INFLUENCE OF ESSENTIAL OIL (CRINA AND NUTMEG) ON PERFORMANCE AND BLOOD PROFILE OF STARTING BROILER CHICKENS

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Abstract
A study evaluated the efficacy of essential oils (Crina and Nutmeg) when added to basal diets on the performance and blood profile of starting broiler chicks. A total of 120 broiler chicks were given the basal diet supplemented with no additive (TI), 100 grams/tonne of Crina (T2), Nutmeg (T3), or Crina+Nutmeg (T4) in a study which lasted for 21 days. Growth performance, haematology and serum biochemical indices were determined. Results showed that highest (P<0.05) final weight (728.06 g), daily weight gain (24.56 g) and best feed: gain (2.21) were obtained for birds on Crina+nutmeg. Feed intake per bird per day increased as a result of essential oils addition in the diet. Survivability was not affected by the treatments imposed. Significant (P<0.05) higher total protein and albumin in birds fed mixtures of crina and nutmeg. Serum creatinine, uric acid and liver enzymes (AST and ALT) activity were significantly reduced when essential oils were fed to broiler chicks. It was concluded that dietary combination of essential oils (Crina and Nutmeg) resulted to improved body gain, better utilization of dietary nutrients, and reduced liver enzymes activity.

Introduction

Aromatic plants are receiving more attention as feed additive in the nutrition of broiler chickens. Not only because they are found suitable as alternative growth promoters (AGP), their essential oil components also exert antioxidant, antimicrobial, anticarcinogenic, immunomodulatory, hypolipidemic effects and flavouring properties (Botsoglou *et al.*, 2002; Lee *et al.*, 2004) which helps deliver high-quality, safe, and consumer-satisfying products. Several studies have shown that essential oil components of the aromatic plants positively influenced feed intake and endogenous enzymes secretion which enhance nutrient utilization thereby resulting to improved growth performance (Botsoglou *et al.*, 2002; Jang *et al.*, 2004; Williams and Losa, 2011). Crina (Crina Poultry plus) contains seven active ingredients including benzoic acid, thymol and eugenol whose activity in other plant extracts have been investigated. However, Jang *et al.* (2004) reported no significant different in growth performance of starting broiler chickens fed Crina. Nutmeg (*Myristica fragrans* H) contains active ingredients such as myristin, elemicin, eugenol and safrole. Nutmeg has a characteristic fragrance and has been widely used as spice and flavouring agents in beverages, its anti-inflammatory, stimulant and bactericidal activities had been explored in man. Nutmeg oil increases blood circulation, stimulates the cardiovascular system and serves as effective liver and kidney detoxifier. It has medicinal properties against nervous and digestive systems disorders (Sonavane *et al.*, 2001).

However, observed variation in the response of poultry birds to various essential oils used could be attributed to differences in botanic origin, processing methods, composition and concentration of active ingredients as well as inclusion level employed. Thus, the paucity of available information on the use of Crina and Nutmeg, singly and in combination, as feed additive for broiler chickens necessitate the need for this study.

Materials and Methods

One hundred and twenty 1-d-old, unsexed, Marshall broiler chicks were obtained from a commercial hatchery. They were randomly and equally allocated to four dietary treatments. A basal diet was prepared that had major ingredients of 570.0 g/kg maize, 230.0 g/kg soybean meal, and 128.0 g/kg wheat offal, and contained 230.5 g/kg crude protein and 12.51 MJ/kg ME. The basal diet was then divided into four portions and supplemented with no additive (Control), or 100 grams/tonne of Crina, Nutmeg, and mixtures of Crina and Nutmeg. (CRINA® Poultry used is a commercial blend manufactured by Akzo Nobel, Crina S.A, Switzerland, while nutmeg seed was purchased at a local market in Abeokuta, sun-dried and milled into a powdery form).

Birds were fed one of four diets. The diets were provided in mash form *ad libitum* throughout the experiment. Thirty birds were assigned to each treatment made of three replicates of ten birds for the period of 21 days.

Body weights and feed intake were determined weekly while FCR was estimated. Mortality was recorded as it occurred. Blood samples were collected from 2 birds in each replicate through brachial vein directly into EDTA-containing bottles and heparinized syringe for the determination of haematological indices and serum chemistry, respectively using standard procedure as described by Fafiolu *et al.* (2014). The data collected was subjected to One-way Analysis of Variance technique in a Completely Randomized Design using General Linear Model procedure of SAS (2007). In all instances, differences were reported as significant at $P<0.05$.

