, *Xylopia aethiopica* fruits contain many vitamins and minerals that help store proteins in myofibrils and promote muscle fiber hypertrophy. These results corroborate the work of Salomon *et al,* [32] who found no significant difference in the proportions of parts of broilers supplemented with *Xylopia aethiopica* fruit powder compared with controls.

Relative weight of selected organs

In the present trial, the proportions of liver, heart, gizzard and kidney to live weight were comparable ($P>0.05$) regardless of treatment. However, there was a relative increase in liver weight compared with controls. These observed similarities could be explained by the fact that *Xylopia aethiopica* fruits had no adverse effect on internal organs, and the different levels incorporated into the feed would not have induced any toxicity [29]. This slight increase in liver weight compared with controls could be due to the hepatoprotective effects of the phenolic compounds and essential oil contained in Xylopia aethiopica fruits. Indeed, the phenolic compounds and other phytochemicals present in these fruits tend to stimulate catalase and glutathione-S-transferase activities in liver tissue, facilitating hepatocyte cell multiplication and growth [2]. The same finding was made by Salomon *et al,* [32] who evaluated the effect of dietary supplementation with *Xylopia aethiopica* fruit powder on the growth performance, carcass characteristics and internal organs of broilers and found that the proportions of internal organs of supplemented batches were comparable to those of control batches.

CONCLUSION

This study focused on the growth trait and carcass characteristics of the Japanese quail fed on diets that are supplemented with graded level of *Xylopia aethiopica* fruit powder. The findings from the study demonstrated the feasibility of utilizing XAFP as a suitable feed additive source to improve carcass yield. The incorporation of *Xylopia aethiopica* fruit powder into quail feed led to a significant reduction in feed intake by increasing the carcass weights of supplemented animals. The addition of Xylopia aethiopica fruits to the ration had no adverse effect on carcass yield or on the proportion of parts and organs. Thus, supplementing poultry with 0.25% Xylopia aethiopica fruit powder would reduce feed costs.

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