International Journal of Science and Research Archive

eISSN: 2582-8185

Cross Ref DOI: 10.30574/ijsra

Journal homepage: https://ijsra.net/

(Research Article)

Check for updates

Pumpkin leaf (*Telferia occidentalis*) and scent leaf (*Ocimum grattisimum*) meals as dietary additives on growth and egg production of laying chickens

FREDERICK UGBESIA IGENE * and JOY UTOMO APEH

Department of animal and food sciences, faculty of agriculture, natural resources and food science, Ambrose Alli University, Ekpoma, Edo State, Nigeria.

International Journal of Science and Research Archive, 2025, 14(03), 1362-1371

Publication history: Received on 13 February, 2025; revised on 28 March 2025; accepted on 30 March 2025

Article DOI: https://doi.org/10.30574/ijsra.2025.14.3.0802

Abstract

This study was carried out to investigate the effects of *Telferia occidentalis* (fluted pumpkin leaf) and *Ocimum gratissimum* (scent leaf) meals as additives on growth and egg production of laying chickens. A total of 420 Isa-brown point-of-lay pullets were randomly allocated in a completely randomized design to seven dietary treatments (T_1 - T_7). T_1 served as the control diet with no inclusion of test ingredients namely; pumpkin leaf meal (PLM) and scent leaf meal (SLM). In other treatments or diets, PLM and SLM were included per 100kg feed as follows; T_2 250g PLM, T_3 250g SLM, T_4 500g PLM, T_5 500g SLM, T_6 250gPLM+250gSLM, and T_7 500gPLM+500g SLM. Data were collected on egg production in three phases (cycles) of egg laying. Phase one was marked as egg production period during which the birds were between 18 and 28 weeks old, phase two spanned from week 28 to 38 weeks old, while phase three covered the laying periods from 38 to 48 weeks old. Data on performance records; hen day egg production, feed intake, weight gain feed conversion ratio were pulled together and assessed. In all the phases, only the daily live weight gain and feed conversion ratio of the birds were insignificantly affected ($P>0.05$). Daily weight gain was best in the control diet 59.41g/bird, FCR was best in T_5 (500g SLM) and the composite T_6 diet (250g PLM+250g SLM) with the value of 1.86 each. Vitamins A and D, Calcium (Ca) and Sodium (Na) of the eggs were generally significantly ($P<0.05$) higher in birds fed the supplemented diets. At the first laying cycle, eggs of the layers on control diet had the highest ($P<0.05$) value of vitamin D (57.73 mg/100g), those from laying chicken fed T_3 had the highest Ca (58.91mg/100g), while those on T_2 had the highest K and Na (122.68 and 134.93 mg/100g respectively). At the second laying cycle, T_6 had the highest level of vitamin A (328.01 mg/100g). Eggs in T_3 had the highest level of vitamin D (55.56 mg/100g). At third laying cycle, the highest values of vitamins A, D and Ca were obtained in eggs from T_7 while the K content was significantly highest in eggs from T_3 (126.02 mg/100g) with those from T_2 having the highest ($P<0.05$) Na (136.12 mg/100g). Proximate composition of the eggs across treatments was significantly ($P<0.05$) affected by dietary treatments with the supplemented diets' eggs being superior. In conclusion, these results suggest that *Telferia occidentalis* and *Ocimum gratissimum* can be used as natural alternatives to antibiotics to improve growth, egg production and nutrient composition of eggs.

Keywords: Pumpkin leaf; Scent leaf; *Telferia Occidentalis; Ocimum Grattisimum*; Laying Chickens

1. Introduction

Nigeria is the largest economy in Africa with a population of over 200 million persons (World Bank, 2020). This amazing data calls for a sustained approach to provide citizens with quality food, especially safe and affordable animal protein. Unfortunately, the level of animal protein intake is absolutely low at 45g/day per caput (USDA, 2013). This level of animal intake is not befitting a nation that is the largest economy in Africa and the 26th in the world. In order to salvage this situation, the poultry industry plays a large role as it has the potential to increase the per capita protein intake in Nigeria populace.

*Corresponding author: IGENE F. U

Poultry production remains the fastest means of providing animal protein to any nation. Poultry meat and egg are still widely consumed with little or no religious or social constraints. Eggs have been described as nature's convenience food since they come in a hygienic pack and can easily be stored and readily opened and cooked. They are also valuable and acceptable in the diets of younger and older people whose caloric needs are lower and who sometimes have difficulty in chewing certain types of food. The structure of humans and animal are built on protein. Man depends on animal and vegetable protein for the supply of amino acids. Chicken egg is a valuable protein source and also supplies several vitamins such as vitamin A, riboflavin (vitaminB_2), folic acid (vitamin B_9), vitamin B_6, vitamin B_{12}, cholin and minerals such as iron, calcium, phosphorus and potassium (Oboh and Igene, 2006). Also present in the yolk are the fat soluble vitamins A, D and E (Oboh and Igene, 2006). Thus, the abundance of natural readily available amino acids, minerals and vitamins makes the egg an important part of human diet.

