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Performance and Egg Quality Characteristics of Egg-Type Chickens as Influenced by Fluted Pumpkin (*Telfaria Occidentalis*) Leaf Extract

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Target audience: Poultry farmers; Researchers and Animal Scientists

Abstract

A total of 120 sixteen week old point of lay birds of the Isa Brown strain were used for the experiment to determine the effect of fluted pumpkin (Telfaria occidentalis) leaf extract (FPLE) administered orally on Laying performance, egg quality characteristics; blood chemistry haematology and serum chemistry for a 12 week period. The birds were randomly assigned to five treatment groups: control group with no FPLE; 30ml FPLE/litre of drinking water; 60ml FPLE; 90ml FPLE and 120ml/litre FPLE respectively at 3 day intervals. Feed was given ad libitum. Eggs were collected at 2 week interval to determine external and internal egg qualities. Blood sampling was carried out at the twelfth week of experiment. The results show that FPLE significantly (P<0.05) increased hen day with birds in group with 120ml FPLE/litre water having higher values than other groups. External egg qualities were not influenced by FPLE inclusion. Internal egg qualities like shell weight and haugh unit were significantly increased by FPLE with birds in group with 120ml/litre FPLE having the highest significant values than birds in control and other groups. Haematological results show that for packed cell volume (PCV), Haemoglobin were not similar for all the groups in this experiment. However results for Red blood cell count (RBC) and White blood cell count (WBC) and differential were increased with FPLE intake with birds administered 120ml/litre of FPLE having the highest values for RBC and WBC. Serum chemistry results show similarities for serum total protein, Albumin, Globulin, Total Cholesterol and Serum Alanine Transaminase (SALT). FPLE has been proven to be a haematinic in rats and broiler chickens; this present result further strengthens this assertion though the results for blood analysis are contrary to that obtained by the authors for meat type chickens. It can therefore be concluded that up to 120ml FPLE/litre of drinking water can be tolerated by egg type chickens from point of lay phase to early laying phase.

Key Words: Fluted Pumpkin, Egg, haematology, Serum Biochemistry

Description of the problem

It is well known that Nigeria perennially faces problems of acute shortage of animal protein. The dearth of animal products in the diet of an average Nigerian has been due to poverty, high cost of animal feed, cultural norms, and inadequate information amongst others.

In spite of the expansion that Nigeria is witnessed in its poultry industry, percapital consumption of broiler meat is still below 2.0kg as against 12.0kg to 15.5kg between 1985 and 1990 in South Africa (1).Out of the 53g of protein per caput per day, Nigeria obtains 10-15g per caput per day from animal source as against 35g per caput per day recommended by (2).As such, Nigeria still remains amongst the least consumers of animal protein in Africa (3),in spite of her enormous natural and human resources, although most African countries are in the midst of feed crises (4). Poultry holds a vital position in bridging the animal supply and demand gap in developing countries like Nigeria. The poultry industry also has a great potential in realizing the protein demand of the country due to its fast growth rate, high creation of employment opportunities, high turnover rate of animal protein as well as provision or of high quality meat and eggs for human consumption. The use of supplements (organic and inorganic) to produce special effect in animal production is on the increase. These supplements are growth promoters and they exist in different forms (5).Herbs and spices have been found and widely used as alternatives therapies in both human and animal medicines.

Herbal medicine refers to using of plants seed, berries, root, leaves, bark or flowers for medicinal purposes. In all African societies, the use of plants for medicinal purpose is widespread (6). Plants have been used for medicinal purposes long before recorded in history. Indigenous cultures (such as Africa and native America) used herbs, in healing rituals, while others developed traditional medical systems (such as Africa and Traditional Chinese medicine incorporate it into their herbal therapies. The use of herbs in the treatment of different diseases is fast becoming revolutionized. In some countries, it has been integrated into the health scheme despite advances in orthodox medicines.

The world health organization (WHO) estimated that 80% of people in developing countries depend on traditional medicines for their health needs, and 85%of traditional medicine involves the use of plant extract. The side effect of orthodox medicine/drugs is making herbal medicine more widely acceptable because it is believed that natural product if utilized in the correct form and dosage are less harmful than synthetic product, which most often elicit some anaphylactic response or reactions (7).Herbal medicine remains a popular alternative throughout China and Far East, and is growing in popularity throughout the United States. This has also extended to part of African countries. Herbal remedies are natural, less expensive and environmentally friendly and could serve as alternatives to conventional medication or complement their roles. These supplements are generally added at low levels (less than 55ppm).Research works are going on in our universities and colleges on the use of non-conventional sources or protein and leaf protein to supplement the diet of man and farm animals. Some of these plants have been shown to provide not only nutritional but also medicinal benefits (8; 9, 10).

