

GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHER BROILER CHICKENS FED AQUEOUS *Hibiscus Sabdariffa* CALYX EXTRACT

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ABSTRACT

This experiment was conducted to investigate the performance and carcass characteristics of finisher broilers fed aqueous *Hibiscus sabdariffa* calyx extract using 180 COBB broilers. The birds were randomly assigned to five groups of 36 chicks each and replicated 3 times (12 birds each) in a completely randomized design (CRD). *Hibiscus sabdariffa* calyx extracts were administered per litre of drinking at a dose of 0ml for the control (T₁). T₂, T₃, T₄, and T₅ were served 15 ml, 30 ml, 45 ml and 60 ml *Hibiscus sabdariffa* calyx extract/liter of water respectively. Feed and water were offered *ad libitum*. Results showed that aqueous *Hibiscus sabdariffa* calyx extracts had significant ($p < 0.05$) effects on final body weight (FBW), body weight gain (BWG), daily weight gain (DWG) and feed conversion ratio (FCR) of the birds. Birds fed *Hibiscus sabdariffa* calyx extracts recorded significantly ($p < 0.05$) heavier FBW, BWG, DWG and superior FCR than the control group. Aqueous *Hibiscus sabdariffa* calyx extract had no significant ($p > 0.05$) influence on total feed intake, daily feed intake and daily water intake of the birds. *Hibiscus sabdariffa* calyx extract significantly ($P < 0.05$) increased the live weight, dressed weight, dressing percentage, thigh muscles, breast muscles and the drumstick weight of the treated birds. There was no marked ($P > 0.05$) variations in the weights of the internal organs. It could be concluded that up to 60 ml of *Hibiscus sabdariffa* calyx extract can be used to improve the growth performance of broiler without any adverse effect on the carcass indices of the birds.

Keywords: Carcass characteristics, extract, finisher broilers, *Hibiscus sabdariffa*, performance

INTRODUCTION.

The residuals in the final meat products and the development of antibiotic-resistant bacteria strains in consumers of poultry meat (Akinduro and Asaniyan, 2022) has resulted to rising demand for elimination of the use of antibiotics as growth promoters in poultry production. Consequently, herbal growth enhancers are extensively used in poultry production as natural feed additives to improve the productive performance globally. Beneficial impacts of herbs in poultry feeding such as improvement INin feed intake, growth rate, appetite, energizing secretion of digestive enzyme, stimulation of immune response and antioxidant, antimicrobial, antihelminthic, antiviral properties and antiheat stress modulators (Alagawany *et al.*, 2019; Alçiçek *et al.*, 2003).

Roselle (*Hibiscus sabdariffa* L.) is a herbal additive that belongs to the family Malvaceae, it is an important annual crop grown successfully in tropical and sub-tropical climates (Ashour *et al.*, 2020). The cultivation of *Hibiscus sabdariffa* in Nigeria is steadily expanding due mainly to increasing demand for its calyxes which are used for the preparation of “zobo” drink, and soups (El-Shall *et al.*, 2020). Nutritionally, the calyxes are rich in carbohydrates, dietary fiber, proteins, vitamins, minerals, and bioactive compounds (Hamodi and Al – Khalani, 2011). The calyxes also contain a high amount of iron (164.78 mg/kg) (Jabeur *et al.*, 2017). The plant is also found to be rich in minerals especially potassium and magnesium. Vitamins (ascorbic acid, niacin and pyridoxine) are present in appreciable amounts (Ibrahim *et al.*, 2010). Presently there is inadequate research on the potentials of this wonderful flower on improving broiler production especially in Nigeria. Thus this study was conducted to evaluate the effects of feeding graded levels of aqueous Roselle calyx extract on the growth performance and cost effectiveness of finisher broiler chickens.

Materials and methods

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Science, Ebonyi State University, Abakaliki, Nigeria.

