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ORIGINAL RESEARCH PAPER

Utilization of graded levels of Jimson weed (*Datura stramonium*) and Turmeric (*Curcuma longa*) blend additive in laying birds' diet

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Abstract: A total of 180 laying birds were used to evaluate the influence of graded levels of Jimson weed and turmeric blend on laying performance and egg quality. The birds were allotted into six dietary treatment groups of 30 birds per treatment and 3 replicates of 10 birds each. The test ingredients were mixed at a ratio of 1:1 and the blend ingredient was included in the treatments at T1(0g), T2 (2 g/kg), T3 (4 g/kg), T4 (6 g/kg), T5 (8 g/kg) and T6 (10 g/kg) inclusion levels. Data were collected on egg production performance and egg quality; they were analyzed using one-way analysis of variance (ANOVA). The highest ($p < 0.05$) hen day production (87.88) was recorded with layers bird-fed diet containing (2 g/kg) while layers fed control diets (0g/kg) had the least (71.17). The highest ($p < 0.05$) feed intake/egg (265.72 g) was recorded with layers' bird-fed diet containing 2 g/kg of Jimson weed and turmeric blend while layers fed a control diet (0 g/kg) had the last (219.75g). The highest ($p < 0.05$) albumen (62.60 g) was recorded with layers bird-fed diet containing (4g/kg) while layers fed diet containing (8 g/kg) of jimson weed and turmeric blend had the least (59.31 g). The highest ($p < 0.05$) yolk (26.78 g) was recorded with layers bird-fed diet containing 6 g/kg of Jimson weed and turmeric blend while layers fed a diet containing (4 g/kg) had the least (23.30 g). It could be concluded that the use of jimson weed and turmeric blend in diets had a positive effect on production performance and egg quality of laying birds. It is therefore recommended that feeding layers birds with a diet that contains 2 g/kg, 4 g/kg and 6 g/kg of Jimson weed and turmeric blend will aid better production performance and egg quality.
Keywords: laying birds; egg quality; performance; jimson; turmeric blend.

1. Introduction

Poultry health and good management practices are the core components of the operational dynamics of a developing and profitable production industry (Adene, 2004). However, the continuous rise in the production cost through the procurement of medicine (such as antibiotics) affects layers and broiler production. However, one major aspect of food production and safety today is the reduction in the use of antibiotics and other medicinal products in livestock production largely due to fears over bacterial resistance and possible transmission of these antibiotic residues into the human food chain. In the last two decades, considerable research has been carried out on exploring the beneficial effects of growth promoters and finding suitable alternatives to antibiotics (Berge, 2017).

Also, the ban by the European Union (2006) has led a lot of poultry and plant experts to think of alternative sources to solve this problem. This new context caused an increase in the search for alternative antibiotics and

growth promoters. In recent years, interest has developed in many countries in the collection and extended use of medicinal plant extract for an alternative production purpose (Griggs; Jacob 2005). Knowledge of medicinal plants has been the key to the survival of the ethnic group. Antibiotics have been used in poultry feed to improve growth performance, prevention of coccidiosis, and some specific pathogenic microorganisms, and increase some useful microorganisms in intestinal microflora over the years (Jazi, et al., 2018). The utilization of several medicinal plants as feed ingredients or supplements is not a new thing but inclusion levels at various ages and physiological conditions vary (Onyimonyi et al., 2009). Among these are Jimson weed (*Datura stramonium*) and turmeric (*Curcuma longa*).

Jimson weed is an important medicinal plant from which tropane alkaloids, amino acids, tannin, phytic acids, and carbohydrates have been isolated. Its diverse biological activities include anti-asthmatic, antibacterial, antifungal, anti-inflammatory, antioxidant, antinociceptive, anti-rheumatoid, and anti-ulcer activities (Sreenivasa et al., 2012)

Turmeric has good pharmacological properties and effect of turmeric supplementation is a useful natural growth promoter and a safe alternative to antibiotics (Zeinali et al., 2011) therefore supplementation of antioxidants in diets may decrease the oxidative reaction in chicken products under heat stress conditions. The main antioxidant component in turmeric is curcumin which is a phenolic antioxidant. Turmeric is beneficial in many biological reactions including anti-inflammatory, antioxidant, antiviral, antibacterial, anticoagulant, and antimicrobial (Emadi et al., 2010).