Results and Discussion

Dietary treatment significantly ($P<0.05$) influenced final liveweight, weight gain and FCR of the chicks (Table 1). Birds fed Crina+nutmeg had the highest ($P<0.05$) final weight (728.06 g), daily weight gain (24.56 g) and best feed: gain (2.21). The improvement in body gain of broiler chickens fed EO could be attributed to its positive effect on palatability and digestion stimulation. This agrees with the report of Ademola *et al.* (2009) who observed significant difference in body weight gain and FCR in broiler chicks fed garlic, ginger and their mixtures. Meanwhile, Jang *et al.* (2004) and Toghyani *et al.* (2010) observed similar body weight and FCR values across dietary treatments in broiler starter chickens fed crina and/or lactic acids, as well as thyme, respectively. Survivability was not affected by the treatments imposed.

Essential oils significantly ($P<0.05$) influenced WBC, leucocytes differential and serum biochemical constituents of broiler chickens. Non-significance in PCV and RBC implies the adequacy of dietary nutrients for normal haematopoiesis without any sign of anaemia. The values obtained were within the normal range reported for broiler chickens by Fafiolu *et al.* (2014). Relative higher WBC counts obtained in birds fed crina and nutmeg alone supports their immunomodulatory properties, which is an indication that the birds could perform their phagocytic functions for optimum immunity levels and higher disease resistance (Fafiolu *et al.*, 2014).

The significant ($P<0.05$) higher total protein and albumin in birds fed mixtures of crina and nutmeg indicates better protein utilization. Significant reduction in serum creatinine and uric acid could be attributed to higher dietary protein utilization for muscle tissue accretion and proper functioning of liver and kidney. Lowered ($P<0.05$) liver enzymes (AST and ALT) activities observed in birds fed essential oils indicates no toxic effect within the liver parenchyma of the birds, thus suggests its effectiveness as liver detoxifier.

Conclusion

The study concluded that dietary combination of essential oils (Crina and Nutmeg) resulted to improved body gain, enhanced feed efficiency, better utilization of dietary nutrients, and reduced liver enzymes activity. More detailed studies are still needed to elucidate the implications and standard dosage of Nutmeg in the diets of broiler chickens.

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Table 1: Performance of broiler chickens fed essential oils

Parameters	Essential oils				SEM	P-Value
	Basal diet*	Nutmeg	Crina	Crina+ Nutmeg		
Initial weight (g)	40.48	40.52	40.50	40.42	0.09	0.9796
Final weight (g)	680.27^{ab}	656.50^{b}	658.98^{b}	728.06^{a}	9.72	0.0215
Daily feed intake (g)	51.88^{b}	51.47^{b}	56.35^{a}	54.12^{ab}	0.69	0.0332
Daily weight gain (g)	22.85^{ab}	22.00^{b}	22.07^{b}	24.56^{a}	9.73	0.0208
Feed conversion ratio	2.28^{b}	2.36^{ab}	2.57^{a}	2.21^{b}	0.05	0.0309
Survivability (%)	96.91	95.96	97.67	98.67	0.92	0.1488

^{abc} Means on the same row having different superscript are significantly (P<0.05) different
**B – Basal diet with no additive, SEM - Standard Errors of Means*

Table 2: Haematological indices and serum chemistry of broiler chickens fed essential oils

Parameters	Essential oil				SEM	P- Value
	Basal diet*	Nutmeg	Crina	Crina+ Nutmeg		
PCV (%)	32.00	32.83	32.50	32.08	0.73	0.8507
RBC (x10^{12}/L)	4.65	4.63	4.75	4.78	0.09	0.9680
WBC (x10^{9}/L)	12.36^{b}	15.22^{a}	15.72^{a}	12.55^{b}	0.49	0.0073
Neutrophils (%)	26.53^{c}	33.14^{a}	27.62^{b}	32.98^{a}	3.82	0.0308
Lymphocytes (%)	73.50^{a}	64.17^{b}	70.50^{a}	64.25^{b}	2.53	0.0410
Serum Total protein (g/L)	50.45^{b}	53.23^{b}	51.49^{b}	61.53^{a}	2.53	0.0053
Serum Albumin (g/L)	30.12^{b}	32.34^{b}	30.32^{b}	42.31^{a}	3.15	0.0001
Serum Globulin (G/L)	20.33^{ab}	20.89^{a}	21.07^{a}	19.22^{b}	1.16	0.0873
A:G	1.48^{b}	1.55^{b}	1.44^{b}	2.20^{a}	0.26	0.0014
Serum Creatinine (mg/dL)	1.07^{ab}	1.15^{a}	0.92^{bc}	0.57^{c}	0.14	0.0137
Serum Uric acid (mg/dL)	9.27^{a}	7.00^{ab}	9.03^{a}	6.07^{b}	0.78	0.0752
AST (IU/L)	33.23^{a}	30.87^{ab}	29.75^{b}	27.26^{c}	5.14	0.0126
ALT (IU/L)	18.13^{a}	16.03^{b}	15.40^{b}	13.15^{c}	11.01	0.0208

^{abc} Means on the same row having different superscript are significantly (P<0.05) different
**B – Basal diet with no additive, A:G – Albumin globulin ratio, SEM - Standard Errors of Means.*