ISSN No:-2456-2165

Evaluating the Effect of Graded Doses of Ginger Powder Augmentation in Broilers on the Feed Consumption Pattern, Weight, Carcass Weight After Flaying and Evisceration

Orinya Agbaji Orinya [1]
College of Agriculture and Veterinary Medicine, University of Rwanda

Nkereuwem Sunday Etukudoh [1]
Department of Heamatology Federal College of Medical Laboratory Science and Technology Jos University Teaching Hospital JUTH Jos Plateau State.

Martins Ntawabuzi [1]
College of Agriculture and Veterinary Medicine, University of Rwanda

Saganuwan Alhaji Saganuwan [2]
College of Veterinary Medicine, Federal University of Agriculture Makurdi Benue State

Joyce Ene Ocheola Oki [2]*
Department of Academics Federal College of Medical Laboratory Science and Technology Jos University Teaching Hospital JUTH Jos Plateau State.

Jean de Dieu Ayabagabo [2]
College of Agriculture and Veterinary Medicine, University of Rwanda

Danjuma Daniel Rafan [3]
Department of Basic Science Federal College of Medical Laboratory Science and Technology Jos University Teaching Hospital JUTH Jos Plateau State.

Sunday Serah Temitope [3]
Department of Basic Science Federal College of Medical Laboratory Science and Technology Jos University Teaching Hospital JUTH Jos Plateau State.

Abstract:- Improving poultry performance is key to enhancing sustainable development goals. Apart from helping to reduce poverty (SDG1) it also aims at reducing malnutrition as it produces quality proteins for adequate diet (SDG3). Feed performance on broilers was studied with the augmentation of the feed with graded portions of Zingiber officinale (ginger). Phytochemical analysis, proximate analysis, feed consumption pattern, feed conversion rate and weight after flaying and evisceration were analyzed using standard methods. Phytochemical analysis revealed the presence of alkaloids, flavonoids, phenols, tannins, terpenoids, steroids, reducing sugars, and saponins. Zingiber officinale contained sodium (4.6ppm) magnesium (4.485ppm), potassium (1.33ppm), zinc (1.232) and lead (1.232). Proximate analysis showed that the plant has presence of high content of carbohydrates (77.24±0.37) moisture (8.89±0.06), fiber (5.52±0.13), protein (5.32±0.14), Ash (2.13±0.4) and fat (0.90±0.02). The study also revealed that treated group 2 which received the lowest percentage (5%) of Z.officinale had the highest weight after flaying (0.6678±0,1110) and evisceration (0.5483±0.1047) respectively, Zingiber officinale in diet depresses the feeding center leading to low feed consumption and reduced weight gain in broilers. The broiler birds with the augmentation of Zingiber officinale powder at the rate of 5% feed had proven to be the best, safer and efficacious. Hence, 5% Zingiber officinale powder in broiler diet is recommended for optimum performance of broiler.

Keywords:- *Poultry, Augmentation, Ginger, Flaying, Evisceration.*

I. INTRODUCTION

Plants whether medicinal in nature or not are widely used as natural feed additives in poultry diets to improve the performance, immune response, and anti-oxidative status of poultry birds (Tenweer *et al.*, 2012; Al-khalaifa, 2020; Al-khalaifa *et al.*, 2020; Hafez *et al.*, 2020; Attia *et al.*, 2022). A widely used example of such additive is ginger scientifically known as *Zingiber officinale* and belonging to the family Zingibeaceae, which includes aromatic herbs that often have tuber-bearing roots with fleshy, tuberous or non-tuberous rhizomes (Ke *et al.*, 2000). This plant has been use in culinary and in traditional medicine for ages. Ginger is made up of a number of effective component, such as gingerdione and

ISSN No:-2456-2165

gingerol that exert powerful antioxidant activity. Apart from many other attributes, *Zingiber officinale* has antibacterial properties and is also known to be immunomodulatory in laboratory animals, (Dieumou *et al.,* 2009;Al-Nasser *et al.*,2020). Whenever Plant-derived additives are utilized in animal feed to improve production performance, they are known as phytogenic feed additives, hence ginger is one such plant derived additive (Umatiya *et al.*,2018). On a general note it is well researched and proven that *Zingiber officinale* has lipid-reducing effects and can also be used to promote growth.