Farmers use synthetic feed additives which are more expensive and have residual effects on both the birds and humans leading to a ban on their usage in livestock feeds by the (European Union 2006). Thus, the need to research herbs that are known to produce certain chemicals that naturally serve as growth promoters with antimicrobial activities is of great importance. This study therefore aimed at how effective natural feed additives jimson weed (*Datura stramonium*) and turmeric (*Curcuma longa*) are on the production performance and egg quality of laying chicken.

2. Material and Methods

2.1 Experimental site

The experiment was carried out at the poultry unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State Nigeria. The area is in derived savannah zone of Nigeria. It lies on longitude 4.5^0 east of greenish meridian and latitude 8.5^0 North-East towards Ibadan the capital of Oyo State. The mean annual rainfall is 1247mm while relative humidity is between 75% and 95%. It is situated at about 300-600 metters above the sea level with a mean annual temperature of 27^0C (Ayinla and Odetoye, 2015).

2.2 Test ingredient preparation

Jimson weed (*Datura stramonium*) and Tumeric (*Curcuma longa*) the test ingredient were sourced in Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State Nigeria. It was sliced into smaller pieces to increase its surface area and ease the drying process then shield-dried after which it was ground using a grinding machine into powdery form according to the process reported by (Okanlwon et al., 2020a). (Jimson weed) *D. stramonium* and (Turmeric) *C. longa* were mixed at a ratio of 1:1. After thorough mixing, it was stored in an air-tight container till the time of use.

2.3 Experimental birds and treatment

A total of 180 Isa Brown laying birds were used for the experiment. The birds were randomly distributed into six (6) treatments of 30 birds per treatment. Each treatment was grouped into 3 replicates of 10 birds per replicate. The experiment was conducted in a battery cage system. Treatment 1 was 0 g/kg, Treatment 2 was 2 g/kg (1 g of jimson weed and 1g turmeric), Treatment 3 was 4 g/kg (2 g of jimson weed and 2 g turmeric), Treatment 4 was 6 g/kg (3 g of jimson weed and 3 g turmeric), Treatment 5 was 8 g/kg (4 g of jimson weed and 4 g turmeric) and Treatment 6 was 10 g/kg (5 g of jimson weed and 5g turmeric).

2.4 Data collection

2.4.1 Egg production performance: at the end of each day and week, the following parameters were determined:

2.4.2 Feed intake (g) = feed given - leftover feeds.

Percentage day production: This was calculated as the number of eggs produced as

$$\%\ \text{Day production} = \frac{\text{Total number of eggs produce} \times 100}{\text{Total number of laying birds}}$$

2.4.3 Cost of feed per tray of the egg:

2.4.4 Feed cost per tray = Feed consumes per 30 eggs x cost per kg of the feed.

2.4.5 Feed consumed to produce 30 eggs = feed intake/no of egg produced x 30

2.4.6 Egg Quality Analysis: The under-listed parameters were determined during egg analysis.

2.4.7 Egg weight: This was determined using the sensitive weighing scale. The egg samples were weighed individually, and the average weight would be estimated.

2.4.8 Egg Dimension: This was measured using a Vernier caliper in cm. Width was determined at three different points (Narrow end, Broad end, and at the Centre).

2.4.9 Shell Weight: It was determined with the aid of a sensitive scale in grams after breaking and removal of the shell membrane.

2.4.10 Shell Thickness: The micrometer screw gauge was used to measure the thickness at the broad end, middle and narrow end, then the average was determined in mm.

2.4.11 Albumen Height: A spherometer was used to determine the height of the albumen.

2.4.12 Albumen Weight: The weight of the albumen was determined after the removal of the yolk from a broken egg.

2.4.13 Yolk Index: The weight of the separated yolk was estimated by subtraction of weight of albumen from the weight of albumen + yolk.

2.5 Statistical analysis

All data collected was subjected to a one-way analysis of variance (ANOVA) using SPSS 2010. All means that are significant are separated using Duncan's multiple range test of the same software. The materials, equipment, and methodologies used to develop the study must be systematically described. These aspects must be presented in such a way that other researchers who consult the article can reproduce it based solely on what was described in the article.

3. Results

Table 1 shows the main effect of jimson weed and turmeric blend on the production performance of layers. There was a significant ($p < 0.05$) difference in hen day production, feed intake/egg, feed intake/dozen eggs, feed intake/30 eggs, feed cost/dozen eggs, feed cost/30 eggs, feed intake/kg of egg and feed cost/kg of egg. The highest ($p < 0.05$) hen day production (88.38) was recorded from layers bird-fed diet containing (2 g/kg) while layers-fed control diets had the least (81.85).

