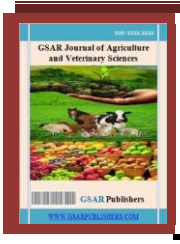

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ANTIBIOTIC POTENTIALS OF BITTER LEAF (*Vernonia amydgalina*) ON BROILER CHICKENS

By

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Abstract

This experiment was conducted to assess different mode of administrating Vernonia amydgalina in broiler chickens diet. The harvested V. amydgalina from Moniya, Ibadan, Oyo State, were air dried, milled into powder and 4kg was divided into two groups of which one was macerated in a diluted ethanol at a ratio of 1:1 of ethanol and water to make 5 liters, while the other group was in 5 liters of water; they were both allowed to stay for 72 hour of 12 hours intermittent stirring. The mixture was sieved with a muslin cloth after which it was filtered with a whatmann No. 1 filter paper. The extracts were refrigerated until required for use. Two hundred unsexed Arbor acre day-old broiler chicks were procured and subjected to five experimental diets consisting of T_1 (0%) V. amydgalina, plus normal routine medication, T_2 and T_3 were administered 1% ethanolic and aqueous extracts, T_4 were subjected to 1% V. amydgalina leaf meal in diet and T_5 (negative control) had no antibiotics nor V. amydgalina. Data were analyzed using one-way ANOVA α0.05. The proximate composition of V. amydgalina revealed: 22.75%, 12.00%, 24.10%, 7.13%, 10.10%, 89.90% and 31.05% for CP, Ash, CF, EE, MC, DM and NFE respectively. There were no significant difference in the growth parameters except FCR which had the best values in T_1 and T_3. In conclusion V. amydgalina has the potential to replace antibiotics in broiler production and can be either administered either as extract of aqueous and ethanol or as a leaf meal at 1%.

Keywords: *antibiotics, medicinal plants, phytochemical, screening, Vernonia amydgalina extract,*

INTRODUCTION

Livestock production currently faces challenges posed by demand for 'clean, green and ethical' animal production (1). This concept involves limited use of drugs, chemicals and hormones, while reducing the negative impact of food production on the environment and taking into consideration animal welfare. However, there has been serious concern about the indiscriminate use of antibiotics as feed supplements in poultry as this often results in antibiotic residue deposition in animal products which invariably poses a health hazard to humans because of the potential development of antimicrobial resistance and about transference of antibiotic resistant genes from animals to human micro biota (2, 3). There are several naturally existing medicinal plants which could be used in preventing pathogen infestation and disease occurrence which in turn improve growth, prominent among these medicinal plants is *Vernonia amydgalina.*

The utilization of *V. amydgalina* supplements in poultry nutrition is not common however, this leaf is cheap and it was abundant potential source of medicine, micro-nutrients and protein because of its ability to synthesize amino acids from a wide range of virtually unlimited and readily available primary materials such as water, carbondioxide and atmospheric nitrogen in the presence of sunlight. The organic fraction extracts of the plant was shown to possess cytotoxic effects towards human carcinoma cells of the nasopharynx (4). It is effective against amoebic dysentery (5), gastrointestinal disorder (6), and has antimicrobial and antiparasitic activities (7, 8). The biologically-active

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compounds of *Vernonia amydgalina* are saponins and alkaloids (9), phenolic acids, lignans, xanthones and anthraquinone (10), edotides (11) and Sesquiterpenes (12).

Having understood the phytochemical composition of *V. amydgalina*, this study therefore aimed at assessing its potentials on the performance of broiler chickens by administering it on feed and water of the birds.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Poultry unit, Pro-Patria farms, Solalu village via Moniya, Ibadan, Oyo State, Nigeria. The *V. amydgalina* leaves were harvested from a cultivated farmland in Moniya, Ibadan metropolis area of Oyo State, Nigeria. The harvesting of the leaves was carefully done in the morning before sunrise, stalks were removed, and the leaves were air dried for two weeks, milled before subjecting it to proximate analysis.