Inclusion of *Zingiber officinale* in feed, gives it properties quite similar to those of antibiotic, as it lowers number of enteric pathogens microbial load and also increases nutrient digestion as well as absorption in the gut of poultry birds, which enhances poultry production and performance especially in broilers (Hayajneh, 2019). According to Salawu, (Salawu *et al.,* 2014),in ascertaining different level of preference for poultry meat types, results from the respondents showed that a total of 94.7% respondents had preference for broilers, 93.3% for cockerel and turkey while 90% was recorded for layers. The multinomial logit regression results of the respondents shows that broiler is the most preferred with 40% followed by turkey (33.3%), layers (14.7%) and cockerel (12%). Many researches have been done on broilers and ginger inclusion in their feeds but evaluating its effect on flaying and evisceration has paucity in data. This goes on to show the need for further improvement in its production for weight, as well as ease for flaying and evisceration.

II. MATERIALS AND METHODS

The research was done between the months of April and October in Nigeria. Animal house was made ready and fumigated with 2% formaldehyde, allowed to remain for and about two days. The animal house was later divided into five separate pens of equal sizes, and two days old broilers with no vaccination history where purchased from CHI hatchery Ibadan, Oyo State Nigeria. Fair dietary treatments were along with the control group. Ginger was also collected from two different locations, Benue State and Kaduna State; phytochemical as well as proximate analysis was carried out alongside the determination of their wavelengths. Also mineral content analysis was also carried out before it was blended into powder and graded portions were added to the poultry feed.

The graded portion/feed was administered to the various groups as follows:
Group 1, control – 0% ginger
Group 2 -5% ginger
Group 3 -10% ginger
Group 4 -15% ginger
Ginger 5 -20% ginger

Each of the afore mentioned groups had 10 birds (broilers), with each pen having a drinker of 2,5liter capacity. The broilers were fed with pre starter feed for the first 4 weeks and finisher for 4-8 weeks. Chikun feed from Olam Nigerian limited was used for feeding the birds. The birds were fed and watered ad libertum twice a day, once in the morning and once in the late afternoon, with only 30minutes dark period within each 24hours.

III. RESULTS

Table 1: shows phytochemical principles present in Zingiber officinale

Phytochemicals	Inference
Alkaloids	+
Flavonoids	+++
Phenols	++
Tannins	+
Glycosides	+
Terpenoids	_
Steroids	+
Reducing Sugars	+
Saponins	+

Key; + Indicates Mildly Presence of Phytochemical
- Indicates Phytochemical Not Detected
+++ Indicates Phytochemical Much

Table 2: Quantities of phytochemical principles and their wavelengths of detection

Phytochemical		Absorbance	Concentration µg/ ml
Flavonoids		0.323	52
Phenols		0.245	32
Tannins		0.228	28

ISSN No:-2456-2165

Table 3: Nutritional components of Zingiber officinale

Zone	Protein (%)	Fibre (%)	Fat (%)	Carbohydrate (%)	Ash (%)	Moisture (%)
Kaduna	5.42	5.61	0.92	76.97	2.61	8.93
Benue	5.22	5.43	0.89	77.50	2.11	8.85
Mean	5.32±0.14	5.52±0.13	0.90±0.02	77.24± 0.37	2.13±0.4	8.89

Table 4: Feed consumption (g) pattern of broilers

Groups/Weeks	Group 1(g)	Group 2(g)	Group 3(g)	Group 4(g)	Group 5(g)
Week 1	840.7	742.3	684.6	862	656.3
Week 2	1500	1500	1500	1448.8	1482.1
Week 3	3797.2	3462	3508.6	3649.7	3615.9
Week 4	10792	8691.6	9409.9	9570.2	9302
Week 5	12568.2	12605.7	11710.7	12332.2	11906.5
Week 6	8400	8262.9	8293.4	8325.1	8305.8
Week 7	7000	6927.1	6769.1	6919.1	6892.5
Week 8	5600	5600	5528.4	5570.6	5585.1
	50498.1^{a}	**47791.6^{b}**	**47404.7^{b}**	**48677.7^{b}**	**47746.2^{b}**

