GROWTH PERFORMANCE OF ISA BROWN COCKERELS FED GRADED LEVELS OF AIR-DRIED NEEM LEAF AND BARK MEAL

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ABSTRACT
Poultry farmers prefer rearing of healthy birds using natural growth and health promoting additives. Azadirachta indica (neem leaf and bark) has good potential as feed additives. This study assessed the effect of graded levels of neem leaf and bark meal on performance and carcass characteristics of ISA Brown cockerels. Two hundred and seventy (270) day-old ISA Brown strain cockerels were used for the study. The birds were randomly allotted to nine dietary treatments of thirty birds each, replicated thrice with ten birds per replicate. The treatments were 0g Neem Leaf Meal (NLM) and Neem Bark Meal (NBM) as control, 2.5g, 5.0g, 7.5g and 10.0g NLM/kg feed, 2.5g, 5.0g, 7.5g and 10.0g NBM/kg feed in a Completely Randomized Design. Birds were fed the experimental diets from 1st week to 20th week of age. Daily feed intake (DFI), Daily Weight Gain (WG) and Feed Conversion Ratio (FCR) were evaluated. Data were analyzed using General Linear Model. Cockerel chickens fed 2.5g/kg NLM exhibited significantly highest Final Weight (FW), DWG, and ADG during the starter phase compared to the control. In the grower phase, birds fed 5.0g/kg Neem Bark Meal (NBM) showed significantly heaviest FW, DWG, and ADG. In conclusion, feeding ISA Brown cockerels with neem bark meal up to 5.0g/ kg of feed enhance performance at finisher phase.
Keywords: poultry, neem leaf, neem bark, growth performance, cockerel

INTRODUCTION

The poultry sector has experienced remarkable growth in recent decades, transitioning from unscientific practices to a commercial production system. This substantial advancement is attributed to the effective implementation of modern growth-promoting strategies and comprehensive disease prevention measures (Angelakis *et al*., 2013). Modern poultry farmers face a critical challenge in producing healthy birds with quality meat and eggs, devoid of harmful residues. The use of synthetic drugs like antibiotics and growth promoters is costly and may have adverse effects on bird health. Concerns about prolonged withdrawal periods and the risk of residue accumulation in tissues and eggs, potentially affecting human health, have intensified (Jawad *et al*., 2014; Sarker *et al*., 2018). Consequently, consumers express a preference for poultry products free from drug residues (Talukder *et al*., 2017). This growing demand has spurred efforts to explore alternative approaches for cost-effective poultry production using natural growth and health promoters (Sarker *et al*., 2020). Researchers are now focusing on ancient medicinal systems to identify beneficial herbs that can safely enhance production (Islam *et al*., 2018). Plants inherently provide essential nutrients and valuable bioactive compounds (Cherkupally *et al*., 2017). Throughout history, herbs and spices have played a vital role in addressing health issues. Commonly utilized herbs such as neem fruit and leaves, nutmeg, cinnamon and ginger serve diverse purposes, functioning as digestive stimulants, antidiarrheal agents, antiseptics, anti-inflammatories, antiparasitics, and appetite stimulants for both humans and animals (Agarwal, 2002). Neem (*Azadirachta indica*) is a tropical plant indigenous to Nigeria, known as "Ogwu-iba" in Igbo and "Dogonyaro" in Hausa. Renowned for its medicinal properties, neem acts as an anti-coccidial agent in broilers and a natural pesticide (Tipu et al., 2002; Esonu *et al*., 2006). Recent studies have explored the application of neem leaf meal in the nutrition of broilers (Onyimonyi *et al*., 2009) and layers (Olabode *et al*., 2013), yet there is a lack of information regarding its utilization in cockerel production. Therefore, this study explores the influence of graded levels of neem leaf and bark meal on growth performance and carcass characteristics.

MATERIALS AND METHODS

Description of the Experimental Site

The experiment was carried out at the Poultry Unit, Teaching and Research Farm of the Ladoke Akintola University of Technology, Ogbomoso, Nigeria. Ogbomoso is located in the derived Savanna Zone that lies on longitude $4^{o}10^{1}$ East of greenish meridian and latitude $8^{o}10^{1}$ North of the equator. The latitude ranges from 300m and 600m above sea level while mean temperature and annual rainfall are 27^{o}C and 1247mm (Google Earth Map, 2022)

Collection and Preparation of the Test Ingredient

Neem leaves and neem tree bark were harvested from neem trees around the project site in Ogbomoso, Oyo State, Nigeria. The neem tree bark was then chopped with a sharp knife for size reduction. Consequently, the leaves and bark were thoroughly washed under running tap water to remove dirt. Afterward, they were placed in a shaded area to air dry for 14 and 21 days respectively in the month of November until they became crispy to touch. The dried neem leaf sample was grounded into fine particles using the burr mill and stored in an air tight container while the dried neem bark sample was crushed and ground into powdery form using the burr mill.

