



PAT December, 2019; 15 (2): 1-7 ISSN: 0794-5213

Online copy available at www.patnsukjournal.net/currentissue

Publication of Nasarawa State University, Keffi



Fluted pumpkin (*Telfairia occidentalis*) leaf extracts improved productive performance and testicular weight of growing cockerels

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Abstract

This experiment was carried out to determine the effect of fluted pumpkin leaf extract on the performance, internal organs and carcass characteristics of cockerels. The study consisted of the following four (4) treatments in a completely randomized design experiment: oral administration of fluted pumpkin leaf extract to individual birds at the dose of 0 ml (T_1 = control), 1ml (T_2), 2ml (T_3) and 3ml (T_4), respectively for seven days. The parameters assessed included body weight, feed consumption, feed conversion ratio, internal organ weights, dressed carcass weight and weights of carcass portions, expressed as percentage of whole carcass. Oral administration of fluted pumpkin leaf extract improved the final body weight, feed conversion ratio, whole carcass weight and testicular weight of treated cockerels, particularly at 1-ml dose. Treatment had no effect on the weights of the liver, heart, gizzard and carcass portions. It was concluded that oral administration of fluted pumpkin leaf extract at the dose of 1 ml/bird improved the productive performance and testicular weight of cockerels.

Key words: Fluted pumpkin, body weight, carcass quality, treated cockerels, leaf extract.

Introduction

Cockerels are male chickens less than one year old. The major role of cocks in poultry production is egg fertilization. They are also a very good source of poultry meat, which is most often preferred by consumers because of its good taste. Many small-scale poultry farmers prefer to rear cockerels due to their low cost as day-old chicks compared to broiler chicks. Moreover, the farmers believe that the cockerels are hardy and are less susceptible to diseases compared to other poultry. Fluted pumpkin (*Telfairia occidentalis*, Hook F.), belonging to the family *Cucurbitaceae*, is a perennial plant with great economic importance. It is largely consumed by millions of people in Nigeria, perhaps due to its nutritional and medicinal characteristics (Odiaka *et al.*, 2008). Fluted pumpkin is rich in calcium, iron, potassium, folic acid and manganese. In addition, the leaves have antioxidant properties as they contain high levels of vitamins, including vitamin A, E, C, B₂ and K used as food supplements (Nwakanma *et al.*, 2014; Mohammed *et al.*, 2016). The seeds which can be boiled and eaten, also serve as source of oil for making margarine, soap, paint and vanishes. The plant has been investigated for various antioxidant and medicinal properties. For instance, supplementing broiler diets with fluted pumpkin leaf meal (FPLM) resulted in improved performance and haematological indices (Imasuen *et al.*, 2014) of the birds. Supplementing Japanese quail diets with 10 and 15 g/kg of fluted pumpkin seed oil also improved their productive performance. In another experiment conducted by Ladokun *et al.* (2016), oral administration of fluted pumpkin leaf extract to laying birds improved hen-day, haematological indices, and internal egg quality. Dada (2017) used fluted pumpkin leaf powder as feed additive for African catfish fingerlings and reported improvement in growth, feed utilization and survival rate of the fishes. Similarly, Akang (2010) administered fluted pumpkin seed oil to rats and observed a slight improvement in semen parameters. On the contrary however, Ekanem *et al.* (2005) and Ekanem *et al.* (2010) reported the hepatotoxic and nephrotoxic effects of the root extracts of fluted pumpkin

on rats respectively. There is, however, paucity of information on the effect of FPLE on performance indices and carcass characteristics of cockerels. The current study therefore aimed at evaluating the effect of fluted pumpkin leaf extract on the growth performance, organ weights and carcass characteristics of cockerels.