Livestock industry in developing countries is plagued by numerous challenges among which is scarcity of feed ingredients that are in strict competition with man's dietary need. Livestock feeds accounts for 60-80% of the total cost of poultry production in developing countries such as Nigeria. In view of this, there is increased interest by livestock farmers for the search of feed additives of comparative quality that are cheap such as leaf and seed meals of ethno-medical plants. And also, the use of ecofriendly materials such as phyto-products from medicinal plants, fruits and herbal based extracts in the poultry and livestock industry. These compounds contain some bioactive phytochemicals which have been found to exhibit antimicrobial, antioxidant, antiparasitic, antiprotozoal and anti-inflammatory properties (Achilonu *et al*., 2018) and consequently have been shown to have beneficial effect on appetite, growth and the immune status of the animal.

Scientists all over the world are now actively engaged in researches into the use of botanical and plant derived products to reduce the heavy economic losses in poultry industry caused by poultry diseases (Abbas *et al.,* 2012). In recent years, there has been particular interest in the anti-oxidant ability and benefits of phytochemicals in vegetables and other tropical plant feed ingredients which have been used for a large range of purpose including nutrition, medicine and flavouring, among other industrial uses. The use of these vegetables along with other herbs is still increasingly being examined because of the numerous phytochemicals in addition to antioxidants present in them (Oboh and Akindahunsi, 2004). The use of synthetic drugs as antibiotics and growth promoters has high-cost implications and sometimes with adverse side effect on birds' health, prolonged withdrawal period and risk of accumulation in tissues and egg which could have harmful effects on human (Jawad *et al.,* 2014). However, to ensure more net returns and minimize high expenditure in feed, many researchers strategise the utilization of plant and leaf extracts as feed supplements and feed additives (Salihu *et al.,* 2020). Such alternatives include pumpkin leaf and scent leaf which are leafy, important low-cost vegetables containing low level of fat and high levels of vitamins, minerals, fibre, some calories and protein. In this study, pumpkin leaf (*Telferia occidentalis*) and scent leaf (*Ocimum grattisimum*) meals were used as dietary additives to assess the growth and egg production performances of laying chickens at different laying cycles.

2. Materials and methods

2.1. Experimental Site

This research was carried out at the Poultry Unit of the Teaching and Research Farm, Ambrose Alli University, Ekpoma, Edo State, Nigeria. The experiment lasted for 30 weeks.

2.2. Experimental design and management of birds

A total of four hundred and twenty (420) Isa-brown point-of-lay pullets were used for this study. The birds were randomly allocated to seven (7) dietary treatment groups with a total of sixty (60) birds per treatment. Each treatment was replicated three (3) times with 20 birds per replicate. This experiment was laid out in a completely randomized design. The birds were raised on a deep litter house and fed commercial layer mash with or without supplemented pumpkin and scent leaf meals throughout the experimental period.

Routine vaccination against Newcastle disease was strictly adhered to during the study. This was combined with adequate bio-security measures to prevent outbreak of infectious diseases. Other necessary routine management practices including de-worming and delousing were done. The birds had *ad libitum* access to feed and water throughout the period of the experiment.

2.3. Experimental feed / ingredients

These included pumpkin leaf meal, scent leaf meal and commercial layer mash.

2.4. Collection and Processing of pumpkin leaf meal and Scent leaf meal

The test ingredients which are the pumpkin leaf (*Telferia ocidentails*) and scent leaf (*Ocimum gratissimum*) were obtained from Ega market in Idah, Kogi State, Nigeria. The leaves were destalked, and immediately air-dried on a clean concrete floor in a well-ventilated room. It was left to dry for about fourteen days until moisture content becomes stabilized at 12%. The air-dried leaves were milled using harmer milling machine of 0.02 mesh size. The milled *Telferia occidentalis* leaf meal (PLM - Pumpkin Leaf Meal) and *Ocimum gratissimum* leaf meal (SLM - Scent Leaf Meal) were collected in jute bags separately and tightly tied to prevent the attack of insects and pests. They were kept in a clean ventilated room prior to the feed formulation to ensure that their qualities are maintained. Samples were taken from the bagged pumpkin leaf meal and scent leaf meal for proximate analysis, amino acid and mineral determination. Thereafter the pumpkin leaf meal and scent leaf meal were incorporated into commercial layers feed at different levels of inclusion.

2.5. Experimental diets

Seven dietary treatments were prepared using the commercial layer mash with the test ingredients (pumpkin and scent leaves) added as additives.

Treatment 1, control diet with no inclusion of test ingredients (PLM and SLM); Treatment 2, 250gPLM/100kgfeed; Treatment 3, 50gSLM/100kgfeed; Treatment 4, 500gPLM/100kgfeed; Treatment 5, 500gSLM/100kgfeed; Treatment 6, 250gPLM+250gSLM/100kgfeed, Treatment 7; 500g PLM+500gSLM/100kg feed.

2.6. Proximate composition of test ingredients (pumpkin leaf meal and scent leaf meal)

Prior to the experiment, samples of the prepared pumpkin leaf meal and scent leaf meal were taken for proximate analysis. The parameters examined were percentage dry matter, crude protein, crude fibre, ether extract and crude ash. They were determined according to the methods reported by AOAC (2000).