The highest ($p < 0.05$) feed intake/egg (235.90 g) was recorded from layers bird-fed diet containing 8g/kg of jimson weed and turmeric blend while layers fed a control diet (0 g/kg) had the last (217.55 g). The highest ($p < 0.05$) feed intake/dozen eggs (2830.85g) was recorded from layers bird-fed diet containing 8g/kg of jimson weed and turmeric blend while layers fed a control diet (0 g/kg) had the least (2610.61 g). Highest ($p < 0.05$) Feed intake/30 eggs (7077.12 g) was recorded from layers bird-fed diet containing 8 g/kg of jimson weed and turmeric blend while layers fed a control diet (0 g/kg) had the least (6526.53g). Feed cost per dozen eggs, feed cost per tray of eggs, and feed cost per kilogram of egg produced were all significant ($p < 0.05$) and followed the same trend as the feed intake, they all increased significantly ($p < 0.05$) as the inclusion level increased.

Table 2 shows the main effect of the Jimson weed and turmeric blend on the egg quality of layers. There was a significant ($p < 0.05$) difference in Egg weight, %yolk, haugh unit, and Shell Surface Area. The highest ($p < 0.05$) egg weight (58.53 g) was recorded with layers bird-fed diet containing 2 g/kg while the layers-fed control diet had the least (55.73 g) though statistically ($p > 0.05$) similar to other treatments. The highest ($p < 0.05$) %yolk (26.78 g) was recorded with layers bird-fed diet containing 6 g/kg of Jimson weed and turmeric blend while the layers-fed diet containing 4 g/kg had the lowest value (23.30 g) and was statistically similar to others including the control treatment. The highest ($p < 0.05$) haugh unit (97.46 g) was recorded from a layers bird-fed diet containing 4 g/kg of Jimson weed and turmeric blend while a layers-fed diet containing (8 g/kg) had the least (88.91 g) which was similar ($p > 0.05$) to control and 10 g/kg diets. There was no significant ($p > 0.05$) difference in albumin proportion, yolk index, and egg shape index.

Table 1. Performance of layers-fed diet containing a graded level of Turmeric and Jimson weed blend.

Parameters	Control	2 g (1:1) JW:T	4 g (1:1) JW:T	6 g (1:1) JW:T	8 g (1:1) JW:T	10 g (1:1) JW:T	SEM
EggWt (g)	55.57^{b}	58.81^{a}	57.72^{ab}	56.99^{ab}	56.89^{ab}	57.60^{ab}	0.33
HDP	84.01^{b}	88.38^{a}	83.86^{b}	82.49^{bc}	81.85^{c}	81.85^{c}	0.43
FI/egg (g)	217.55^{b}	228.78^{b}	227.44^{b}	230.52^{b}	235.90^{a}	235.76^{a}	1.92
FI/12egg (g)	2610.61^{b}	2745.34^{ab}	2729.23^{ab}	2766.22^{ab}	2830.85^{a}	2829.10^{a}	23.01
FI/30egg (g)	6526.53^{b}	6863.34^{ab}	6823.06^{ab}	6915.54^{ab}	7077.12^{a}	7072.74^{a}	57.54
FeedCost/Kg (g)	507.76	505.71	507.56	507.29	508.00	508.25	0.54
FeedCost/12eggs (₦)	1325.83^{b}	1389.02^{ab}	1385.72^{ab}	1403.83^{ab}	1438.77^{a}	1438.33^{a}	12.36
FeedCost/30eggs (₦)	3314.58^{b}	3472.54^{ab}	3464.31^{ab}	3509.57^{ab}	3596.94^{a}	3595.83^{a}	30.90
FeedI/kgEgg (₦)	3921.51^{bc}	3893.53^{c}	3950.75^{bc}	4053.68^{b}	4149.64^{a}	4095.09^{a}	33.02
FeedCost/KgEgg (₦)	1991.68^{c}	1969.20^{c}	2005.63^{b}	2057.48^{b}	2109.02^{a}	2081.69^{b}	17.65

Note: ^{abcd}means on same row with different superscript were significant ($p < 0.05$) different. HDP: Hen day production, FI: Feed intake. Source: Authors, 2024.

Table 2. Egg quality of layers-fed diet containing a graded level of Turmeric and Jimson weed blend.