Table 5: Feed conversion rate at week 4 and week 8

Group / Weeks	WEEK 4	WEEK 8	Mean±S.D
Group 1	1.9971	1.456	1.7266±0.3826^{b}
Group 2	1.9136	1.2746	1.5941±0.4518^{b}
Group 3	2.4132	1.3184	1.8658±0.7741^{a}
Group 4	2.5615	1.5489	2.0552±0.7160^{a}
Group 5	2.8102	1.6678	2.2390±0.8078^{a}

Table 6: Live weight (kg) of broilers at week 4 and week 8

Week	G1	G2	G3	G4	G5
4	0.7401±0.098^{a}	0.7525±0.122^{adc}	0.6271±0.148^{bd}	0.5849±0.138^{bd}	0.5141±0.092^{bd}
8	3±0.361^{ac}	2.66±0.321^{ac}	2.38±0.192^{bc}	2.14±0.152^{dc}	1.94±0.152^{bc}

Key: a=significantly increased; b=significantly decreased across the rows
c=significantly increased across the columns
d=significantly decreased along the columns

Table 7: Weight of the carcass (kg) after flaying and evisceration at week 4

Group	1	2	3	4	5
After Flaying	0.6567±0.1202	0.6678±0,1110^{ac}	0.4993±0.1151^{bc}	0.5109±0.1698^{ac}	0.4280±0.0341^{bc}
After evisceration	0.5274±0.0945	0.5483±0.1047^{ad}	0.3835±0.1018^{bd}	0.4126±0.1194^{ad}	0.3316±0.0297^{bd}

Key: a = significantly increased; b=significantly decreased across the rows
c = significantly increased across the columns
d = significantly decreased along the columns

IV. DISCUSSION

The qualitative phytochemical analysis of *Zingiber officinale* has revealed that the plant has various phytochemical principles with different biological activities. Phytochemical principles present include alkaloids, flavonoids, phenols, tannins, terpenoids, steroids, reducing sugars, and saponins. Among all the phytochemical principles present, flavonoids were more abundant (+++) in *Zingiber officinale* followed by phenols (++) as seen in Table 1.

Quantitative phytochemical analysis carried out shows the various quantities of phytochemical principles and their wavelengths of detection. Flavonoids were present in the highest quantity (52ug/ml), phenols 32ug/ml and tannins (28ug/ml) respectively this can be viewed in Table 2. Flavonoids are a hydroxylated phenolic substance and are synthesized by plants in response to microbial infections. Flavonoids possess antibacterial, antiviral, antioxidant, anti-inflammatory, antimutagenic, and anticarcinogenic properties. (Roy *et al.*, 2022).

ISSN No:-2456-2165

Proximate analysis of *Z.officinale* obtained from separate locations has shown the presence of high content of carbohydrates **(**77.24±0.37) followed by fibre (5.52±0.13), protein (5.32±0.14), Ash (2.13±0.4) and fat (0.90±0.02) respectively the result is shown in Table 3. This result shows that of the two ginger types obtained, the ginger from kaduna had higher proximate values than those obtained from Benue State.

According to this study, the control group consumed the most feed (50498.1g^{a}), followed by the fourth treatment group, which got 15% dietary *Z.officinale*. Treatment group three, which got 10% *Z.officinale*, had the lowest rate as seen in Table 4, albeit the difference was not significant when compared to the other treatment groups.

The study also revealed in Table 5 that treatment group 5 which received the highest percentage (20%) of dietary *Z.officinale* has the highest feed conversion rate while the lowest was treatment group 2 which received the lowest (5%) dietary *Z.officinale*.. This results show that *Z.officinale* enhances metabolism, or increases the rate of metabolism.

The results show that the control group 1 has the highest weight gain at 8 weeks (3±0.3606kg) while treatment group 5 which received the highest percentage (20%) of *Z.officinale* has the lowest weight gain (1.94±0.1517kg) as compared to alternative treatment option. At week four, the data revealed that treatment group 2 had gained the most weight (0.7525±0.1222) followed by the control group (0.7401±0.0982) as compared with the other treated groups.