2.7. Data collection

Data collection was done in three phases. Phase one was marked as egg production period during which the birds were between 18 and 28 weeks old, phase two spanned from 28 to 38 weeks old, while phase three covered the laying periods from 38 to 48 weeks old. Data collection on performance and egg quality traits thus lasted for thirty (30) weeks. Number of eggs collected and egg weights were taken daily while feed intake and body weight gain of the birds were measured weekly. Weekly body weights of the birds, feed offered and leftover with daily egg weights were measured using a 5kg sensitive scale of 0.1g sensitivity.

2.7.1. Performance and egg production records

The performance parameters that were examined on the experimental birds were;

- **Average initial weight (kg)**: This was taken as the average weight of the birds at the beginning of the experiment.
- **Average final weight (kg)**: This was taken as the average weight of the birds at the end of the feeding trial.
- **Average daily weight gain (kg)**: This was taken as the average difference between the weekly final weights and the weekly initial weights. The values were thereafter divided by 7 to get average daily weight gain..
- **Average feed intake per bird per day (g)**: This was taken as the difference between the quantity of feed given the previous day and the quantity of feed leftover in the current day.
- **Feed Conversion ratio (FCR)**: This was determined as the ratio of feed intake to weight gain per bird per day.

$$\text{FCR} = \frac{\text{Feed intake/bird/day (g)}}{\text{Weight gain/bird/day (g)}}$$

- **Hen-Day egg production (HDEP)**: This is the percentage hen – day egg production and was determined as the total number of eggs produced in a day expressed as the percentage of hens present on that day.

$$HDEP = \frac{\text{Total daily eggs produced}}{\text{Total daily number of hens present}} \text{X} \frac{100}{1}$$

Hen-Housed Egg Production (HHEP): This is a ratio of total number of eggs laid during the period to the total number of hens housed at the beginning of laying period.

$$\text{HHEP} = \frac{\text{Total number of eggs laid during the period}}{\text{Total number of hens housed at the beginning}} \times 100$$

2.8. Proximate, minerals and vitamin composition of raw eggs

At the end of each laying cycle, four eggs per replicate per treatment were randomly collected and taken to the laboratory for proximate analysis of the egg internal contents (the yolk and albumen). The eggs were analyzed for percentage dry matter content, crude protein, crude ash, crude fibre, ether extract, minerals and vitamins in accordance to the methods by AOAC (2000).

2.9. Statistical analysis

For performance data, all records taken in each of the egg production cycle were pulled together and analysed statistically. Data for eggs' external and internal qualities were analysed separately per cycle of production.

All data collected were subjected to one way analysis of variance (ANOVA) using the general linear model incorporated in SPSS version 16 (SPSS, 2011). Significant means were separated using Duncan multiple range test, incorporated in the same software at 5% level of significance.

3. Results and discussion

The results of the proximate composition of pumpkin leaf and scent leaf are shown in Table 1. The results show that scent leaf had higher moisture content (11.50 %) and CHO (52.00 %) than the pumpkin leaf. However, the pumpkin leaf meal was higher in terms of crude protein (22.20 %), crude fibre (6.05 %), ash (6.08 %) and crude fat (6.40 %)

Table 1 Proximate composition of Pumpkin leaf and Scent leaf

Parameters	**Moisture (%)**	**Protein (%)**	**Crude fibre (%)**	**Ash (%)**	**Crude fat (%)**	**CHO (%)**
Pumpkin leaf	8.15	22.20	6.05	6.08	6.40	51.12
Scent leaf	11.50	21.50	5.50	3.90	5.60	52.00

The results of the performance of laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals; T_1(Control), T_2(250g PLM/100Kg feed), T_3(250g SLM/100kg feed), T_4(500g PLM/100kg feed), T_5(500g SLM/100kg feed) T_6 (250g PLM+250g SLM/100kg feed) and T_7 (500g PLM+500gSLM/100kg feed) are shown in Table 2.

The results show that there were no significant ($P>0.05$) differences in hen-day egg production (HDEP) and average daily feed intake (ADFI). However, average daily weight gain (ADWG) and feed conversion ratio (FCR) were significantly ($P<0.05$) increased by dietary treatments. The layers on the control diet had highest value of average daily weight gain (59.41g) but statistically comparable to the values 58.72, 58.40 and 58.24g/bird in layers fed diets T_2, T_7 and T_4 respectively. The layers offered diets T_2, T_4, T_5 and T_7 had comparable values of ADWG with the layers placed on diet T_3 (57.49g/bird) while the layers maintained on diet T_6 had the least ADWG (56.16 g). The FCR was significantly ($p<0.05$) highest in layers fed diet T_7 (2.11) while those on other dietary treatments including the control diet had comparable values of FCR.