Parameters	Control	2 g (1:1) JW:T	4 g (1:1) JW:T	6 g (1:1) JW:T	8 g (1:1) JW:T	10 g (1:1) JW:T	SEM
Egg Weight	55.73^{b}	58.53^{a}	57.02^{ab}	56.90^{ab}	57.02^{ab}	57.71^{ab}	0.36
% Albumen	59.56	61.72	62.60	59.33	59.21	60.97	0.46
% Yolk	26.13^{ab}	25.35^{ab}	23.30^{b}	26.78^{a}	25.94^{ab}	25.17^{ab}	0.44
YI	0.46	0.47	0.46	0.47	0.47	0.48	0.00
ESI	56.34	57.61	57.26	57.10	56.45	56.48	0.27
HU	92.28^{bc}	96.03^{ab}	97.46^{a}	97.05^{ab}	88.91^{c}	92.65^{abc}	0.73
SSA	67.69^{b}	70.04^{a}	68.77^{ab}	68.70^{ab}	68.80^{ab}	69.38^{ab}	0.30

Note: ^{abc}means along the row with uncommon superscripts are significantly different ($p < 0.05$). YI: Yolk Index, ESI: Egg shape index, HU: Haugh unit, SSA: Shell surface area. Source: Authors, 2024.

4. Discussion

The result of the effect of graded level Jimson weed and turmeric blend on performance of layers shows that the inclusion of blend in the diet at 2 g/kg of feed had a positive effect on production performance and this is in agreement with the report of (Malekizadeh *et al.*, 2012) who concluded in their study that egg production increased ($p < 0.05$) with the addition of Turmeric powder to laying hen diets since turmeric can improve the performance of the digestive tract in laying hens, resulting in improved egg production.

Also (Park *et al.*, 2012) showed that turmeric affected egg production, but not egg weight whereas in this recent work, it caused favorable variation. This could also be traced to the combined effects of some phytochemicals embedded in plants. It is now known that curcumin can modulate multiple signaling pathways in either a direct or an indirect manner. This polyphenol has been shown to possess pleiotropic activities in animal models of many human diseases (Gupta *et al.*, 2012). Therefore, we speculate that the beneficial effect of curcumin is mechanistically related to this effect on signaling.

Based on our experiment, a diet supplemented with curcumin improved the laying performance and physical condition and is in line with the report of (Mengjie *et al.*, 2020). According to (Sreenivasa *et al.*, 2012; Okanlawon *et al.*, 2023) who stated that phytobiotics contain steroids that help to improve the reproductive performance of livestock, so this study has shown that the inclusion of the phytobiotic in the diet of layers improves the production level. This study also presents the complementary action of the Jimson weed and turmeric blend it improves the productive performance of layers. There was an increase in the cost of feed when the cost of blend is added to the diets there is an increase in cost and as feed intake increases the cost will also increase. This result is in line with the report of (Okanlawon *et al.*, 2020) who reported that as the cost of turmeric is added to the diets there is an increase in the cost of feed consumed.

Though the egg weight was influenced no definite trend was followed, likewise the yolk proportion. The Haugh unit significantly increased as the inclusion level increased up to 6 g/kg feed. Likewise, the shell surface area. This indicates that the combined turmeric and datura have a positive influence on egg quality which is in line with the report of (Amir *et al.*, 2022) who obtained positive effects of turmeric supplementation observed in laying hens, which presented higher egg quality when compared with the control.

Layers fed diet containing turmeric and jimson weed blend numerically increases in terms of egg quality and this increase may be attributed to the curcumin and turmeric acid; the main components in *Curcuma longa* which have antioxidant activity (Sherif *et al.*, 2016). *Curcuma longa* may improve the small environment in the uterus (site of calcium deposition) and consequently have a positive effect on egg quality. Taking into consideration the active ingredients in jimson weed and its toxicity (Tropain alkaloids) as reported by (Alexander et al., 2008) it could be a factor responsible for reduced performance as the inclusion level was above 6 g/kg.

5. Conclusion

It could be concluded that the use of jimson weed and turmeric blend in diets had a positive effect on production performance and egg quality of laying birds. It is therefore recommended that feeding layers birds with a diet that contains 2 g/kg, 4 g/kg and 6 g/kg of Jimson weed and turmeric blend will aid better production performance and egg quality without any toxicity effect.

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7. References

Adene, D. F (2004). Poultry health and production: principles and practices, Stirling- Horden Publishers (Nig.), Ibadan, Nigeria.

Alexander, J., Benford, D., Cockburn, A., Cravedi, J., Dogliotti, E., & Domenico, A. D. (2008). Tropain alkaloids (from *Datura* species) as undesirable substances in animal feed. *The European Food Safety Authority*, 691, 1-55.

Amir, M. Z., Seyyed, A. M., Peyman, H. & Hossein, S. A. (2022). Effects of turmeric (Curcuma longa) powder supplementation in laying hens' diet on production performance, blood biochemical parameters and egg quality traits. *Journal of Animal Physiology and Animal Nutrition*, 7(2), 691-702.