Materials and methods

Fresh fluted pumpkin (*Telfairia occidentalis*) leaves together with the stalk was harvested, cleaned and washed to remove dirt and sand. The leaves were then drained and chopped, after which they were squeezed with little water and filtered with sieve to obtain a homogenous extract. The extract was stored in an air-tight container and refrigerated for use (Onu, 2012). A total of forty-eight (48) growing cockerels, raised under the conventional intensive system for 56 days were used for the experiment. All experimental procedures were conducted in accordance with the Ethics of Ahmadu Bello University on Animal Use and Care. The birds were randomly allotted to four treatments in a completely randomized design experiment. Each treatment was replicated two times, with six birds in a pen as one replicate. Each pen was therefore considered as an experimental unit and parameters observed were recorded as such. The treatments included the oral administration of fluted pumpkin leaf water extract to individual birds at the rate of 0ml (Control), 1ml, 2ml and 3ml, representing T₁, T₂, T₃ and T₄, respectively. The birds were given access to commercial grower mash (Hybrid[®]) and normal drinking water *adlibitum* throughout the period of the experiment, which lasted for 7 days. Initial body weights of the birds at the commencement of the experiment were recorded. Thereafter, body weight was recorded every 2 days, while feed intake was recorded on daily basis. Feed conversion ratio was calculated at the end of the experiment as ratio of feed intake to body weight gain. At the end of the experiment, 2 birds from each replicate were slaughtered, defeathered and eviscerated. The internal organs, including liver, heart, gizzard, intestines and testes, were harvested and weighed using 350-g capacity electronic scale (Citizen Scale, Model-CY 320, USA) as percentage of live body weight. Whole carcasses without the head, neck and legs were weighed, after which carcass portions such as drumsticks, breasts and wings were also weighed and expressed as percentage of the whole carcass.

All data collected were subjected to one-way analysis of variance using SPSS software (version 10.0, SPSS Inc, Chicago, IL, USA). Tukey's test was used to compare the differences between the treatment means. Treatment differences were considered significant at $P \leq 0.05$.

Results

The effect of fluted pumpkin leaf extract on performance of cockerels is shown in Table 1. Cumulative feed consumption for the entire period of experiment was highest in the control group, whereas the group treated with 1 ml of extract had lowest feed consumption rate. Contrariwise, group treated with 1 ml of extract recorded the highest weight gain whereas the control group had the lowest weight gain. In terms of feed conversion efficiency, group treated with 1ml of FPLE performed better than both the control group and groups supplemented with 2 ml and 3 ml of FPLE, respectively. Furthermore, the effect of oral administration of FPLE to cockerels on the internal organ weights is shown in Fig. 1a. In general, the relative internal organ weights of the control group were higher than those of the groups treated with FPLE. Gavaging cockerels with FPLE had no significant effect on the relative weights of the liver, heart and gizzard of the treated birds. There was, however, a decrease in intestinal weights in a linear manner, as the level of FPLE increased. In addition, the group treated with 1 ml of the extract had the highest testicular weight,

whereas the group treated with 3 ml of the extract recorded the lowest testicular weight compared to control and other treated groups (Fig. 1b).

Table 1: Performance indices of cockerels as influenced by fluted pumpkin leaf extract

Parameter	Treatments (ml of FPLE)				SEM
	0 (control)	1	2	3	
Initial body weight (g/bird)	950	1025	992	967	32.5
Final body weight (g/bird)	975	1100	1042	1017	34.2
Weight gain (g/bird)	25	75	50	50	2.65
Cumulative feed consumption (g/bird)	960	925	946	918	31.7
Feed conversion ratio	5.49 ^a	1.76 ^c	2.70 ^b	2.62 ^b	0.19

Means within the same row bearing different letters are significantly different at $p \leq 0.05$.
 FPLE = Fluted pumpkin leaf extract; FCR = feed conversion ratio

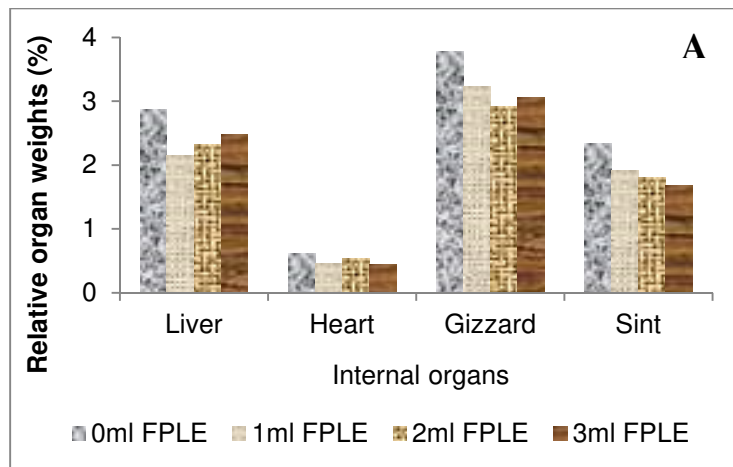


Figure 1a: Effect of fluted pumpkin leaf extract (FPLE) on some internal organs of cockerels