Telfairia occidentalis(fluted pumpkin) is native to the tropical rainforest of West

Africa with the largest diversity in south eastern Nigeria. It grows in a wide range of soil condition (11).It is partially drought resistance and its often the dominant leafy vegetable in the dry season (12).Folklore claims that the leaf extract is used as an anticonvulsant (13) and it can be used in treating animals suffering from varying degrees of anemia (14; 15). The proximate, gross energy, amino acid and mineral composition revealed that *Telfairiaoccidentalis* leaf meal is a potentially rich source of nitrogen in monogastric feed formulation (16).The results from another study showed that inclusion of *Telfaria occidentalis* leaf extract in water promoted growth influenced feed intake, feed efficiency, serum chemistry and haematology of cockerel chickens (17). The Telfaria Leaf extract has also been successful used in Broiler chicken production (18). However, not much has been reported on the effect of ***T****elfairia occidentalis* leaves extract on the laying performance and blood chemistry, egg qualities of laying chickens.

Materials and methods

A total of 120 16-weeks old pullet chicks of the Isa Brown strain were used in this study.The fluted pumpkin leaf extract was processed in the Nutrition Laboratory, College of Animal Science and Livestock Production. The procedure used was solvent extraction (water). The extract was mixed with the drinking water at the rate of 0 ml/litre of drinking water (control group); 30 ml extract/litre; 60 ml extract/litre; 90 ml extract/litre; and 120 ml/litre. The birds were fed a straight layer diet throughout the duration of experiment (12 weeks). Data were collected for performance parameters: feed intake and Hen-Day production; Egg Quality Characteristics-weight, length, breadth, shape index. Blood sampling was done at the end of the 12th week of experiment (wing vein-puncture) for serum biochemistry and haematology. The blood samples were analysed using the MINDRAY BC 2800VET-Auto haemoanalyzer for haematology.Serum biochemical values were obtained using spectrophotometric methods for Total Protein; Albumin; Alanine Transaminase (SALT) and Total Cholesterol.Internal Egg Qualities were measured using standard equipments and procedures.Blood was collected into two sets of tubes- one set with EDTA(anti-coagulant) the other set into tubes without EDTA. The first set was for haematology while the other set was for serum chemistry. Packed cell volume (PCV) was determined by the micro haematocrit method; Haemoglobin concentration (HB) was measured spectrometrically using the cyanohaemoglobin method; Red blood cell and White blood cell counts were done using electronic cell counter. Serum total protein, Albumin, Total Cholesterol, Glucose and Urea were determined using their various diagnostic kits with a spectrophotometer (19). Quantitative Data were analyzed using one-way ANOVA (20)and significant means were separated using the Duncan multiple range test of the same package.

Results and Discussion

The results obtained from this study are stated and discussed as follows:

The gross composition of the layers' mash shows that the energy, crude

protein, calcium and lysine were adequate for laying chicken.

Table 1: shows the gross composition of Layers' diet

Ingredient	Percent Inclusion (%)
Maize	50.0
Wheat Offal	10.70
Soybean Meal	20.0
Palm Kernel Cake	13.30
Fish meal	3.00
*Premix	0.25
Salt	0.25
Bone meal	1.50
Oyster shell	1.00
Total	100
Calculated Analysis:	
ME MJ/kg	11.65
Crude Protein (CP) %	20.16
Calcium (ca)	1.02
Lysine	1.21
Methionine	0.52

**Premix provided per kg diet: Vitamin A 15,000 I.U., Vitamin D_3 3000 I.U., Vitamin E 15 I.U., B_{12} 0.013 mg. Vitamin K 4 mg. Riboflavin 10 mg, Folic acid 2 mg. Nicotinic acid 44 mg, Pantothenic acid 13 mg. Biotin 0.064 mg, Vitamin B_1 2.2 mg, Vitamin B_6 5.5 mg, Choline Chloride 350 mg, Copper 6.25 mg. Iodine 1.5 mg, Zinc 62.5 mg, Manganese 62.5 mg, Selenium 0.1 mg, BHT (Antioxidant) 100 mg, Zinc Bacitracin 10 mg.*

Table 2 shows both the chemical and proximate composition of the *Telfaria occidentalis* leaf used. The crude protein vitamins and minerals support the findings of 8, 9, 10 and 16.

Table 2: shows the chemical composition of the Telfaria leaf extract used FPLE)

Parameter	Percentage (%) composition
CP	21.31
CF	6.41
EE	5.50
Ash	10.92
NFE	55.56
ME ($MJKg^{-1}$)	3121
GE ($MJKg^{-1}$)	4420
Calcium	0.67
Phosphorus	0.40
Potassium	0.15
Nitrogen	3.41
Magnesium	0.43
Sodium	0.02
Zinc	7.50
Iron	1.18
Phytate	510.51
Tannin	0.18
Oxalate	0.60

Table 3 shows the result of hen-day production and feed intake. Results shows that birds in the group having 120ml/L of fluted pumpkin leaf extract (FPLE) had lowest feed intake (118.3g/bird) and highest hen-day production (78.5%) compared to control, 30, 60 and 90ml/L FPLE groups. This agrees with the reports of 14, 15 and 17 who reported better feed intake with FPLE or meal although with meat type animals or birds.

