

MONOGASTRIC PRODUCTION/NUTRITION

THE USE OF PURGE NUT (*Jatropha curcas*) AND BITTER LEAF (*Vernonia amygdalina*) AS PHYTOGENIC ADDITIVES ON CARCASS AND ORGAN WEIGHT OF BROILER CHICKENS

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Abstract

Growing concern about antibiotic growth promoters in animal nutrition and its health implication to consumers of poultry products has initiated efforts towards use of alternative growth promoting agents especially medicinal plants. This study was conducted to evaluate the use of *Jatropha curcas* and *Vernonia amygdalina* as phytogenic additives on carcass and organ weight of broiler chickens. A total of two-hundred and fifty- two (252) day old broiler chicks were allocated to twelve treatment groups in a 2x2x3 factorial arrangement. There were twenty- one chicks in each treatment with three replicates of seven birds each in a Completely Randomized Design experiment for a period of 42 days. The factorial layout is such that two (2) herbs (Purge nut & Bitter leaf), two (2) media of extraction (hot water & ethanol) and three (3) inclusion levels (0,10 & 20ml per litre of water) were used. At the end of the feeding trial, one bird from each replicate making three per treatment were fasted overnight and severe for carcass and organ analysis. Result revealed that Significant difference ($P<0.05$) was observed in neck, drumstick, wing, back, proventriculus, thymus, and bursa of Fabricius. Although herb types and inclusion levels exhibited significance on the carcass and organ parameters whereas extraction methods do not significantly influence them. However, the interactive effect of herb type, extraction media and inclusion levels showed no significant ($P> 0.05$) influence across the treatment. Conclusively, the use of medicinal plants as phytogenic additives can improve carcass yield and organ weight of broiler chickens.

Keyword: Oral feeding, Plant extracts, Phytogenic additives, Carcass studies, Broiler chickens

DESCRIPTION OF PROBLEM

There is no doubt that the productivity of animals in Nigeria and the world at large needs to be improved upon due to the rising demand for animals' products and its by-products. Therefore, the use of feeds as well as additives that are safe and of high nutritive quality is very crucial for optimum performance of livestock (1). In numerous countries Nigeria inclusive, the use of antibiotics as growth promoters in the poultry industry has declined due to consumer's preference (2), the deleterious effects of some of the synthetic feed additives on livestock and consumer health and the exorbitant prices of the commercial premixes (3) and anti-microbial growth promoters (AGPs). Thus, these have led to the promotion of phytogenic feed additives (PFAs) in poultry diets as it is economical and has no residual effect on man when properly administered. Phytogenic feed additives are compound derived from varieties of plants, its

parts, extracts and essential oils which possess active substances that are of significant importance. Some of its functions include anti-microbial and anti-oxidative effects on the poultry feeds and carcass as well as enhancement of flavour of feeds. Purge nut (*Jatropha curcas*) is a wonder plant in the family of euphorbiaceas and is a multi-purpose, large drought resistant plant with several attributes as potential biofuel crop and livestock feedstuff. It contains 37% oil and has relatively high crude protein content with specific value in livestock feeding (4), Bitter leaf (*Vernonia amygdalina*), is a small tree of Asteraceae family. It is drought tolerant although it grows better in humid environments (5). It is used in tropical Africa for multiple purposes especially in culinary and traditional medicine. It is popularly called bitter leaf because of its abundant bitter principles (6). The leaves contain a considerable amount of anti-nutritive factors like high level of tannic acid and saponin. Hence,

this study was conducted to evaluate the use of purge nut and bitter leaf as phytogetic additives on carcass and organ weight of broiler chickens.