Table 2 Performance of laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals (g/100kg feed)

Parameters	**T1 (Control)**	**T2(250g PLM/100Kg feed)**	**T3(250g SLM/100kg feed)**	**T4(500g PLM/100kg feed)**	**T5(500g SLM/100kg feed)**	**T6(250g PLM+250g SLM/100kg feed)**	**T7(500g PLM+500g SLM /100kg feed)**
Hen-day egg	62.31±1.33	65.47±1.36	65.11±1.33	64.30±1.32	63.28±1.40	64.73±1.36	66.10±1.24NS

production (%)							
Average daily feed intake (g)	111.55±0.75	112.01±0.76	111.15±0.79	111.08±0.86	111.11±0.88	111.24±0.88	111.20±0.78NS
Average daily weight gain (g)	59.41±0.33 ^{a}	58.72±0.31 ^{ab}	57.49±0.40 ^{b}	58.24±0.42 ^{ab}	58.48±0.37 ^{ab}	56.16±0.66 ^{c}	58.40±0.27 ^{ab}
Feed Conversion Ratio	1.89±0.02 ^{b}	1.91±0.01 ^{b}	1.89±0.02 ^{b}	1.87±0.02 ^{b}	1.86±0.02 ^{b}	1.86±0.03 ^{b}	2.11±0.17 ^{a}

Means in the same row with different superscripts are significantly different (p<0.05). Note: PLM = Pumpkin leaf meal, SLM= Scent leaf meal, NS= Not-significant

Tables.3, 4 and 5 show vitamin and mineral composition of eggs in layers fed diets containing different levels of dried pumpkin leaf and scent leaf meals at first, second and third laying cycles.

Table 3 Vitamin and mineral compositions of eggs of laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals at first laying cycle (18-28 weeks)

Parameters (mg/100g)	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**SEM±**
Vitamin A	304.61 ^{e}	314.58 ^{c}	306.41 ^{e}	310.22 ^{d}	316.73 ^{c}	321.45 ^{b}	326.45 ^{a}	1.15
Vitamin E	2.81	3.06	3.01	2.76	2.88	2.96	2.91 ^{NS}	1.05
Vitamin K	1.08	1.04	1.32	1.16	0.98	1.21	1.11 ^{NS}	1.12
Vitamin D	57.73 ^{a}	52.89 ^{bc}	54.12 ^{ab}	52.66 ^{bc}	53.84 ^{b}	49.38 ^{c}	54.93 ^{ab}	1.14
Calcium	55.23 ^{ab}	56.93 ^{ab}	58.91 ^{a}	54.73 ^{b}	57.78 ^{ab}	57.16 ^{ab}	58.11 ^{ab}	1.05
Potassium	113.26 ^{de}	122.68 ^{a}	121.05 ^{bc}	116.33 ^{dc}	118.67 ^{bc}	118.91 ^{bc}	110.25 ^{e}	1.15
Iron	1.82	1.79	1.74	1.81	1.78	1.73	1.83 ^{NS}	1.11
Magnesium	10.13	11.45	9.96	11.38	10.72	10.88	10.12 ^{NS}	1.06
Sodium	128.97 ^{bc}	134.93 ^{a}	134.65 ^{a}	126.45 ^{c}	130.91 ^{b}	131.46 ^{ab}	125.98 ^{c}	1.01

Means in the same row with different superscripts are significantly different (p<0.05); Note: PLM = Pumpkin leaf meal, SLM= Scent leaf meal, NS= non-significant., T_1: (Control), T_2: (250g PLM/100Kg feed), T_3: (250g SLM/100kg feed), T_4: (500g PLM/100kg feed), T_5: (500g SLM/100kg feed), T_6: (250g PLM and 250g SLM mixture/ 100kg feed), T_7: (500g PLM and 500g SLM mixture/ 100kg feed), SEM±: Standard error of mean

Table 4 Vitamin and mineral compositions of eggs of laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals at second laying cycle (28-38 weeks)

Parameters (mg/100g)	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**SEM±**
Vitamin A	298.45 ^{d}	305.05 ^{bcd}	312.45 ^{b}	302.56 ^{cd}	310.22 ^{bc}	328.01 ^{a}	322.11 ^{a}	0.46
Vitamin E	2.84	2.92	3.08	2.82	2.94	2.90	2.89 ^{NS}	1.15
Vitamin K	1.12	1.10	1.26	1.20	1.02	1.22	1.18 ^{NS}	1.16
Vitamin D	51.93 ^{ab}	52.63 ^{ab}	55.56 ^{a}	53.06 ^{ab}	53.01 ^{ab}	50.82 ^{b}	53.04 ^{ab}	1.05
Calcium	56.93	56.68	58.46	54.81	57.08	56.89	57.92 ^{NS}	1.19
Potassium	116.85 ^{ab}	119.61 ^{a}	113.01 ^{b}	106.39 ^{d}	118.94 ^{a}	120.43 ^{a}	108.97 ^{cd}	1.14

Iron	1.80	1.79	1.64	1.76	1.74	1.71	1.72	0.45
Magnesium	10.24	10.72	10.24	11.11	10.92	10.61	10.35	1.15
Sodium	128.46^{c}	131.57^{bc}	134.89^{a}	125.63^{d}	130.02^{bc}	132.61^{ab}	126.46^{cd}	1.10

Means in the same row with different superscripts are significantly different (p<0.05); Note: PLM = Pumpkin leaf meal, SLM= Scent leaf meal, NS= non-significant.T_1: (Control), T_2: (250g PLM/ 100Kg feed), T_3: (250g SLM/100kg feed), T_4: (500g PLM/100kg feed), T_5:(500g SLM/ 100kg feed), T_6: (250g PLM and 250g SLM mixture/ 100kg feed), T_7: (500g PLM and 500g SLM mixture/ 100kg feed), SEM±: Standard error of mean