Source and preparation of roselle *Hibiscus Sabdariffa* calyx extract

Roselle *Hibiscus Sabdariffa* calyx was sourced from the international main market, Abakaliki, Ebonyi State, Nigeria. The *Hibiscus Sabdariffa* calyx was air dried for two days. The dried *Hibiscus Sabdariffa* calyces were milled to coarse power before extraction. The extract was prepared by soaking 200g of the milled *Hibiscus Sabdariffa* calyces in one litre of water for 24 hours. The extract was obtained by filtering the infusion using a filter paper. The extract was **kept in a capped bottle inside refrigerator until needed**. The extract was administered to the birds in their drinking water according to the respective treatments on daily basis.

Experimental Treatment and Diets

The *Hibiscus Sabdariffa* calyx extract was administered per liter of drinking at a dose of 0ml, 15ml, 30ml, 45ml and 60ml representing T₁, T₂, T₃, T₄ and T₅ respectively. The birds were fed commercial broiler finisher diet. Feed and water were provided *ad libitum* throughout the period of the experiment

Experimental Birds and Management

One hundred and eighty (180) 5-week old Cobb broilers were randomly assigned to five treatment groups of 36 birds each in a completely randomized design. Each treatment was further sub divided into three replicates of 12 birds each. Feed and water were provided *ad libitum*. All necessary vaccinations and other routine poultry management practices were maintained. The experiment lasted for 4 weeks. Performance indices evaluated were body weight gain, feed intake and feed conversion ratio. Individual body weights of the birds were recorded at the beginning of the experiment and thereafter on weekly basis. Feed and water intakes were recorded daily. Feed conversion ratio was calculated by dividing the feed intake by the weight gain. At the end of the feeding trial, three birds were selected at random from each replicate; the birds were slaughtered and eviscerated. The body parts and organs were weighed and expressed as percentage of live weight.

Data Analysis

Statistical analysis of all the data generated were subjected to one-way analysis of variance (ANOVA) using SPSS version 17.0 for windows, SPSS inc. Means were separated using least significant difference (LSD). The P-value was set at 0.5%.

Results and Discussion

The effect of aqueous *Hibiscus sabdariffa* calyx extract on the performance of finisher broiler chickens is presented in Table 1.

Significant ($P < 0.05$) differences were observed in the FBW, BWG, DWG and FCR of the birds among the treatment. The FBW, BWG, DWG and FCR were significantly ($P < 0.05$) better in groups fed aqueous *Hibiscus sabdariffa* calyx extract compared to the control group. Birds fed 45ml and 60ml aqueous *Hibiscus sabdariffa* calyx extract recorded significantly ($p < 0.05$) higher BWG compared to the birds fed 15ml and 30ml, while those fed 0mls roselle extract (control) recorded significantly ($p < 0.05$) the lowest weight gain. Results showed that weight gain of the birds significantly ($p < 0.05$) increased as the level of calyx extract inclusion increases. The increase in weight gain of the treated birds suggested that the extract contains substances that enhanced growth of broilers.

Table 1: Effect of aqueous *Hibiscus sabdariffa* calyx extracts on growth performance of finisher broilers.

Parameter	T ₁ (0ml)	T ₂ (15ml)	T ₃ (30ml)	T ₄ (45ml)	T ₅ (60ml)	SEM
Initial body weight (g)	1255.03	1254.72	1257.91	1255.39	1256.55	8.98
Av. Final body weight (g)	2948.24 ^c	3191.20 ^b	3276.58 ^b	3357.61 ^a	3399.84 ^a	13.86
AV. Body weight gain	1693.21 ^c	1936.48 ^b	2018.67 ^a	2102.22 ^a	2143.29 ^a	9.78
Av. Daily weight gain (g)	60.47 ^c	69.16 ^b	72.10 ^a	75.08 ^a	76.55 ^a	0.89

Av. Total feed intake (g)	4422.04	4474.40	4480.56	4483.08	4479.72	55.99
Av. Daily feed intake (g)	157.93	159.80	160.02	160.11	159.99	0.21
Feed conversion ratio	2.61 ^a	2.31 ^b	2.22 ^c	2.13 ^d	2.09 ^d	0.04
Av. Total water intake(ml)	7717.36.	7586.32	7528.92	7379.68	7747.04	95.11
Av. Daily water intake(ml)	275.62	270.94	268.89	263.56	276.68	0.73
Feed water ratio	1.75	1.70	1.68	1.65	1.73	0.62