Experimental Diets

Nine (9) diets were formulated for the study such that Diet 1 (T_1) served as the control that neither contain neem (*Azadirachta indica*) leaf meal nor neem (*Azadirachta indica*) bark meal. Diets 2 (T_2,), 3(T_3), 4(T_4), 5(T_5) contained 2.5g, 5.0g, 7.5g and 10.0g NLM/kg of feed. Diets 6(T_6), 7(T_7), 8(T_8), 9(T_9) contained 2.5g, 5.0g, 7.5g and 10.0g NBM/kg of feed respectively. Gross composition of the experimental diets is shown in Tables 1 & 2

Eperimental Animals and Management

A total of two hundred and seventy (270) 1-day old cockerel chicks were purchased from Amo Sieberer Hatchery in Awe, Oyo State, Nigeria. The chicks were de-boxed, weighed and randomly allocated into nine dietary treatments. Each treatment was replicated three (3) times with ten birds per replicate in a Completely Randomized Design (CRD). Vaccination and medication were administered to birds grouped in the control (T_1) only.

Experimental Design

The experiment comprised two factors namely, neem leaf meal (NLM) and neem tree bark meal (NTBM). The levels of inclusion (2.5g, 5.0g, 7.5g and 10.0g/ kg of feed were used during the experiment to have a two by four (2×4) factorial arrangement within a completely randomized design.

Data Collection

Growth performance

The birds were weighed initially before the commencement of the experiment, weekly weight gains, feed intake and feed conversion ratio were recorded during the experiment and were used as a measure of growth performance.

RESULTS AND DISCUSSION

Table 1 shows the effect of varying levels of neem leaf meal (NLM) and neem bark meal (NBM) on the growth performance of ISA brown cockerels fed graded levels of neem leaf and bark meal at starter phase (0-8 weeks). Final weight (FW), weight gain (WG), average daily gain (ADG), feed intake (FI), average daily feed intake (ADFI) and feed conversion ratio (FCR) were significantly ($p<0.05$) affected by the levels of neem leaf and bark meal. The highest values for final weight, weight gain and average daily gain was recorded among cockerels fed T_2 (2.5g NLP/1 kg of feed) while the highest values for feed intake and average daily feed intake was observed among cockerels fed T_6, T_7, T_8 and T_9 respectively. The highest value for feed conversion ratio was observed among cockerels fed T_8 (7.5g NBP/kg of feed) while the lowest feed conversion ratio was recorded among cockerels fed T_2 (2.5g NLP/kg feed) respectively. The initial weight of the cockerel chicks was not significantly ($p>0.05$) influenced due to weight balancing at the experiment's commencement. Birds fed T2 (2.5g NLM) exhibited the highest final weight, weight gain, and average daily gain compared to those on the control diet. This contradicts Olabode *et al*. (2013) findings of reduced body weight in birds fed NLM diet. The increased weight gain in this study suggests minimal toxic factors like terpenes and limonoids, potentially promoting bird growth with NLM and NBM. Tipu *et al*. (2002) reported similar positive outcomes with neem as a feed additive in broilers. The results highlight neem leaf and bark as nutrient sources and growth promoters, differing from Durrani *et al.* (2008) findings,

possibly due to variations in processing methods - oven-drying in their study versus air-drying in the present one.

Table 1: Effect of varying levels of neem leaf and bark meal on growth performance of ISA Brown cockerels at starter phase (0 – 8 weeks)

TRT	1	2	3	4	5	6	7	8	9	SEM
IW (g)	34.10	34.00	34.10	34.10	34.00	34.10	34.10	34.10	34.00	0.02
FW (g)	622.80^{cde}	684.96^{a}	664.36^{abc}	640.76^{bcd}	620.38^{de}	672.66^{ab}	635.00^{bcd}	586.66^{e}	650.00^{abcd}	5.62
WG (g)	588.46^{cd}	650.96^{a}	630.36^{ab}	606.76^{bc}	586.38^{cd}	642.00^{ab}	603.80^{bc}	555.53^{d}	618.60^{abc}	5.60
ADG (g/bird/day)	10.50^{cd}	11.62^{a}	11.25^{ab}	10.83^{bc}	10.47^{cd}	11.46^{ab}	10.78^{bc}	9.92^{d}	11.04^{abc}	0.10
FI (g)	1954.95^{c}	2046.79^{bc}	2113.23^{b}	2088.16^{bc}	2151.21^{b}	2410.26^{a}	2434.26^{a}	2523.10^{a}	2511.10^{a}	31.88
ADFI (g/bird/day)	34.91^{c}	36.54^{bc}	37.73^{b}	37.28^{bc}	38.41^{b}	43.04^{a}	43.46^{a}	45.05^{a}	44.84^{a}	0.56
FCR	3.32^{de}	3.14^{e}	3.35^{de}	3.44^{d}	3.67^{c}	3.75^{c}	4.03^{b}	4.56^{a}	4.06^{b}	0.06

