EFFECTS OF ONION EXTRACT (*Allium cepa*) AS A NATURAL ALTERNATIVE TO ANTIBIOTIC GROWTH PROMOTERS ON CARCASS TRAITS AND PHYSIOLOGICAL RESPONSES IN BROILER CHICKENS

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ABSTRACT
This study investigates the effects of dietary inclusion of onion (Allium cepa) extracts as an alternative to antibiotic growth promoters (AGPs) on broiler chickens' carcass traits and physiological responses. Specifically, it seeks to evaluate the impact of onion extracts on growth performance, dressing percentage, breast muscle yield, and abdominal fat deposition. One hundred twenty unsexed Abor acre day-old broiler chicks were obtained for the study. In a completely randomized design, the chicks were allotted into four treatments: A, B, C, and D, with thirty chicks each. Each treatment was further subdivided into three replicates of ten chicks. The diets were incorporated at 0% (control), 0.4%, 0.6%, and 0.8% of onion extract (Allium cepa). All data obtained from the experiment were statistically analysed using the General Linear Model Procedure of the Minitab 17 software package. The results showed no significant differences (P>0.05) in live weight, dressed weight, weights of head, wing, neck, back cut, shank, ribs, and thigh across the treatment groups. Significant differences (P<0.05) were observed in eviscerated weight, dressing percentage, breast cut, and heart weight. It was also discovered from the results that no significant differences in respiratory and pulse rates (measured in beats per minute) across the treatment groups. Based on the results, onion extract can be included in broiler diets up to 0.8% to achieve improved carcass quality and physiological responses.
Keywords: Onion extract; Broiler chicken; Antibiotic; Antibiotic Growth promoters

INTRODUCTION

Over the years, the poultry industry has consistently relied on antibiotic growth promoters (AGPs) to enhance broiler performance, improve feed efficiency, and prevent diseases in broiler chickens. However, the extensive use of AGPs has led to growing concerns regarding antibiotic resistance, which threatens animal and human health (Gadde *et al*., 2017). Onions belong to the Allium family, known for their rich phytochemical content, particularly sulfur compounds, flavonoids, and phenolic acids, which exhibit antimicrobial, antioxidant, and anti-inflammatory properties (Benkeblia, 2005). These bioactive compounds in onion have shown the potential to promote animal health, enhance immune responses, and improve nutrient absorption, translating to improved growth performance in broilers (Obianwuna, 2024). Specifically, the bioactive compounds in onion extracts, such as quercetin and organosulfur compounds, have been suggested to play a vital role in improving gut health by reducing pathogenic bacteria, promoting beneficial gut flora, and improving nutrient utilization (Narashans *et al*., 2022).

Onion extracts have been studied for their potential impact on physiology and carcass traits, critical indicators of poultry production efficiency and profitability (An *et al*., 2015). Research has indicated that natural growth promoters, including plant extracts like *Allium cepa*, improve these carcass traits by enhancing muscle development and reducing fat deposition (Malematja *et al*., 2022).

This study investigates the effects of dietary inclusion of onion (*Allium cepa*) extracts as an alternative to AGPs on broiler chickens' carcass traits and physiological responses. Specifically, it seeks to evaluate the impact of onion extracts on growth performance, dressing percentage, breast muscle yield, and abdominal fat deposition. This research will provide insights into the potential of onion extracts as a sustainable and health-conscious feed additive in broiler production.

MATERIALS AND METHOD

Experimental location

The experiment was conducted at Abak local government area of Akwa Ibom State. Abak local government area is situated in the humid tropics of South-south Nigeria along latitude 5.021°N and longitude 7.7874°E. The area has an elevation of 226 feet, relative humidity of 60-90 %, an annual rainfall of 3500-5000mm, and an average monthly temperature of 24^0C-26^0C (SLUS-AK, 1994).

Preparation of the Experimental Diet
Fresh onion bulbs (*Allium cepa*) were purchased from Itam market in Uyo, Akwa Ibom state, Nigeria. The onion bulb was well blended into a paste using a Silver Crest German Industrial 8500W Blender. The paste was then squeezed out with a sieve. The extract was prepared daily and administered to the birds via drinking water.

Experimental Design and Management of Birds
120 unsexed Abor acre day-old broiler chicks were used for the study. The experimental birds were housed in deep litter pens and managed with all necessary routine management. In a completely randomized design, the chicks were allotted into four treatments: A, B, C, and D, with thirty chicks in each. Each treatment was further subdivided into three replicates of ten chicks. The diets were incorporated at 0% (control), 0.4%, 0.6%, and 0.8% of onion (*Allium cepa*) extract. The birds were weighed, slaughtered under hygienic conditions, and the viscera organs were eviscerated. The live weight, carcass weight, dressing weight, primal parts, and viscera organs (liver, kidney, heart, and lung) were expressed as each bird's live weight percentage.

Respiratory rate (RR): This was determined by observing the number of flank movements of the bird per minute using a stopwatch for an hour. Rectal temperature (RT): This was measured with the aid of a mini digital thermometer with ±0.1°C accuracy; the disinfected thermometer was inserted into the rectum of the birds for one minute using a stopwatch, and reading was taken once it beeped. Pulse rate (PR): This was determined with a stethoscope placed under the chicken's wing, with the pulse counted for one minute using a stopwatch for an hour.

Statistical Analysis
All data obtained from the experiment were statistically analysed using the General Linear Model Procedure of the Minitab 17 software package. At the same time, significant differences between treatment means were separated using Tukey's Procedure (Minitab 17 (2000) Computer Software. Minitab, Inc., State College, PA).