Experimental birds and diets

Two hundred (200) unsexed Arbor Acre day-old broiler chicks were used for the experiment. The birds were brooded for 21 days, weighed and allotted to five (5) treatment groups of ten (10) birds each in a Completely Randomized Design (CRD). The experiment lasted for 35 days. A broiler starter and finisher feeds were formulated to meet the NRC standard diets of 23% CP and 21% CP.

Table 1: Percentage composition of the experimental diets

Ingredient	Broiler starter (Kg)	Broiler finisher (Kg)
Maize	50.00	46.00
Wheat offal	7.00	18.00
Soybean meal	36.00	30.00
Fish meal	3.00	2.00
Soybean oil	0.50	0.50
Di-Calcium Phosphate	1.40	1.40
Limestone	1.10	1.10
Broiler premix	0.25	0.25
Methionine	0.25	0.25
Lysine	0.25	0.25
Salt	0.25	0.25
Total	**100.00**	**100.00**

Table 2: Proximate composition of the experimental Diets and *V. amydgalina* leaf meal

Parameters	Starter diet	Finisher diet	*V. amydgalina* leaf meal
CP	23.80	19.63	22.75
Ash	8.10	6.70	12.00
Crude Fibre	4.02	4.50	24.10
MC	7.51	6.80	10.10
DM	92.49	93.20	89.90
EE	7.01	6.34	7.13
NFE	55.58	65.37	31.05

CP: Crude Protein, MC: Moisture contents, DM: Dry matter, EE: Ether Extract, NFE: Nitrogen Free Extract

Experimental Treatment

The experimental treatments were as follows:

T_1: Control diet (antibiotics administered orally for 3 days / week

T_2: Ethanolic extract of *V. amydgalina* (administered orally at 1% of average daily water intake for 3 days per week)

T_3: Aqueous extract of *V. amydgalina* (administered orally at 1% of average daily water intake for 3 days per week)

T_4: *V. amydgalina* leaf meal (mixed with feed at 1% of average weekly feed intake)

T_5: Negative control (without extracts or antibiotics)

Drugs, medication and *V. amydgalina* extractives was given in the drinking water *ad-libitum* for three (3) days in a week for six (6) weeks, and a two (2) weeks withdrawal period was strictly observed.

Data collection

Growth Performance

Data were collected daily on Weekly Feed Intake (WFI) and Weekly Weight Gain (WWG) while Feed to Gain Ratio (FGR) was computed using the appropriate formula.

Slaughter performance, carcass and organ evaluation

Two birds that had similar body weights and were quite close to the average weight of each replicate were chosen for slaughter on day 56. They were properly bled by hanging upside down and then scalded using water at the temperature of 60°C. They were de-feathered, eviscerated and dressed. The weights were recorded at each stage. The weight of the cut-up parts (thigh, breast, neck, wings, drumsticks and back); abdominal fats, organs (heart, kidney, lungs, liver, spleen, cleaned gizzard, crop and proventriculus) and offal (small intestine, large intestine and caecum) were recorded and expressed to live weight basis. Lengths of offal were also measured and expressed to the live weight of sacrificed birds (i.e cm/kg).

Statistical Analysis

The data collected were subjected to a one way analysis of variance (ANOVA) in a Completely Randomized Designed (CRD). The means separation was done using New Duncan Multiple Range Test of SAS (2010).

RESULTS

Growth performance of the broiler chickens administered *V. amydgalina* in feed or water

The performance of broiler chickens fed *V. amydgalina* in feed or water presented Table 3 showed no significant differences were recorded among the parameter taken except the FCR. All the treatments recorded better FCR when compared with those on control diet. However, the best was recorded in T_1 and T_3

Slaughter performance of the broiler chickens administered *V. amydgalina* in feed or water

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All the pre-slaughtered performance parameters measured and expressed in relative to live weight of the broiler chickens administered *V. amydgalina* leaf in feed or water were significantly ($p<0.05$) affected except for dressing percentage and intestinal %. The bled %, de-feathered % and eviscerated % which had their highest values in T_1, T_4 and T_4 respectively (Table 4).