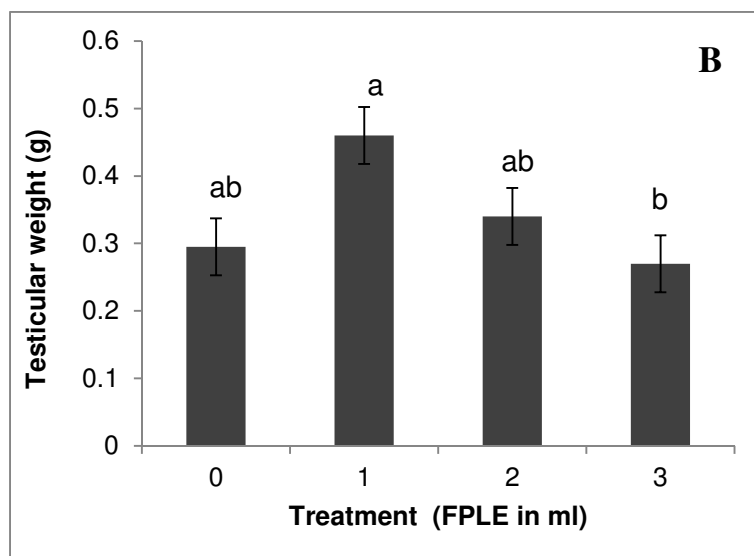


Figure 1b: Effect of fluted pumpkin leaf extract (FPLE) on testicular weights of cockerels

The Pearson correlation analysis showed a strong relationship ($r = 0.90$) between body and testicular weights.

The effect of oral administration of FPLE to cockerels on whole carcass weight followed the pattern observed with the final live weight of the birds, with the group treated with 1ml of FPLE recording the highest dressed weight (Fig. 2a). Treatment however, had no effect on the percentage primal cuts of the dressed carcass of treated birds (Fig. 2b).

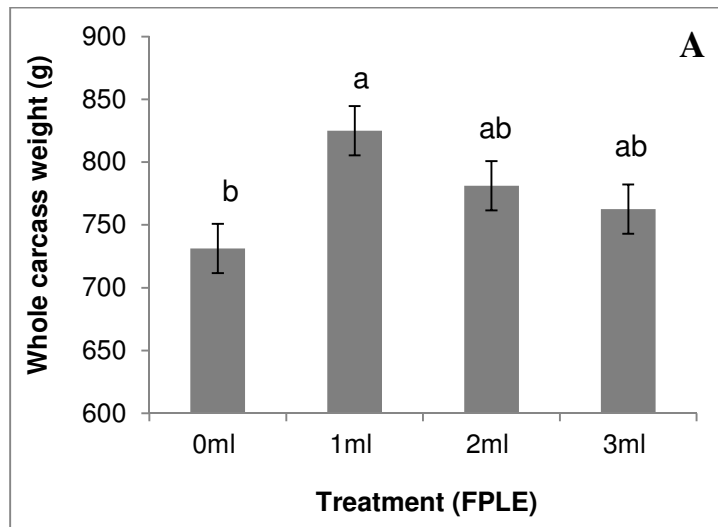


Figure 2a: Effect of fluted pumpkin leaf extract (FPLE) on whole carcass weights of cockerels
FPLE = Fluted pumpkin leaf extract

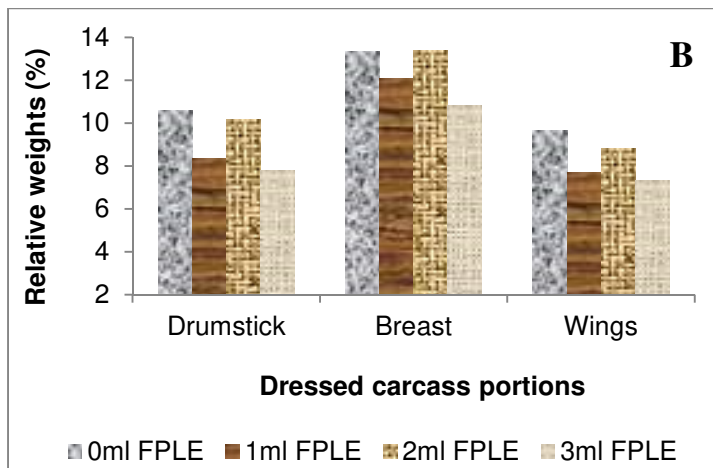


Figure 2b: Effect of fluted pumpkin leaf extract (FPLE) on relative weights of dressed carcass portions of cockerels.