For treatment group 5 which received the highest percentage (20%) of *Z.officinale* and had the lowest weight gain as observed in Table 7, this could be a proof to weight loss. According to a study by Sharifi-Rad *et al.*, (2017), compounds called zingerone and shogaols in ginger (*Z.officinale*) may help with weight loss. These compounds may be beneficial in the complex bodily processes that burn and store fat. This seems to be in agreement with a study in 2015 (Ebrahimzadeh *et al*.,2015) which had women with obesity take two 1-gram (g) tablets of powdered ginger per day for 12 weeks. This group experienced significantly decreased appetite and body measurements compared with those who took a placebo. The reduced feed intake in the treated groups must have been due to the taste of the meal. According to Roura *et al.*, (2013) the bird's sense of taste can detect excessive dietary vitamins and minerals, resulting in refusal to ingest the feed.(392).This situation is similar to those of the broilers as inclusion of *Z.officinale* in their diet depresses the feeding center leading to low feed consumption and reduced weight gain in broilers.

Considering the results as it pertains to weight after flaying , and evisceration that the treated group 2 which received the lowest percentage (5%) of *Z.officinale* had the highest weight after flaying (0.6678±0,1110) and evisceration (0.5483±0.1047) respectively, while the treatment group 5 which received the highest (20%) of *Z.officinale* had the lowest weight after flaying(0.4280±0.0341) and evisceration (0.3316±0.0297) respectively as revealed in Table 7.

V. CONCLUSION

In conclusion therefore, the study has revealed that the phytochemical analysis showed the presence of flavonoids and phenols in high quantities, while alkaloids, tannins, glycosides, steroids, and reducing sugars, saponins and terpenoids were present in low quantities. The *Zingier officinale* from kaduna had higher proximate values than that which was obtained from Benue State. Inclusion of *Zingier officinale* in broiler feed was observed to reduce weight gain and therefore could be used to treat bulimia nervosa in and control diabetes. Broilers treated with the lowest augmentation of *Zigngier officinale* had the lowest weight after flaying and evisceration respectively, and are proven to be the best, safer and efficacious. Therefore, 5% ginger in broiler diet is recommended for optimum performance of broiler.

RECOMMENDATIONS

- *From the results of the study 5% ginger in broiler diet is recommended for optimum performance of broiler.*

REFERENCES

[1]. Tanweer, A.; Chand, N.; Khan, S.; Qureshi, M.; Akhtar, A.; Niamatullah, M. Impact of Methanolic Extract of Peganum Harmala on The Weight Gain, Feed Conversion Ratio, Feed Cost and Gross Return of Broiler Chicks. J. Anim. Plant Sci. 2012, 22, 264–267.

[2]. Al-Khalaifah, H. Modulatrory Effect of Dietary Polyunsaturated Fatty Acids on Immunity, Represented by Phagocytic Activity. Front. Vet. Sci. 2020, 7, 672. [CrossRef]

[3]. Al-Khalaifah, H.; Al-Nasser, A. Dietary Supplementation with Various Fat Oils Affect Phytohemagglutinin Skin Test in Broiler Chickens. Front. Immunol. 2020, 11, 1735. [CrossRef] [PubMed]

[4]. Al-Khalaifah, H.; Al-Nasser, A.; Abdulmalek, N.; Al-Mansour, H.; Ahmed, A.; Ragheb, G. Impact of SARS-Con-V2 on the poultry industry in Kuwait: A case study. Front. Vet. Sci. 2020, 7, 656. [CrossRef]

[5]. Hafez, H.M.; Attia, Y.A. Challenges to the poultry industry: Current perspectives and strategic future after the COVID-19 outbreak. Front. Vet. Sci. 2020, 7, 516. [CrossRef] [PubMed]

[6]. Al-Khalaifah, H.; Al-Nasser, A. Dietary source of polyunsaturated fatty acids influences cell cytotoxicity in broiler chickens. Sci. Rep. 2021, 11, 10113. [CrossRef]