Prima cuts and offals characteristics of the broiler chickens (expressed in relative to live weight) administered *V. amydgalina* in feed or water

The prima cuts of the birds were significantly ($p<0.05$) affected except hind-back and neck (Table 5), the table revealed that T_4 and T_5 had similar values for drumstick, foreback, wing, breast and head. However, all the offals parameters measured were not ($p>0.05$) significantly affected

Table 3: Performance of Broiler Chickens fed *V. amydgalina* leaf

Parameter	T_1	T_2	T_3	T_4	T_5	SEM
IBW (g/b)	670.00	657.50	654.00	612.50	655.00	93.40
FBW (g/b)	2956.00	2856.20	3026.50	2838.80	2960.00	37.70
AWWG (g/w)	457.20	439.80	476.30	445.30	461.00	65.30
AWFI(g/w)	823.25	866.50	851.50	859.50	859.25	35.40
FCR	1.80^{d}	1.97^{a}	1.78^{d}	1.93^{b}	1.86^{c}	0.01

^{abc} means with different superscript within rows are significantly different ($p<0.05$) T_1: Control (antibiotic only); T_2: *V. amydgalina* ethanol; T_3: *V. amydgalina* aqueous extract; T_4: *V. amydgalina* leaf meal; T_5: Negative control (no antibiotic, leaf extracts and leaf meal*)* SEM: Standard Error of Mean, IBW: Initial body weight, FBW: Final body weight, AWWG: Average weekly weight gain, AWFI: Average weekly feed intake, FCR: Feed Conversion Ratio

Table 4: Slaughter performance of the broiler chickens fed *V. amydgalina* leaf

Parameter	T_1	T_2	T_3	T_4	T_5	SEM
LW (Kg)	3.23	3.21	3.33	3.38	3.09	0.01
BW (%)	95.57^{a}	92.63^{bc}	96.70^{ab}	96.71^{ab}	91.88^{c}	0.76
DW (%)	90.22^{ab}	88.84^{bc}	92.79^{a}	93.00^{a}	86.18^{c}	0.71
EW (%)	81.92^{ab}	81.77^{ab}	80.37^{ab}	84.36^{a}	77.90^{b}	0.70
D (%)	70.32	69.81	70.10	72.30	68.73	0.61
IW (%)	3.25	3.58	3.19	3.13	3.25	0.10

^{abc} means with different superscript within rows are significantly different ($p<0.05$)

T_1: Control (antibiotic only); T_2: *V. amydgalina* ethanol; T_3: *V. amydgalina* aqueous extract; T_4: *V. amydgalina* leaf meal; T_5: Negative control (no antibiotic, leaf extracts and leaf meal*)* SEM: Standard Error of Mean, LW: Live weight, BW: Bled weight, DW: Defeathered weight, EV: Eviscerated weight D (%): Dressing percentage, IW: Intestine weight

Table 5: Offals characteristics of broiler chickens fed *V. amydgalina* leaf extracts, leaf meal and synthetic antibiotic (as % live weight)

Parameter (%)	T_1	T_2	T_3	T_4	T_5	SEM
Liver weight	1.27	1.27	1.31	1.18	0.03	0.03
Heart weight	0.36^{a}	0.35^{a}	0.36^{a}	0.19^{b}	0.03^{c}	0.03
Bile weight	0.07	0.90	0.10	0.88	0.09	0.01
Lung weight	0.36	0.38	0.35	0.32	0.41	0.01
Spleen weight	0.07	0.08	0.09	0.06	0.10	0.01
Whole gizzard	2.70	2.93	2.80	2.80	2.81	0.09
Open gizzard	1.84	1.82	1.87	1.87	1.86	0.06
Intestinal weight	80.10	83.70	83.70	80.80	79.20	1.47