Table 5 Vitamin and mineral compositions of eggs of laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals at third laying cycle (38-48 weeks)

Parameters (mg/100g)	T_1	T_2	T_3	T_4	T_5	T_6	T_7	SEM±
Vitamin A	300.69^{f}	306.91^{e}	311.16^{d}	328.11^{c}	321.48^{bc}	324.01^{b}	328.34^{a}	1.15
Vitamin E	2.94	3.10	3.21	2.88	2.76	2.79	2.86^{NS}	1.11
Vitamin K	1.04	1.12	1.28	1.21	1.04	1.26	1.16^{NS}	1.02
Vitamin D	52.73^{ab}	53.58^{ab}	52.89^{ab}	53.12^{ab}	54.81^{a}	49.86^{b}	55.19^{a}	1.13
Calcium	54.34^{bc}	58.53^{a}	55.89^{abc}	54.14^{bc}	57.02^{ab}	53.05^{c}	58.91^{a}	1.10
Potassium	116.33^{d}	124.09^{ab}	126.02^{a}	119.223^{cd}	121.69^{bc}	120.83^{bc}	116.71^{d}	1.00
Iron	1.80	1.76	1.73	1.82	1.70	1.79	1.83^{NS}	1.15
Magnesium	10.23	11.13	9.93	11.08	10.32	10.81	10.04^{NS}	1.12
Sodium	124.59^{d}	136.12^{a}	132.52^{b}	127.18^{cd}	131.08^{b}	130.62^{bc}	126.91^{d}	1.14

Means in the same row with different superscripts are significantly different (p<0.05); Note: PLM = Pumpkin leaf meal, SLM= Scent leaf meal, NS= non-significant;T1: (Control), T2: (250g PLM/ 100Kg feed), T3: (250g SLM/100kg feed), T4: (500g PLM/100kg feed), T5:(500g SLM/ 100kg feed), T6: (250g PLM and 250g SLM mixture/ 100kg feed), T7: (500g PLM and 500g SLM mixture/ 100kg feed), SEM±: Standard error of mean

Table 6, 7, and 8 show proximate composition of eggs in layers fed diets containing different levels of dried pumpkin leaf and scent leaf meals at first, second and third laying cycles.

Table 6 Proximate compositions of eggs in laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals at first laying cycle (18-28 weeks)

Parameters (%)	T_1	T_2	T_3	T_4	T_5	T_6	T_7	SEM±
Ash	0.93^{d}	0.84^{e}	1.21^{b}	0.98^{d}	1.08^{c}	1.12^{c}	1.31^{a}	0.07
Fat	8.80^{e}	6.88^{g}	9.98^{b}	8.31^{f}	9.44^{d}	9.72^{c}	10.12^{a}	0.05
Carbohydrate	0.29^{e}	0.45^{d}	0.65^{a}	0.45^{d}	0.55^{b}	0.62^{a}	0.51^{c}	0.06
Crude Protein	11.46^{e}	8.69^{g}	12.94^{b}	10.68^{f}	12.11^{d}	12.64^{c}	13.12^{a}	0.07
Moisture Content	78.52^{c}	83.14^{a}	75.22^{f}	79.58^{b}	76.82^{d}	75.90^{e}	74.94^{f}	0.05
Dry Matter	21.48^{d}	16.86^{f}	24.78^{a}	20.42^{e}	23.18^{c}	24.10^{b}	25.06^{a}	0.05

Means in the same row with different superscripts are significantly different (p<0.05); Note: PLM = Pumpkin leaf meal, SLM= Scent leaf meal, NS= non-significant; T_1: (Control), T_2: (250g PLM/ 100Kg feed), T_3: (250g SLM/100kg feed), T_4: (500g PLM/100kg feed), T_5:(500g SLM/ 100kg feed), T_6: (250g PLM and 250g SLM mixture/ 100kg feed), T_7: (500g PLM and 500g SLM mixture/ 100kg feed), SEM±: Standard error of mean

Table 7 Proximate compositions of eggs in laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals at second laying cycle**(28-38 weeks)**

Parameters (%)	T_1	T_2	T_3	T_4	T_5	T_6	T_7	SEM±
Ash	1.10^{c}	0.85^{d}	1.42^{a}	0.88^{d}	1.26^{b}	1.03^{c}	1.06^{c}	0.01
Fat	9.81^{ab}	7.50^{b}	10.73^{a}	7.51^{b}	10.04^{a}	9.19^{ab}	9.81^{ab}	0.01

Carbohydrate	0.51^{c}	0.36^{e}	0.31^{e}	0.66^{b}	0.58^{c}	0.75^{a}	0.49^{d}	0.03
Crude Protein	12.56^{ab}	9.59^{b}	13.63^{a}	9.77^{b}	13.18^{a}	11.81^{ab}	12.51^{ab}	1.01
Moisture Content	76.02^{ab}	81.70^{a}	73.91^{b}	81.18^{a}	74.94^{b}	77.22^{ab}	76.13^{ab}	0.05
Dry Matter	23.98^{ab}	18.30^{b}	26.09^{a}	18.82^{b}	25.06^{a}	22.78^{ab}	23.87^{ab}	2.05