^{abc} means on the same row with different superscript are significant (p<0.05)

Hamodi and AL-Khalain (2011) reported that the improvement could be due to the active compounds that is presented in Roselle (anthocyanin and protocatechiuc) and its content of vitamin C, which had a positive effect on all cell activity and increase O₂ consumption and as a result stimulate thyroid gland which play a major role in metabolism. This finding tends to corroborate the findings of Onu *et al.* (2019) and Akinduro and Asaniyan (2022) on related studies that the dried roselle calyx extracts improved the weight gain of broilers. Feed intake, water intake and feed water ratio were not significantly (P<0.05) influenced by aqueous *Hibiscus sabdariffa* calyx extract. However, there was marginal increase in feed intake of birds fed 30ml, 45ml and 60ml of calyx extract. The non significant variations in feed and water intakes revealed that the treatments had similar effect on the feed and water intakes. However, the slight increase in feed intake of birds fed aqueous roselle calyx extract could be attributed to the high content of vitamin C, protein and minerals in roselle which enhances appetite (Mahadaven and Pradeep, 2009).

Carcass characteristics

The carcass characteristics of broiler chickens fed aqueous *Hibiscus sabdariffa* calyx extract is presented in Table 2.

Table 2: Effect of aqueous extract of *Hibiscus sabdariffa* calyx extract on the carcass characteristics of finisher broilers

Parameters	T ₁ (0ml)	T ₂ (10ml)	T ₃ (20ml)	T ₄ (30ml)	T ₅ (40ml)	SEM
Live weight (g)	2862.48 ^c	3160.94 ^b	3212.51 ^b	3323.64 ^a	3361.80 ^a	13.86
Dressed weight (g)	2183.79 ^c	2525.27 ^b	2683.41 ^b	2791.86 ^a	2845.76 ^a	14.25
Dressing (%)	76.29 ^c	79.89 ^b	83.53 ^{ab}	84.00 ^a	84.65 ^a	1.69
Head (%)	2.79	2.82	3.01	3.20	2.93	0.23
Neck (%)	6.25	6.79	6.92	7.29	6.89	0.38
Breast (%)	25.13 ^b	27.74 ^a	27.95 ^a	27.47 ^a	28.01 ^a	0.29
Wings (%)	8.11	9.15	9.33	9.54	8.93	0.33
Back (%)	15.10	15.25	16.07	15.72	16.19	0.24
Thigh (%)	11.85 ^b	14.91 ^a	15.20 ^a	15.68 ^a	15.72 ^a	0.05
Drumstick (%)	11.01 ^b	11.90 ^a	12.64 ^a	12.86 ^a	12.61 ^a	0.05
Shank (%)	4.32	4.11	4.75	4.30	4.43	0.10
Gizzard (%)	3.08	3.26	3.11	3.64	3.48	0.88
Heart (%)	1.04	1.11	1.20	1.31	1.23	0.89
Liver (%)	1.87	2.26	2.75	2.97	2.78	0.81
Spleen (%)	0.42	0.41	0.47	0.49	0.46	.003

^{a,b,c}: Rows with different superscripts are statistically different (p.<0.05).

The effect of aqueous *Hibiscus sabdariffa* calyx extract on the carcass characteristics of broilers is presented in Table 2. Results indicated that feeding *Hibiscus sabdariffa* calyx extract significantly (P<0.05) increased the live weight, dressed weight, dressing percentage, thigh muscles, breast muscles and the drumstick weight of the treated birds. Birds fed 60ml (T₅) *Hibiscus sabdariffa* calyx extract recorded the highest live weight (3361.80g) followed by birds fed 45ml (T₄) (3323.64g), T₃ (3212.51g) and T₂ (3160.94g) while the control (T₁) (2862.48g) recorded the least mean value. Birds

in treatment four (T₅) recorded the highest dressing percentage (84.65%) followed by birds in (T₄) (84.00%) followed by birds in T₃ (83.53%). Birds in T₂ recorded higher dressing percentage (79.89%) than the control (76.29%) group. Aqueous *Hibiscus sabdariffa* calyx extract had no significant ($P>0.05$) influence on the other cut-up parts. There were no marked ($P>0.05$) variations in the weights of the internal organs. The increase in breast, drumstick and thigh weights observed in the present study is similar to Akinduro and Asaniyan (2022).