^{abc} means with different superscript within rows are significantly different ($p<0.05$)

T_1: Control (antibiotic only); T_2: *V. amydgalina* ethanol; T_3: *V. amydgalina* aqueous extract; T_4: *V. amydgalina* leaf meal; T_5: Negative control (no antibiotic, leaf extracts and leaf meal*)* SEM: Standard Error of Mean

Table 6: Carcass cut evaluation broiler chickens fed *V. amydgalina* leaf

Parameter (%)	T_1	T_2	T_3	T_4	T_5	SEM
Shank	3.59^{ab}	3.55^{ab}	3.58^{ab}	3.01^{b}	4.11^{a}	0.12
Thigh	12.44^{ab}	10.90^{ab}	9.90^{b}	9.71^{b}	13.56^{a}	0.63
Drumstick	10.32^{b}	10.79^{ab}	10.78^{ab}	12.66^{a}	12.66^{a}	0.35
Foreback	5.58^{ab}	5.20^{b}	5.66^{ab}	6.66^{a}	6.66^{a}	0.23
Hindback	7.33	6.77	6.78	8.33	8.33	0.30

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Neck	4.68	4.24	4.18	4.94	4.94	0.17
Wing	7.28^{ab}	7.21^{ab}	7.14^{ab}	8.27^{a}	8.27^{a}	0.20
Breast	24.64^{b}	23.20^{b}	26.30^{ab}	29.32^{a}	29.32^{a}	0.79
Head	2.15^{ab}	2.15^{ab}	2.06^{ab}	2.28^{a}	2.28^{a}	0.06

^{abc} means with different superscript within rows are significantly different ($P<0.05$), T_1: Control (antibiotic only); T_2: *V. amydgalina* ethanol; T_3: *V. amydgalina* aqueous extract; T_4: *V. amydgalina* leaf meal; T_5: Negative control (no antibiotic, leaf extracts and leaf meal*)* SEM: Standard Error of Mean

DISCUSSION

The increase in weight gain among birds fed with *Vernonia amygdalina* is attributed to the additional nutrients provided by the leaves, corroborating (13) observations that many herbs and spice extracts function as growth enhancers by eliminating parasites that impede digestion and growth. Furthermore, the improved feed conversion ratio (FCR) observed can be linked to the medicinal properties of the extracts, which have been shown to boost digestive enzyme production and optimize nutrient utilization through enhanced liver function, as noted by (14). The FCR ratios of 1.97g to 1.78g in this study are more favorable and supported the report of (14) compared to the ranges reported by (15) and (16), who documented FCR values between 3.15 and 3.75 for birds on *Vernonia amygdalina*-supplemented diets. Furthermore, current result supported the report of (17) who reported improved FCR in birds fed diets containing 2 and 3% Vernonia amydgalina.

Notably, the inclusion of *Vernonia amygdalina* leaf meal did not adversely affect organ weights, aligning with findings from (18), who concluded that intermittent feeding did not significantly alter carcass weight or organ sizes among experimental groups. This is consistent with (19) and (20), who found no significant changes in organ weights due to the addition of prebiotics, probiotics, or antibiotics.

While breast muscle and drumstick weights are critical for economic returns in broiler production, this study revealed significant differences in these weights, aligning with (21), who noted improvements in muscle weights with enzyme supplementation. However, contrary to findings from (22) and (23), which indicated that enzyme additions lead to increased fat deposition in carcasses, this study observed no such fat accumulation across treatments.

CONCLUSSION AND RECOMMENDATION

i. *Vernonia amydgalina* leaf does not adversely affect growth performance and weight gain in broilers, making it a viable alternative to antibiotics in poultry production.

ii. Feeding *Vernonia amydgalina* does not adversely affect the liver, gut, or internal organs of broiler birds, indicating its potential for safe medicinal application in broiler diets.

iii. The study supports the use of *Vernonia amydgalina* in both aqueous extracts and leaf meal forms at a 1% inclusion rate.

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