Means in the same row with different superscripts are significantly different ($p<0.05$); Note: PLM = Pumpkin leaf meal, SLM= Scent leaf meal, NS= non-significant; T1: (Control), T2: (250g PLM/ 100Kg feed), T3: (250g SLM/100kg feed), T4: (500g PLM/100kg feed), T5:(500g SLM/ 100kg feed), T6: (250g PLM and 250g SLM mixture/ 100kg feed), T7: (500g PLM and 500g SLM mixture/ 100kg feed), SEM±: Standard error of mean

Table 8 Proximate compositions of eggs in laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals at third laying cycle

Parameters (%)	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**SEM±**
Ash	0.93^{e}	0.89^{f}	1.08^{d}	0.93^{e}	1.15^{c}	1.20^{b}	1.38^{a}	0.01
Fat	8.55^{f}	8.21^{g}	8.85^{d}	8.63^{e}	9.88^{c}	10.15^{b}	10.58^{a}	0.01
Carbohydrate	0.38^{d}	0.42^{c}	0.42^{c}	0.30^{e}	0.50^{b}	0.55^{a}	0.40^{dc}	0.01
Crude Protein	11.02^{f}	10.26^{g}	11.39^{d}	11.16^{e}	12.66^{c}	13.22^{b}	13.73^{a}	0.01
Moisture Content	79.12^{b}	80.22^{a}	78.26^{c}	78.98^{b}	75.81^{d}	74.88^{e}	73.91^{f}	0.05
Dry Matter	20.88^{e}	19.78^{f}	21.74^{d}	21.02^{e}	24.19^{c}	25.12^{b}	26.09^{a}	0.05

Means in the same row with different superscripts are significantly different ($p<0.05$); Note: PLM = Pumpkin leaf meal, SLM= Scent leaf meal, NS= non-significant;T_1: (Control), T_2: (250g PLM/ 100Kg feed), T_3: (250g SLM/100kg feed), T_4: (500g PLM/100kg feed), T_5:(500g SLM/ 100kg feed), T_6: (250g PLM and 250g SLM mixture/ 100kg feed), T_7: (500g PLM and 500g SLM mixture/ 100kg feed), SEM±: Standard error of mean

The efficacy of feed ingredients is often determined by the performance response of animals. As shown in this study, the hen-day egg production and average daily feed intake were higher generally in laying chickens fed diets supplemented with dried pumpkin leaf (PLM) and scent leaf meals (SLM) than the control though the values were not significantly different. This implies that the additives had no detrimental but synergistic effect on the egg production and feed intake of the laying chickens. The enhancement of the growth performance parameters after supplementation with phytobiotics may be dependent on the synergistic mechanism among their active molecular complex (Hussein *et al*., 2020). According to the report by Yasodha *et al*. (2019), improved growth parameters were detected in birds fed on different types of herbs, polysaccharides or essential oils components (Yasodha *et al*., 2019). Adegbenro *et al*. (2020), observed similar trend in an experiment involving quality of eggs produced by laying hens fed composite leaf meal as alternative to premix. The authors observed higher significant values of hen-day egg production in birds fed composite leaf meals than the control.

The higher feed intake especially in laying chickens fed 250g PLM/100kg feed may be attributed to the ability of the phytobiotics in PLM and SLM to maintain or improve normal intestinal architecture, increase the villus length and consequently increase the surface of intestinal absorption (Tabatabaei, 2016). Esonu *et al*. (2003), put forth that increased fibre content of the leaf meal had an energy dilution effect on the feed and a consequential increase in feed intake.

Although the average weight gain was highest in laying chickens fed the control diet, the value was comparable to those of the birds fed supplemented diets. This implies that the PLM and SLM had no adverse effect on growth of the laying chickens. Similar views were earlier expressed by Iheukwumere *et al*. (2008). The lower values of feed conversion ratio (FCR) observed in laying chickens fed dietary treatments (except T7) and control, indicate that the birds were able to utilize the supplemented diets just as the control diets. The laying chickens placed on T5 (500gSLM) and T6 (250gPLM +250gSLM) diet had the least value of FCR which suggests optimal utilization of the supplemented diets at these doses. Adegbenro *et al*. (2020) also observed decrease in feed conversion ratio in the tested diets compared with the control in laying birds offered composite leaf meals. This result also agrees with the report of Onyimonyi *et al*. (2009) who observed reduced FCR in broiler chickens fed varying dietary Levels of Neem Leaf Meal (Azadirachta indica).

Eggs generally are rich in vitamins and minerals; however the composition of these biological molecules may be influenced by several factors including the age of the birds, the stage of egg production and the diets offered. This current study observed that, vitamin A was significantly highest in laying chickens fed T7, 500g PLM+500g SLM diet at both first and third laying cycles, though the value was comparable to that of the T6 250gPLM+250g SLM diet at the second laying cycle. This suggests that incorporation of PLM and SLM at higher doses as seen in T7 and T6 in this study enhance metabolism of vitamin A in laying chickens. According to Oboh *et al*. (2006), the leaves of fluted pumpkin contain a high amount of vitamins A and C, antioxidants, hepatoprotective and antimicrobial properties. In addition, even though the values of vitamin E and K of eggs on supplemented diets were not significantly different from those of the control, the values were higher. This implies that the laying chickens were able to utilize the vitamin E and K in the additives for production advantage. Ogunwole *et al*. (2020), also observed significant influence of different proprietary vitamin premix on vitamin deposition in eggs of laying chickens. Similarly, vitamin D component of eggs from laying chickens was significantly influenced by the supplementation of PLM and SLM, which suggests that the additives enhanced deposition of vitamin D in the eggs of experimental chickens at first, second and third laying cycles.