MATERIALS AND METHODS

The experiment was carried out at the Poultry Unit of the Student's Project Farm while the preparation of the Purge nut and Bitter leaf extracts was done at the Post harvest and Processing Laboratory, Federal College of Animal Health and Production Technology, Ibadan, Oyo State, Nigeria. The experiment lasted for a period of 42 days. Fresh Bitter leaf and Purge nut leaves weighing 500 g was sourced from the premises of Federal college of Animal health and Production Technology Ibadan, each of them was prepared using different media of extraction (hot water infusion and ethanol). The preparation was done in ratio 1:4 (500 g of either Bitter leaf or Purge nut in 2000 liters of hot water or ethanol). The media of extraction was added into the different containers of bitter leaves prepared with hot water of 80°C and 99.6% pure alcohol and Purge nut leaves prepared with hot water of 80 °C and 99.6% pure ethanol respectively and soaked for 24 hours. The extracts were screened using a cheese cloth. Thereafter, 20 % of extract will be prepared using de-ionized water and then concentrated. The experiment was a Completely Randomized Design in a factorial arrangement of 2x2x3. The factorial layout is such that 2 herbs (Purge nut & Bitter leaf), 2 media of extraction (hot water & ethanol) and 3 inclusion levels (0,10 & 20ml per litre of water) were used respectively. A total of two hundred and fifty- two (252) day old broiler chicks were used for the experiment. Twelve treatment groups were assigned for the experiment having twenty- one chicks per treatments in three replicates of seven chicks each. The experiment diets were commercial feeds with 23% CP and 3200Kcal/kg ME at starter phase and 18% CP and 300Kcal/kg at finisher phase. The birds were thoroughly managed through the experiment. Feed and water were supplied *ad libitum*. Vaccination and Medication (control group) are administered as at when due. Three (3) birds from each treatment making a total of thirty-six (36) birds were starved overnight and slaughtered for carcass

analysis and the weight of the carcasses and organs were recorded.

RESULTS AND DISCUSSION

The main effect of herb type, extraction methods, and inclusion levels of *Jatropha curcas* (Purge nut) and *Vernonia amygdalina* (Bitter leaf) on carcass and organ weights of broiler chickens is presented on Table 1. Significant difference ($P < 0.05$) was observed in neck, drumstick, wing, back, proventriculus, thymus, and bursa of Fabricius. For herb types, back weight was highest in Bitter leaf (12.42%) and lowest in Purge nut (11.56%). Extraction methods showed no significant differences across parameters. Inclusion levels significantly influenced results: the highest neck weight (5.34%) was recorded at 20 mL, while the lowest (4.69%) occurred at 0 mL. Drumstick weight ranged from 9.60% (0 mL) to 10.66% (20 mL). Wing weight peaked at 8.17% (20 mL) and was lowest at 7.31% (0 mL). Proventriculus was highest at 0 mL (0.58%) and lowest at 10 mL (0.41%). Thymus weight was highest in JPA (0.34%) and lowest in BL (0.28%). Table 2 presents the interaction effect of Interaction between herb type, extraction methods and inclusion levels of Purge nut (*Jatropha curcas*) and Bitter leaf (*Vernonia amygdalina*) on carcass and organ weight of broiler chickens. No significant effects ($P > 0.05$) were observed across most parameters. However, notable variations were recorded. For live weight, the highest was observed in Bitter leaf hot water at 10 mL (2833.30 g), while the lowest was in Bitter leaf ethanol at 10 mL (2450.00 g). Carcass weight ranged from 56.11% (Bitter leaf hot water at 10 mL) to 72.82% (Bitter leaf ethanol at 10 mL). Back weight was highest in Bitter leaf ethanol at 10 mL (14.26%) and lowest in Purge nut ethanol at 10 mL (11.12%). Proventriculus was highest in Purge nut hot water at 0 mL (0.58%) and lowest in Bitter leaf ethanol at 10 mL (0.38%). Significant differences ($P < 0.05$) were observed in traits such as neck, drumstick, wing, back, thymus, and bursa of Fabricius. Among inclusion levels, the highest values for neck, drumstick, and back weights occurred at the highest inclusion, suggesting a dose-dependent enhancement in muscle deposition and possibly nutrient uptake. Meanwhile, organ weight changes such as increased thymus and bursal

weights may reflect immunomodulatory effects of the herbal extracts at certain doses. These patterns are consistent with findings that *V. amygdalina* inclusion improved carcass traits in broilers without adversely affecting internal organs (7). Inclusion of *Jatropha curcas* at low levels has been shown to enhance performance and carcass characteristics in finisher broilers with no deleterious effects on internal organs when levels were controlled (8). However, high levels of jatropha leaf meal have been reported to impair performance due to higher anti-nutritional factors (9), perhaps explaining why moderate inclusion in your study showed positive effects while avoiding negative impacts. Extraction method did not significantly influence carcass traits, suggesting that the bioactive compounds driving these effects are robust across extraction types or that dose level is the dominant factor (10).