^{abc} =means within the same row with different superscripts differ significantly, SEM= standard error of mean, IW = Initial weight, FW = Final weight, WG = Weight gain, ADG = Average Daily Gain, FI = Feed intake, ADFI = Average daily feed intake, FCR = Feed conversion ratio.

The difference in feed conversion ratio among the treatments indicates that neem leaf and bark meal (NLM) affected nutrient availability, digestion, absorption, and utilization. Poor utilization of diets with higher neem leaf and bark meal levels during the starter phase might be due to the bird's enzymes struggling to break down the active components and improper metabolism linked to neem leaf, as reported by Esonu *et al*. (2005).

Table 2: Main effect of varying levels of neem leaf and bark meal on growth performance of ISA brown cockerels at grower phase (9 – 20 weeks).

TRT	1	2	3	4	5	6	7	8	9	SEM
IW (g)	622.80^{de}	684.96^{a}	664.36^{abc}	640.76^{bcd}	620.38^{de}	672.66^{ab}	635.00^{bcd}	586.66^{e}	650.00^{abcd}	5.62
FW (g)	2028.40^{ab}	1846.03^{bc}	1759.46^{bcd}	1433.90^{d}	1541.60^{cd}	2076.88^{ab}	2386.20^{a}	2107.09^{ab}	2095.65^{ab}	54.88
WG (g)	1405.60^{abc}	1161.06^{bcd}	1095.10^{cd}	793.13^{d}	921.21^{d}	1404.22^{abc}	1751.20^{a}	1520.42^{ab}	1445.65^{abc}	54.83
ADG (g/bird/day)	16.73^{abc}	13.82^{bcd}	13.03^{cd}	9.44^{d}	10.96^{d}	16.71^{abc}	20.84^{a}	18.10^{ab}	17.21^{abc}	0.65
FI (g)	10126.93^{a}	9885.29^{a}	10082.42^{a}	9644.13^{ab}	9977.20^{a}	8722.77^{c}	8881.82^{c}	9196.64^{bc}	8818.02^{c}	97.36
ADFI (g/bird/day)	120.55^{a}	117.68^{a}	120.02^{a}	114.81^{ab}	118.77^{a}	103.84^{c}	105.73^{c}	109.48^{bc}	104.97^{c}	1.15
FCR	9.03^{b}	8.66^{b}	9.33^{b}	12.40^{a}	10.84^{ab}	6.34^{c}	5.19^{c}	6.08^{c}	6.09^{c}	0.38

abc =means within the same row with different superscripts differ significantly, SEM= standard error of mean, IW = Initial weight, FW = Final weight, WG = Weight gain, ADG = Average Daily Gain, FI = Feed intake, ADFI = Average daily feed intake, FCR = Feed conversion ratio.

During the finisher phase (Table 2), feeding *Azadirachta indica* leaf and bark meal to cockerels in this study significantly influenced initial weight, final weight, weight gain, average daily gain, feed intake, average daily feed intake, and feed conversion ratio. Birds fed T_7 had the highest weight gain compared to the control and other dietary treatments. Increasing neem leaf levels led to decreased weight gain and average daily gain. This aligns with Bonsu *et al*. (2012) findings, showing neem leaf meal's significant impact on weight gain and final weight in broiler chickens.

Feed intake and average daily feed intake were highest in the control and neem leaf meal-fed birds, while neem bark meal-fed birds showed the least values, likely due to coumarins present in neem bark. Neem bark meal-fed birds had the highest feed conversion ratio, followed by the control diet, while the neem bark meal-fed birds had the least. The presence of coumarins in neem bark may contribute, as reported by El-Far *et al.* (2016). Studies by Kale *et al.* (2003), Bishnu *et al*. (2009), and Sarker *et al*. (2014) also reported higher body weight and weekly weight gain in birds supplemented with neem leaf extract, attributed to neem leaves' antimicrobial and anti-protozoal properties. Differences may stem from the form of the test ingredient (extract vs. leaf meal) and the means of administration.

CONCLUSION

In light of the results obtained from this experiment, it can be concluded that feeding cockerels with neem bark meal up to 5.0g/ kg of feed will be tolerated with no adverse effect on growth performance.

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