[7]. Attia, Y.A.; Al-Khalaifah, H.; El-Hamid, A.; Hatem, S.; Al-Harthi, M.A.; Alyileili, S.R.; El-Shafey, A.A. Antioxidant Status, Blood Constituents and Immune Response of Broiler Chickens Fed Two Types of Diets with or without Different Concentrations of Active Yeast. Animals 2022, 12, 453. [CrossRef] [PubMed]
[8]. Al-Khalaifah, H. Benefits of probiotics and/or prebiotics for antibiotic-reduced poultry. Poult. Sci. 2018, 97, 3807–3815. [CrossRef]
[9]. Ke, J.; Delin, W.; Larsen, K. Zingiberaceae. Flora China 2000, 24, 322–377.
[10]. Dieumou, F.; Teguia, A.; Kuiate, J.; Tamokou, J.; Fonge, N.; Dongmo, M. Effects of ginger (Zingiber officinale) and garlic (Allium sativum) essential oils on growth performance and gut microbial population of broiler chickens. Livest. Res. Rural. Dev. 2009, 21, 23–32.
[11]. Al-khalaifah, H.S.; Badawi, M.E.; Abd El-Aziz, R.M.; Ali, M.A.; Omar, A.E. Effect of Egyptian Leek Leaf Extract Supplementation on Productive and Economic Performance of Broilers. Front. Vet. Sci. 2020, 7, 890. [CrossRef] [PubMed]
[12]. Al-Khalaifah, H.S.; Khalil, A.A.; Amer, S.A.; Shalaby, S.I.; Badr, H.A.; Farag, M.F.M.; Altohamy, D.E.; Rahman, A.N.A. Effects of Dietary Doum Palm Fruit Powder on Growth, Antioxidant Capacity, Immune Response, and Disease Resistance of African Catfish, Clarias gariepinus (B.). Animals 2020, 10, 1407. [CrossRef] [PubMed]
[13]. Al-Nasser, A.; Al-Khalaifah, H.; Al-Mansour, H.; Ahmad, A.; Ragheb, G. Evaluating farm size and technology use in poultry production in Kuwait. World's Poult. Sci. J. 2020, 76, 365–380. [CrossRef]
[14]. Umatiya, R.; Srivastava, A.; Pawar, M.; Chauhan, H.; Jain, A. Efficacy of ginger (Zingiber officinale) and garlic (Allium sativum) powder as phytogenic feed additives in diet of broiler chickens. J. Pharmacogn. Phytochem. 2018, 7, 1136–1140.
[15]. Hayajneh, F. Natural feed additives for broiler chickens. S. Afr. J. Anim. Sci. 2019, 49, 869–875. [CrossRef]
[16]. Salawu M.B Ibrahim A.G Lamidi L.O Sodeeq A.E (2014) Consumption and Consumer Preference for Poultry Meat Types in Ibadan Metropolis . Journal of Economics and Sustainable Development www.iiste.org ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online) Vol.5, No.28, 2014
[17]. Roy A, Khan A, Ahmad I, Alghamdi S, Rajab BS, Babalghith AO, Alshahrani MY, Islam S, Islam MR. Flavonoids a Bioactive Compound from Medicinal Plants and Its Therapeutic Applications. Biomed Res Int. 2022 Jun 6;2022:5445291. doi: 10.1155/2022/5445291. PMID: 35707379; PMCID: PMC9192232.
[18]. Sharifi-Rad M, Varoni EM, Salehi B, Sharifi-Rad J, Matthews KR, Ayatollahi SA, Kobarfard F, Ibrahim SA, Mnayer D, Zakaria ZA, Sharifi-Rad M, Yousaf Z, Iriti M, Basile A, Rigano D. Plants of the Genus Zingiber as a Source of Bioactive Phytochemicals: From Tradition to Pharmacy. Molecules. 2017 Dec 4;22(12):2145. doi: 10.3390/molecules22122145. PMID: 29207520; PMCID: PMC6149881.
[19]. Ebrahimzadeh Attari V, Asghari Jafarabadi M, Zemestani M, Ostadrahimi A. Effect of Zingiber officinale Supplementation on Obesity Management with Respect to the Uncoupling Protein 1 -3826A>G and ß3-adrenergic Receptor Trp64Arg Polymorphism. Phytother Res. 2015 Jul;29(7):1032-9. doi: 10.1002/ptr.5343. Epub 2015 Apr 21. PMID: 25899896.
[20]. Roura, Eugeni & Baldwin, M. & Klasing, K.. (2013). The avian taste system: Potential implications in poultry nutrition. Animal Feed Science and Technology. 180. 1–9. 10.1016/j.anifeedsci.2012.11.001.