Minerals are indispensible in the diet of poultry and function in the formation of blood cells, blood clotting, enzyme activation, energy metabolism, and for proper muscle function. The mineral contents of the eggs examined in this study revealed that the eggs from PLM and SLM supplemented diets were significantly influenced at the three laying cycles considered. The higher concentration of calcium (Ca), potassium (K), iron and magnesium (Mg), sodium (Na) recorded in the eggs of laying chickens fed supplemented diets at first, second and third laying cycles suggests that the utilization and metabolism of these minerals were influenced by the supplementation of PLM and SLM at these production stages. This may be adduced to the ability of laying chickens to pick additional nutrients from the additives which was consequently deposited in the eggs. Aside from the fact that PLM has been reported to be very rich in minerals, the Leaves are rich in essential and non-essential amino acids and vitamins (Adekunle, 2016) while Oluwole *et al*. (2019), reported that SLM is essentially rich in macro minerals such as calcium, potassium, magnesium, sodium and iron. Minerals in poultry are found to be very useful especially Ca which is one of the most essential minerals in poultry and very useful in bone and egg formation, while its deficiency leads to rickets and production of shell-less eggs (Oboh and Igene, 2006). Deficiency of this mineral is often associated with egg crack and lameness. Thus this study revealed that PLM and SLM supplementation in laying chickens' feed could help to bridge mineral deficiency in the diets.

Tables 6, 7 and 8 show the proximate compositions of eggs in laying birds fed diets containing different levels of dried pumpkin leaf and scent leaf meals at first (18-28 weeks), second (28-38 weeks) and third (38-48 weeks) laying cycles. According to Nte *et al*. (2017), egg displayed very consistent composition with regard to its content of total proteins, essential amino acids, total lipids, phospholipids, phosphorus, and iron. However, the crude protein (CP) of eggs of laying chickens fed PLM and SLM supplemented diets varied significantly from those of control at first, second and third laying cycles. The highest crude ash, crude fat and CP recorded in eggs of laying chickens offered T7, 500gPLM+500gSLM composite mix at first and third laying cycles implies the efficacy and richness of PLM and SLM in these nutritional components, which enhanced the metabolism and deposition in the eggs. In addition, the eggs from laying chickens fed T2, 250g PLM had significantly highest values of crude ash, crude fat and crude protein at second laying cycle. This observation is at variance with the report of Ogunwole *et al*. (2015) who observed that the crude ash, crude fat and crude protein of eggs from laying chickens fed different proprietary vitamin-mineral premixes under two rearing systems during storage were not significantly varied. The disparity may be attributed to the different types of additives used in the two experiments. Further, it was observed that dietary PLM and SLM altered the carbohydrate, moisture and dry matter of eggs of laying chicken at first, second and third laying cycles. This is not surprising because both of them are rich in protein and carbohydrate as was seen in this work (Table 1). Similarly, scent leaf has been reported to be 22% CP and 51.85 % carbohydrate (Mgbemena and Amako, 2020) while Ibironke and Owotomo (2019) reported that the crude protein of pumpkin leaf could be as high as 33.68 % and carbohydrate about 36.82 %. This is similar to the report of Ogunwole *et al*. (2015), who also observed that dietary VMP type altered the moisture, CP, CHO and EE composition of eggs.

4. Conclusion

The results of this study revealed that the supplementation of laying chickens' diets with dosages of dried pumpkin leaf meal and scent leaf meal supported growth indices such as weight gain, feed intake and feed conversion ratio in laying chickens with comparable or even better values than the control group. Additionally, supplementation of the laying chickens' diets with the additives improved the nutrient qualities of the eggs. Specifically, PLM and SLM at 500g/100 kg feed gave better feed conversion ratio, improved vitamins, minerals and proximate composition of the eggs

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Abbas, R. Z., Tassile, T. T., Jerome, B., Michael, P. and Carlos, E. I. (2012). Alternative plant protein sources for pigs and chicken in the tropics. Nutritional value and constraints; A Review. Journal of Agriculture and Rural Development in the Tropics and Sub tropics, 113(3): 101 – 123.

[2] Achilonu, M.C. and Umesiobi, D. O. (2015). Bioactive phytochemicals: bioactivity, sources, preparations and/or modifications via silver tetraflouroborate mediation. Journal of Chemistry, 2015, 1-22

[3] Adegbenro, M., Agbede, J. O., Onibi, G. E. and Aletor, V. A. (2020). Quality of eggs produced by laying hens fed composite leaf meal as alternative to premix. Livestock Research for Rural Development, 32 (4) 2020

[4] Adekunle, J.O. (2016). Proximate and heavy metal analysis of pumpkins brought to two different markets in Osun State Nigeria (Owode Ede and Ota-Efun Osogbo), Munich, GRIN Verlag, https://www.grin.com/document/350886.