Ayinla, A.K. & Odetoye, A.S. (2015). Climatic pattern and design for indoor comfort in Ogbomoso, *Nigeria Journal of environmental and health science*. 17:481-485

Berge, A. C. (2017). Gut health is key to reducing antimicrobial use. *International Pigs Tropics*, 32(2), 11-13.

Emadi, M., & Kermanshahi, H. (2007). Effect of turmeric rhizome powder on the activity of some blood

enzymes in broiler chickens. *International Journal Poultry Science*, 6(1), 48-51.

Griggs, J. P., & Jacob, J. P. (2005). Alternatives to antibiotics for organic poultry production. *Journal of Applied Poultry Research*, 14, 750-756.

Gupta, S. C., Patchva, S., Koh, W., & Aggarwal, B. B. (2012). Discovery of curcumin, a component of golden spice, and its miraculous biological activities. *Clinical and Experimental Pharmacology and Physiology*, 39(3), 283-299. https://doi.org/10.1111/j.1440-1681.2011.05648.x

Jazi, V., Foroozandeh, A. D., Toghyani, M., Dastar, B., Rezaie Koochaksaraie, R. & Toghyani M. (2018). Effects of *Pediococcus acidilactici*, mannan-oligosaccharide, butyric acid and their combination on growth performance and intestinal health in young broiler chickens challenged with *Salmonella typhimurium*. *Poultry Science*, 97(6), 2034-2043. https://doi.org/10.3382/ps/pey035

Malekizadeh, M., Moeini, M. M., & Ghazi, S. H. (2012) The effects of different levels of ginger (*Zingiber officinale* Rosc) and turmeric (*Curcuma longa* Linn) rhizomes powder on some blood metabolites and production performance characteristics of laying hens. *Journal Agricultural Science Technology*, 14, 127-134. https://doi.org/10.5897/jmpr11.131

Park, S. S., Kim, J. M., Kim, E. J., Kim, H. S., Kim, B., & Kang, C. W. (2012) Effects of dietary turmeric powder on laying performance and egg qualities in laying hens. *Korean Journal Poultry Science*, 39, 27-32.

Okanlawon, E. O., Bello, K. O., Akinola, O. S., Oluwatosin, O. O., Irekhore, O. T., & Ademolue, R. O. (2020a). Evaluation of growth, reproductive performance and economic benefits of rabbits fed diets supplemented with turmeric (*Curcuma longa*) powder. *Egyptian Poultry Science Journal*, 40(3), 701-714.

Okanlawon, E. O., Bello, K. O., Akinola, O. S., Adeola, A. A., & Ademolue R. O. (2023). Qualitative and quantitative screening of turmeric, garlic, ginger and clove blend. *International Journal of Traditional and Natural Medicines*, 1(2), 2167-1141.

Onyimonyi, A.E., Olabode, A. & 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.

Sherif, F. & Ismail, E.G. (2017). Effects of plant spacing and its association with humic acid application on the growth, yield and active composition in *Curcuma longa*. *American Journal of Plant Biology*, 2(4), 106-113. https://doi.org/10.11648/j.ajpb.20170204.12

Sreenivasa, S., Vinay, K., & Mohan, N. R. (2012). Phytochemical analysis, antibacterial and antioxidant activity of leaf extract of *Datura stramonium*. *International Journal of Science Research*, 01(02), 83-86.

Zeinali, A., Kermanshahi, H., Riasi, A., Farhangfar, H., Sarir, H., & Ziaie, H. (2011). Effects of sodium selenite and turmeric powder on thyroid hormones and plasma lipids of broiler chickens reared under heat stress condition. *Global Veterinary*, 6(3), 237-240.

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Olayeni Tunji Babatunde, Rafiu Tirimisiyu Adewale and Okanlawon, Eden Olusegun: conceptualize the study and write the article.Rafui Tirimisiyu A and Okanlawon Eden O: Design the study. Rafui Tirimisiyu A and Olayeni Tunji Babatunde: proof read the write up. Olayeni Tunji Babatunde, Rafiu Tirimisiyu Adewale, *Okanlawon, Eden Olusegun, Sangoniyi Olakiitan, Hussain Ridwanullahi, Adegoke Sukurat Opeyemi, Akinlabi John Ayomide, Olakiitan Sangoniyi and Akinboade Femi Tosin: carried out the experiment.

Ethics

Yes, applicable. All procedures were certified by the University's Animal use and Ethics Committee under reference.