Table 4 shows the results of some haematological parameters of birds served FPLE. The packed cell volume for the birds in the study were similar with control having 29% and birds on 120ml/L 27.5% this supports the findings of 14 and 17 who reported efficacy of FPLE in anaemic subjects and that it also haematinic respectively. The results for RBC count showed that control, 60, 90, and 120ml/L had significantly higher values than 30ml/L group, the same trend was observed for WBC count though all the values obtained were within stipulated range for laying chicken

Table 3: Shows the feed intake and Hen-Day production

Parameters	0	30	60	90	120
Feed intake g/bird/day	121.0	119.45	121.2	118.6	118.3
Hen Day Production (%)	72.0	74.5	73.5	75.0	78.5

Table 4: shows the results of Haematology

Parameter	0	30	60	90	120	SEM
PCV (%)	29.5	28.0	29.0	27.5	27.5	0.83
RBC (10^{12})	2.51^{a}	1.69^{c}	1.98^{b}	1.96^{b}	2.03^{b}	0.11
WBC (10^{9})	9.45	9.60	8.80	8.96	7.35	0.76
HB(g/dl)	9.95	9.40	9.55	9.20	9.20	0.83
MCV(µµg)	91.50	93.00	95.00	95.50	92.50	0.09
MCHC (%)	33.00	34.45	33.00	33.05	32.50	0.37

abc: means in the same row with different superscript vary significantly (P<0.05)

PCV= Packed cell volume. RBC= Red blood cell count. WBC= White blood cell count. HB= Haemoglobin. MCV= Mean corpuscular volume. MCHC= mean corpuscular haemoglobin concentration. SEM= Standard error of means

Table 5 shows the results of some serum biochemical indices in birds served FPLE. The indices measured include total protein, albumin, globulin, serum alanine transaminase (SALT) and total cholesterol. The result showed that total protein increased with FPLE level. The same trend for TP was also observed for albumin further affirming the reports of 14, 15, 16 and 17. For SALT, there was a sharp increase from control (0ml/L FPLE) to group with 60ml/L FPLE and then a steady decrease from 90ml/L to 120ml/L FPLE though these values are all within normal range and not significant (20). The results for total cholesterol shows group with 120ml/L FPLE with the highest value and those on 30ml/L FPLE with the lowest though not significant (192.8 and 174.45 respectively). This result corresponds to that of hen-day production suggesting the role of serum total cholesterol in yolk formation in laying hens.

Table 5: shows the results of Serum biochemistry

Parameter	0	30	60	90	120	SEM
Total protein(g /L)	4.02	4.55	3.45	3.54	4.56	0.09
Albumin (g/L)	2.28	2.14	1.78	1.85	1.98	0.08
Globulin (g/L)	2.28	2.41	1.67	1.69	2.58	0.07
SALT(iu)	7.03	7.05	7.52	7.44	7.34	0.12
Cholesterol(g/L)	182.74	174.54	184.94	180.24	192.80	8.42

abc: means in the same row with different superscript differ significantly (P<0.05)SEM= Standard error of means. SALT= Serum alanine transaminase

Table 6 shows the results internal egg quality parameters. The parameters considered include albumen height, yolk height, yolk weight, shell weight, shell thickness, albumen weight and haugh unit. For all these parameters, similar values were obtained across groups except for albumen weight in which groups with 90 and 120ml/L FPLE had higher values than other groups

Table 6 shows the results internal egg quality parameters. The parameters considered include albumen height, yolk height, yolk weight, shell weight, shell thickness, albumen weight and haugh unit. For all these parameters, similar values were obtained across groups except for albumen weight in which groups with 90 and 120ml/L FPLE had higher values than other groups.

Table 6: shows the results of internal egg quality parameters

Parameter	0	30	60	90	120
Albumen height(cm)	10.14	10.12	9.94	10.12	10.19
Yolk height(cm)	2.50	2.40	2.40	2.30	2.50
Yolk weight(g)	13.24	13.46	13.62	13.57	13.84
Shell weight(g)	6.25	6.15	6.23	6.88	7.15
Shell thickness(cm)	0.51	0.52	0.52	0.52	0.52
Albumen weight(g)	36.13	35.24	35.63	38.50	37.77
Haugh Unit	19.98	20.18	19.51	19.89	20.97

abc: means in the same row with different superscript differ significantly (P<0.05)

Table 7 shows the results of external egg quality parameters.The parameters include egg weight, egg breadth, egg length, and egg shape index. All these parameters similar values were recorded with the exception of weight in which birds in 120ml/L FPLE group had slightly higher value than other groups and control.

Table 7: shows the results of external egg quality parameters

Parameter	0ml	30	60	90	120
Egg Weight(g)	57.90	57.70	57.30	56.90	59.00
Egg Breadth(cm)	3.28	3.23	3.32	3.31	3.28
Egg Length(cm)	3.85	3.87	3.79	3.84	3.86
Egg Shape index	0.73	0.73	0.75	0.73	0.75

Conclusion and Application

- Telfaria Leaf Extract can be used in laying chickens up to 120ml/L of drinking water
- The Leaf Extract resulted in increased Hen-Day Production
- The Extract also increased blood formation/composition
- Serum parameters examined were not significantly altered by the extract

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