[5] Esonu, B. O., Iheukwumere, F. C., Iwuji, T. C., Akanu N. and Nwugo, O. H. (2003). Evaluation of microdemis nutrient sources in poultry diets. Nigerian Journal of Animal Production, pp: 819-826.

[6] Hussein, E .O. S., Ahmed, S. H., Abudabos, A. M., Suliman, G. M., Abd El-Hack, M. E., Swelum, A. A. and Alowaimer, A. N. (2020). Ameliorative effects of antibiotic, probiotic, and phytobiotic supplemented diets on the performance, intestinal health, carcass traits, and meat quality of Clostridium perfringens infected broilers. Animals 10: 669.

[7] Ibironke, S. I. and Owotomo, I. (2019). Haematology and comparative study of fluted pumpkin leaf vegetable and seed nutrients (*Telfairia occidentalis*). Archives of Nutrition and Public Health, 1(2).1 (2).

[8] Iheukwumere, F. C., Ndubuisi, E. C., Mazi, E. A. and Onyekwere, M. U. (2008). Performance, nutrient utilization and organ characteristics of broilers fed cassava leaf meal (*Manihot esculenta* Crantz). Pakistan Journal of Nutrition, 7: 13-16.

[9] Jawad, A., Balayesh, W. R., Rami, A., Waleed, R., Hatem, S. and Nathan, W. L. (2014). The influence of extraction solvents on the anticancer activities of Palestinian medicinal plants. Journal of Medicinal Plant Research, 3.9 (2012): 408-415.

[10] Mgbemena, N. M. and Amako, N. F. (2020). Comparative analysis of the phytochemicals, proximate and mineral compositions of scent leaf (*Ocimum gratissimum*) and bitter leaf (*Vernonia amygdalina*). International Journal of Biochemistry Research and Review, 29(7): 1- 9.

[11] Nte, I., Fakae, V. and Fakae, L. (2017). Responses of broiler chicks to scent leaf (*Ocimum gratissimum*) aqueous extracts during different stages of growth. 10.13140/RG.2.2.23370.18886.

[12] Oboh, G. and Akindahunsi, A. A. (2004). Change in the ascorbic total phenol and antioxidant activity of sun dried commonly consumed green leafy vegetables in Nigeria. Nutrition and Health, 18: 29-36.

[13] Oboh, G., Nwanna, E. E., Elusiyan, C. A. (2006). Antioxidant and antimicrobial properties of *Telfairia occidentalis* (fluted pumpkin) leaf extracts. Journal of Pharmacology and Toxicology. 1:167–75.

[14] Oboh, S. O. and Igene F. U. (2006). Poultry Production, the Nigerian Industry. GLJ General Service Ltd., Ibadan.

[15] Ogunwole, O. A., Akinola, Y., Ojelade, P., Oyewo, M. O. and Essien, E. A. (2015). Proximate composition and physical characteristics of eggs from laying chickens fed different proprietary vitamin-mineral premixes under two rearing systems during storage. International Journal of Food Science and Nutrition Engineering, 5(1): 59-67

[16] Ogunwole, O. A., Ojelade, A.Y. P., Adebiyi, F. G., Mosuro, A. O., Olumide, M. D. and Akinloye, Y. E. (2020). Housing systems and type of supplemental vitamin-mineral premix in hens' diets influenced deposition of vitamin in eggs at the late laying phase. Nigerian Journal of Animal Science, 22 (3): 97-106.

[17] Oluwole, S. O., Fajana, O. O., Ogun, M. L., Ogbe, A. A. and Ademola, O. A. (2019). Proximate and mineral composition analysis of leaves of *Amaranthus cruentus* and *Ocimum gratissimum* in some selected areas of Lagos State, Nigeria. International Journal of Ecosystem. 9(1): 6 - 11.

[18] Onyimonyi, A. E., Adeyemi, O. and Okeke, G. C. (2009). Performance and economic characteristics of broilers fed varying dietary levels of neem leaf meal (*Azadirachta indica*). International Journal of Poultry Science, 8 (3): 256-259.

[19] Salihu, E. A., Onimisi, P. A., Omage, J. J., Afolayan, M., Moses, O. and Reuben, R. S. (2020). Evaluation of *Ocimum gratissimum* and *Ocimum canum* as natural growth promoters on the growth performance, intestinal microbiota and villi morphometry of broiler chickens. Nigerian Journal of Animal Production, 47(1):186 – 196.

[20] SPSS Inc. (2011). SPSS Inc. Predictive Analytics Software Portfolio, Grand Pack 18.

[21] Tabatabaei, S. N. (2016). Effect of olibanum (*Boswellia thurifera*) as a feed additive on performance, some blood biochemical and intestinal morphology in broiler chicks. Research Opinions in Animal and Veterinary Sciences, 6: 130-134.

[22] USDA (2013). Foreign Agricultural Science, GAIN report; Nigeria Poultry Product.

[23] World Bank (2020). The world bank in Nigeria. Access in www.worldbank.org/en/contry/nigeia/overview 26/08/2021

[24] Yasodha, T., Jeevitha, S., Yogesh, S. and Ramanan, M. (2019). Growth performance parameters of broiler chickens as influenced by herbal poultry feed. International Research Journal of Animal and Veterinary Sciences, 1: 26-30.