RESULTS AND DISCUSSION
Table 1 shows the carcass traits of broiler chickens fed diets supplemented with onion extract at 0%, 0.4%, 0.6%, and 0.8%. Carcass traits are aimed at evaluating broiler chicken's quality, yield, and physical attributes post-slaughter. The results indicated no observed significant differences ($P > 0.05$) in live weight, dressed weight, weights of head, wing, neck, back cut, shank, ribs, and thigh across the treatment groups. Conversely, significant differences ($P < 0.05$) were observed in eviscerated weight, dressing percentage, breast cut, and heart weight.

A declining trend in the weights of primal parts, ranging from the head to the drumstick, was observed as the level of onion extract in the diet increased. Significant differences were explicitly observed in the breast cut and drumstick weights. These findings align with previous studies by Malematja *et al*. (2023) and An *et al*. (2015), who reported non-significant effects of onion extract on broiler chickens' thigh and wing weights.

Including onion extract in the broiler diets showed no significant differences in carcass yield, with omental fat percentages ranging from 0.44% to 0.49% and abdominal fat percentages from 0.70% to 0.79%. It is plausible that onion extract suppressed the deposition of omental and abdominal fats, consistent with earlier findings by Siska *et al*. (2017). Similarly, Goodarzi and Nanekarani (2014) reported no significant effects of onion extract on abdominal fat and relative organ weights of broiler chickens. Amongst the internal organs, significant variations ($P < 0.05$) were observed in heart weight, while the weights of other internal organs showed no significant differences across the treatment groups.

Table 2 results revealed no significant differences in respiratory and pulse rates (measured in beats per minute) across the treatment groups. Respiratory rates ranged from 67.31 to 69.21 beats per minute, while pulse rates ranged from 199.95 to 206.41 beats per minute. Rectal temperature showed significant differences ($P<0.05$) among the treatment groups, with a decreasing trend observed as the level of onion extract in the diets increased, this observation does not corroborate the findings of Okpe and Olaniyi *et al*., 2024 who reported that dietary inclusion of phytogenic feed additive had no significant effect on the rectal temperature of broiler chickens.

Table 1: Carcass traits of Broilers chickens fed onion (*Allium cepa*) extract

PARAMETERS	T1 (0.0%)	T2 (0.4%)	T3 (0.6%)	T4 (0.8%)	SEM	p-value
LIVE WEIGHT	3200.4	3321.6	3391.8	3421.2	49.11	NS
EVISC WEIGHT	2859.7^{cd}	2959.2^{c}	3011.6^{b}	3026.1^{a}	37.66	0.02
DRESS WT	2665.6	2749.5	2799.8	2819.7	34.35	NS
DRESS WT%	83.28^{a}	82.77^{b}	82.55b^{c}	82.41^{c}	0.19	0.01
Primal parts (% of live body weight)						
HEAD	2.03	1.99	1.97	1.97	0.01	NS
WING	7.55	7.29	7.16	7.13	0.10	NS
NECK	3.77	3.65	3.59	3.59	0.04	NS
BACK	8.52	8.17	8.02	7.98	0.12	NS
SHANK	3.63	3.53	3.48	3.47	0.04	NS
BREAST	27.89^{a}	27.13^{cd}	26.59^{b}	26.39^{c}	0.34	0.01
RIBS	6.00	5.81	5.71	5.69	0.07	NS
THIGH	11.11	10.75	10.55	10.48	0.14	NS
DRUMSTICK	10.87^{a}	10.51^{b}	10.31^{c}	10.25^{d}	0.14	0.03
Organs (% of live body weight)						
Gizzard	1.44	1.42	1.42	1.43	0.02	NS
HEART	0.61^{cd}	0.62^{c}	0.63^{b}	0.64^{a}	0.01	0.03
SPLEEN	0.17	0.20	0.22	0.24	0.01	NS
LIVER	1.85	1.81	1.80	1.80	0.02	NS
OMENTAL FAT	0.44	0.45	0.47	0.49	0.01	NS
ABDOMINAL FAT	0.70	0.71	0.71	0.73	0.01	NS
SMALL INTESTINE	2.82	2.75	2.71	2.71	0.02	NS
LARGE INTESTINE	0.94	0.94	0.94	0.96	0.01	NS
CROP	0.47	0.48	0.50	0.51	0.01	NS
LUNG	0.51	0.52	0.53	0.55	0.01	NS

$^{a, b, c, cd}$ mean values in the column bearing different superscripts are significantly different ($p<0.05$)

**Live body weight was used as the covariate

Table 2: Physiological Response of Broilers fed onion (*Allium cepa*) extract

	Onion extracts (*Allium cepa*) inclusion level					
Parameters	T_1 (0)	T_2(0.4)	T_3(0.6)	T_3(0.8)	SEM	P- value
Respiratory rate (beats/min)	67.31	68.89	68.60	69.21	0.68	0.061
Rectal temperature (ºC)	43.24^{a}	42.90^{b}	41.65^{c}	40.90^{d}	0.54	0.037
Pulse rate (beats/min)	206.41	201.31	200.18	199.95	1.51	0.851

$^{a, b, c}$ mean value in the column bearing different superscripts are significantly different ($p<0.05$)

CONCLUSION

This study showed that incorporating onion extract at varying levels (0%, 0.4%, 0.6%, and 0.8%) influenced some physiological and carcass traits. While the inclusion of onion extract led to significant reductions in rectal temperature and notable changes in eviscerated weight, dressing percentage, and breast cut, other parameters, such as live weight, dressed weight, and most primal cuts, showed no significant differences.

RECOMMENDATIONS

Based on the results, onion extract can be included in broiler diets up to 0.8% to achieve improved carcass quality and physiological responses. Additional studies are recommended to explore how onion extract influences fat deposition and thermoregulation in broilers.

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