CONCLUSION AND APPLICATION

The findings of this study that herb type, extraction methods, and inclusion levels of *Jatropha curcas* and *Vernonia amygdalina* significantly affect carcass yield and organ weights of broiler chickens. *Jatropha curcas* and *Vernonia amygdalina* demonstrated herb-specific effects depending on extraction medium and dosage. These results underscore the influence of phytogetic feed additives on physiological development.

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Table 1: Main Effect of herb type, extraction methods and inclusion levels of Purge nut (*Jatropha curcas*) and Bitter leaf (*Vernonia amygdalina*) on carcass and organ weight of broiler chickens

Parameters (%)	Herb type		Extraction methods				Inclusion levels						
	JPA	BL	SEM	P-value	Hot Water	Ethanol	SEM	P- value	0MI	10mLs	20mLs	SEM	P- value
Live wgt (g)	2749.50	2682.90	39.80	0.248	2757.80	2674.60	39.80	0.152	2766.70	2691.70	2690.30	48.70	0.459
Carcass wgt	69.39	68.35	1.08	0.505	67.77	69.97	1.08	0.164	69.55	67.06	70.01	1.33	0.261
Evis wgt	82.43	83.54	1.68	0.646	82.74	83.23	1.68	0.841	86.18	81.11	81.66	2.06	0.183
Neck	4.97	5.03	0.08	0.638	4.92	5.08	0.08	0.153	4.69 ^b	4.97 ^b	5.34 ^a	0.10	0.000
Breast	26.22	26.39	0.48	0.810	26.47	26.15	0.48	0.641	27.13	26.51	25.28	0.59	0.101
Thigh	12.97	13.07	0.20	0.744	12.94	13.10	0.20	0.557	12.81	12.83	13.42	0.24	0.151
Drumstick	10.06	10.27	0.16	0.360	10.08	10.25	0.16	0.449	9.60 ^b	10.24 ^{ab}	10.66 ^a	0.20	0.003
Wing	7.87	7.88	0.12	0.973	7.80	7.95	0.12	0.403	7.31 ^b	8.15 ^a	8.17 ^a	0.14	0.000
Back	11.56	12.42	0.19	0.003	11.94	12.04	0.19	0.688	11.44 ^b	12.07 ^{ab}	12.46 ^a	0.23	0.016
GD (full)	1.66	1.51	0.07	0.142	1.61	1.57	0.07	0.685	1.62	1.61	1.53	0.08	0.685
GD (empty)	1.12	1.09	0.04	0.514	1.12	1.09	0.04	0.668	1.07	1.16	1.08	0.05	0.365
Organ Weight													
Proventriculus	0.47	0.47	0.04	0.994	0.48	0.47	0.04	0.893	0.58 ^a	0.41 ^b	0.43 ^{ab}	0.04	0.028
Kidney	0.38	0.36	0.01	0.389	0.37	0.37	0.01	0.958	0.36 ^{ab}	0.33 ^b	0.41 ^a	0.02	0.958
Lung	0.38	0.38	0.01	0.698	0.39	0.37	0.01	0.277	0.39	0.36	0.40	0.02	0.209
Liver	1.70	1.69	0.04	0.875	1.69	1.70	0.04	0.894	1.72	1.65	1.71	0.05	0.591
Heart	0.41	0.39	0.02	0.440	0.39	0.40	0.02	0.654	0.41	0.38	0.40	0.02	0.532
Spleen	0.04	0.04	0.00	0.832	0.04	0.04	0.00	0.152	0.04	0.05	0.04	0.00	0.112
Thymus	0.34 ^a	0.28 ^b	0.02	0.014	0.31	0.32	0.02	0.770	0.34	0.32	0.28	0.02	0.147
Bursa of Fab.	0.04	0.04	0.00	0.760	0.04	0.04	0.00	0.116	0.04 ^b	0.04 ^{ab}	0.05 ^a	0.00	0.023