CONCLUSION AND RECOMMENDATION

Considering the result of this study, it can be concluded that aqueous *Hibiscus sabdariffa* calyx extract enhanced performance and carcass yield of broilers without any adverse effect on the internal organs. Therefore, the use of up to 60 ml of aqueous *Hibiscus sabdariffa* calyx extract/litre of water can be adopted by poultry farmers since it has no negative effect on the performance and carcass traits of the broiler chickens.

REFERENCES

- Akinduro, V.O. and Asaniyan, E.K. (2022). Performance and meat attributes of finisher broiler chickens administered aqueous extracts of dried calyx from roselle plant (*Hibiscus sabdariffa*). *Nigerian Journal of Animal Production*, 49(2):140-149. <https://doi.org/10.51791/njap.v49i2.3476>
- Alagawany, M., Elnesr, S.S., Farag, M.R., Abd El-Hack, M.E., Khafaga, A.F., Taha, A.E., Tiwari, R., Yatoo, M.I., Bhatt, P., Marappan, G., and Dhama, K. (2019). Use of licorice (*Glycyrrhiza glabra*) herb as a feed additive in poultry: Current knowledge and prospects. *Animals*. 9(8):536.
- Alçiçek, A., Bozkurt, M. and Çabuk, M. 2003. The effects of an essential oil combination derived from selected herbs growing wild in turkey on broiler performance. *S. Afr. J. Anim. Sci.* 33:89-94.
- Ashour, E.A., Bin-Jumah, M., Abou Sayed-Ahmed, E.T., Osman, A.O., Taha, A.E., Momenah, M.A., Allam, A.A., Swelum, A.A. and Abd El-Hack, M.E. (2020). Effects of dried okra fruit (*Abelmoschus esculentus* L.) powder on growth, carcass characteristics, blood indices, and meat quality of stored broiler meat. *Poult Sci.* 99(6):3060–3069.
- El-Shall, N. A., Awad, A. M., Abd El-Hack, M. E. A., Naiel, M. A. E., Othman, S. I., Allam, A. A. and Sedeik, M. E. (2020). The Simultaneous administration of a probiotic or Prebiotic with live *Salmonella* Vaccine improves growth performance and Reduces Fecal Shedding the bacterium in *Salmonella*-Challenged broilers. *Animals* 10:70.
- Hamodi, S.J. and Al – Khalani, F.A. (2011). Comparism between anise seed (*Pimpinella anisium* L) and Rosella flower (*Hibiscus sabdariffa*) by their effect on production performance of broilers. *Advances in Environmental Biology*. 5(2): 461- 464.
- Jabeur, I., Pereira, E., Barros, L., Calhelha, R. C., Soković, M., Oliveira, M. B., Oliveira, P. P. and Ferreira, I. C.F.R. (2017). *Hibiscus sabdariffa* L. as a source of nutrients, bioactive compounds and colouring agents. *Food Res. Int.* 100, 717–723. doi: 10.1016/j.foodres.2017.07.073
- Ibrahim, D.K., Abdulrazaq, O.R., Igwebuike, J.U. and Kibon, A. (2010). Response of Growing Cockerels to Diets Containing Differently Processed Sorrel Seed Meal. *International Journal of Science and Nature*, 1(2):183-190.
- Mahadaven, S. N. and Pradeep, K. (2009). *Hibiscus sabdariffa* Linn. An overview. *National Product Radiance*, 8(1): 77- 83.
- Onu, P. N., Ohanaso, E. S. and Ekenyen, B. U. (2019). Effects of oral administration of *Hibiscus sabdariffa* calyx extracts on the performance and economics of production of broiler chickens *Proceedings of the 8th ASAN-NIAS Joint annual meeting held at International Conference Centre, Umuahia*, 928-931.