Discussion

Fluted pumpkin leaves have been explored in various researches for its antioxidant and medicinal properties, with varying results. In the current study, the effect of FPLE on body weight and feed conversion efficiency of birds, agrees with the observations of Onu (2012) who reported that

addition of FPLE to the drinking water of broilers at the rate of 80 ml/litre significantly improved body weight gain and feed conversion efficiency of the birds. Alabi *et al.* (2017) similarly reported that the inclusion of 15 and 30% FPLE to the drinking water of broiler finisher birds significantly enhanced average daily weight gain and feed conversion ratio of the birds and compared well with conventional vitamin supplements. In the current study, higher weight gain of the birds gavaged with 1 ml of FPLE each suggests that this level may have stimulated better digestion of the nutrient consumed by the cockerels, and greater efficiency in utilization of the feed resulting in improved growth. Indeed, it has been suggested that the growth-stimulating factor of fluted pumpkin may be due to its well-balanced amino acid contents as well as the high level of its vitamin and mineral composition (Fasuyi and Noyenrem, 2007). Although all the groups supplemented with FPLE in the current study performed better than the controls, performance decreased as the level of FPLE increased. The finding indicates that lower level of the extract was more tolerable by the cockerels. Fluted pumpkin has been reported to contain low levels of nutritional factors that depress growth (Nworgu *et al.*, 2007), which may be the reason why the growth-stimulating efficiency of the leaf extract was higher at the lower treatment level.

The linear decrease in intestinal weight of treated birds observed in the current study disagrees with the report of Imasuen *et al.* (2014), who noted a progressive increment in the length of the small intestine of broilers with increased level of inclusion of fluted pumpkin leaf meal in their diets. Since the latter added the leaf meal to the diets of the birds, the disparity in observations may be due to the form of the test materials used. This is further evidenced by the reports of Kuku *et al.* (2014), who observed intestinal damage when unprocessed fluted pumpkin seeds were incorporated in diet of rats. The lack of effect of FPLE on the relative weights of some internal organs is in agreement with the report of Alabi *et al.* (2017) who also noted that oral FPLE does not exert significant effect on crop and gizzard weights. The findings of Omoikhoje *et al.* (2011) that inclusion of roasted fluted pumpkin pod husk waste in broiler diets significantly improves relative weights of the gizzard, however, contradicts the present result. The part and form of the fluted pumpkin used may be the reason for difference in observations as the fluted pumpkin pod husk waste contains more fiber than the leaf extract, and its digestion may trigger the increase in gizzard weight. Contrariwise, improvement was noticed in the testicular weight of treated birds in a pattern similar to that observed in body weight. It is not unlikely then that improvement in body weight, which was highest at 1ml of FPLE (Table 1), may be responsible for the observed improvement in testicular weight since there is a close relationship between body weight and testis size (Allaoui *et al.*, 2014). In addition, higher testis size may result in the improvement of fertility as there is a direct relationship between testis size and sperm production (Sarabia *et al.*, 2013). The lowest weight of the testes observed in the group treated with 3ml may indicate a negative effect of high dose of the extract on the testes. Similar observations were reported by Akang *et al.* (2010) who showed that a low dose (400 mg/kg) of fluted pumpkin seed oil improves sperm count and testicular histology of adult male Sprague-Dawley rats. However, at higher doses (800 mg/kg), both sperm count and sperm motility of the rats significantly decreased. Similarly, Emmanuel *et al.* (2018) reported spermatogenic properties of FPLE at low doses and its spermatotoxic activities at higher doses, showing histopathologically distorted cytoarchitecture. Based on the observations of Adisa *et al.* (2014), the testicular damage ranges from basement membrane distortion to cellular degeneration, haemorrhage, interstitial space exudations and cellular necrosis. Effect of FPLE on dressed carcass weight and percentage primal cuts of treated birds accords with the findings of Omoikhoje *et al.* (2011), who reported that dressed weight of broilers was not significantly affected by treatment with roasted fluted pumpkin pod husk waste.

In conclusion, oral administration of FPLE improved the final body weight, FCR, whole carcass weight and testicular weight of treated birds particularly at the rate of 1ml/bird, whereas treatment had no significant effect on the weights of the liver, heart, gizzard and carcass primal cuts. Fluted pumpkin leaf extract may be beneficial when administered to cockerels, particularly at the rate of 1ml/bird for the purpose of improving growth and reproductive performance.

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