^{ab}means along the same row with different superscript are significantly different (P<0.05); JPA- *Jatropha curcas* extract, BL- Bitter leaf extract; EW- Eviscerated Weight, GD- Gizzard; BOF- Bursa of Fabricius

Table 2: Effect of Interaction between herb type, extraction methods and inclusion levels of Purge nut (*Jatropha curcas*) and Bitter leaf (*Vernonia amygdalina*) on carcass and organ weight of broiler chickens

Parameters (%)	Purge nut						Bitter leaf						SEM	P - value
	Hot water (mL)			Ethanol (mL)			Hot water (mL)			Ethanol (mL)				
	0	10	20	0	10	20	0	10	20	0	10	20		
Live Wgt (g)	2766.70	2816.70	2763.70	2766.70	2666.70	2716.70	2766.70	2833.30	2600.00	2766.70	2450.00	2681.00	97.40	0.426
Carcass Wgt	69.55	69.35	70.04	69.55	69.97	67.89	69.55	56.11	72.04	69.55	72.82	70.05	2.66	0.067
Evis. Wgt	86.18	80.04	81.25	86.18	81.14	79.81	86.18	79.10	83.72	86.18	84.18	81.88	4.12	0.918
Neck	4.69	4.90	5.11	4.69	4.99	5.47	4.69	4.74	5.39	4.69	5.27	5.40	0.196	0.378
Breast	27.13	26.01	26.06	27.13	26.57	24.45	27.13	26.67	25.82	27.13	26.79	24.80	1.18	0.953
Thigh	12.81	12.40	13.47	12.81	13.40	12.95	12.81	12.54	13.59	12.81	12.98	13.66	0.485	0.706
Drumstick	9.60	10.39	10.10	9.60	10.22	10.44	9.60	9.80	10.97	9.60	10.54	11.10	0.392	0.566
Wing	7.31	8.03	8.00	7.31	8.43	8.16	7.31	7.91	8.27	7.31	8.23	8.24	0.288	0.974
Back	11.44	11.13	12.42	11.44	11.12	11.81	11.44	11.76	13.41	11.44	14.26	12.18	0.457	0.055
GD (full)	1.62	1.81	1.56	1.62	1.53	1.82	1.62	1.60	1.44	1.62	1.52	1.30	0.166	0.451
GD (empty)	1.07	1.17	1.11	1.07	1.16	1.15	1.07	1.20	1.06	1.07	1.10	1.01	0.09	0.921
Organ Weight														
Proventriculus	0.58	0.42	0.43	0.58	0.39	0.45	0.58	0.46	0.40	0.58	0.38	0.45	0.09	0.959
Kidney	0.36	0.32	0.40	0.36	0.38	0.44	0.36	0.32	0.45	0.36	0.31	0.35	0.04	0.373
Lung	0.39	0.39	0.41	0.39	0.35	0.38	0.39	0.32	0.45	0.39	0.37	0.35	0.03	0.234
Liver	1.72	1.61	1.73	1.72	1.72	1.69	1.72	1.56	1.80	1.72	1.71	1.62	0.10	0.795
Heart	0.41	0.40	0.39	0.41	0.39	0.44	0.41	0.37	0.39	0.41	0.37	0.40	0.04	0.866
Spleen	0.04	0.04	0.04	0.04	0.06	0.04	0.04	0.05	0.04	0.04	0.04	0.05	0.01	0.064
Thymus	0.34	0.38	0.27	0.34	0.43	0.32	0.34	0.27	0.26	0.34	0.20	0.27	0.04	0.606
Bursa of Fab.	0.04	0.04	0.06	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.01	0.805

EW- Eviscerated Weight, GD- Gizzard; BOF- Bursa of Fabricius