Effect of the inclusion of scent leaf (*ocimum gratissimum*) in diet on growth and haematology of growing rabbits

¹Buba, W., ²Duru, S., ²Metemilola, J., ³Uchendu, C. and ¹Iyiola-Tunji, A. O.

¹National Agricultural Extension and Research Liaison Services, Ahmadu Bello University, Zaria.

²Animal Science Department, Ahmadu Bello University, Zaria, Kaduna State

³Department of Pharmacology and Toxicology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria.

Corresponding Author: bubawahe@gmail.com

Phone number: +2348065399885

Abstract

The effect of scent leaf (Ocimum gratissimum) as feed additive in rabbit diet on growth and hematological parameters of rabbits was investigated using a number of 24 non-descript rabbits in an eight (8) weeks feeding trial. Four experimental diets were formulated to contain 0.0, 2.0, 4.0 and 6.0g scent leaf (SL) per kg of feed. The diets were randomly assigned to four treatment groups of 6 rabbits per treatment in a completely randomized design (CRD) experiment. Feed and water were offered ad libitum. Feed intake and weight gain was taken and used to calculate other growth performance parameters while blood sample (2 ml) was collected aseptically between 6:30 and 7:30 am from three rabbits per treatment and transferred into heparinised tubes which was used to determine the haematological parameters (PCV, Hb, red blood cells and white blood cells). The results showed that there was significant ($P<0.05$) differences in body weight gain and feed conversion ratio (FCR) across the four (4) treatment groups with treatment group fed scent leaf at 4.0g/kg diet having the highest weight gain and the best FCR. There was also significant difference ($P<0.05$) in albumin and cholesterol levels. Haematological parameters showed significant difference ($P<0.05$) across the treatment groups with treatment group fed 2.0g scent leaf having the lowest white blood cell ($8.00 \times 10^{12}/L$). In conclusion treatment group fed 4.0g scent leaf gave the best result in terms of weight gain and FCR.

Keywords: Scent leave, Rabbit, growth, haematology

Introduction

Phytogenic feed additives are defined as herbal substances included in the feed for the purpose of enhancing production and quality of animal products (Václavková *et al.*, 2010). Phytogenic feed additives comprise of a wide variety of herbs, spices, and essential oils. These feed additives help in enhancing the taste and improving the flavor of feed. Phytogenic feed additives are believed to have positive effects on digestion and intestinal health. Some of the beneficial effects of phytogenic feed additives are their ability to prevent digestive disturbances, improve feed

utilization and enhance animal performance (Krieg *et al.*, 2009; Karaskova *et al.*, 2015).

This class of additive is gaining high interest especially in livestock sector due to the ban on the use of antibiotics as growth promoters in Europe in 1999, and also the high cost of synthetic drugs and their residual effects on livestock and their products (Mirzaei *et al.*, 2012). These plant-derived products are natural, less toxic, residue free and are thought to be ideal feed additives in animal production (Hashemi *et al.*, 2010). The use of phytogenics in feed production can restrict

growth of fungi; production of mycotoxins in animal feeds and also reduces the need of use of drugs. Feeding phytogenics products do not require any withdrawal periods as reported by (Marcincak *et al.*, 2010).

Materials which can be used as phytogenic feed additives include herbs, non woody plants known to have medicinal properties, spices with intensive smell or taste which include: mint, sage, thyme, garlic, scent leaf etc. Scent leaf (*Ocimum gratissimum*) is an herbaceous perennial grass and it is widely distributed throughout the tropics widely naturalized in many regions (Nnabugwu, 2010; Odoemelam, *et al.*, 2012). It is also a known traditional medicinal plant used in curing different ailments, (Onajobi, 1986; Kokwaro, 1993). Some chemical compounds and active ingredients from this plant that makes it exhibit strong antimicrobial properties include Eugenol, Cinamate, Camphor and Thymol (Adebolu and Oladimeji, 2005; Matasyoh *et al.*, 2007). However, available information on the use of *Ocimum gratissimum* as feed ingredient in poultry diets is still scanty. Currently, the demand for these plants and their derivatives has increased because they are natural, eco-friendly and generally recognized as safe products. Therefore, phytogenic plants and their extracts have the potential to become new generation substances for animal nutrition and health. Therefore, the objective of the study is to determine the effect *Ocimum gratissimum* as phytogenic feed additives on performance of growing rabbits.

Materials and methods

Experimental site

The study was conducted at the rabbitry unit of the Skill Acquisition and Development Centre of National Agricultural Extension and Research Liaison Service (NAERLS), Ahmadu Bello University, Zaria. Zaria is located within

the Northern Guinea Savannah Zone of Nigeria at latitude 11° 09' 06" N and longitude 7° 38' 55" E, at an altitude of 706m above sea level (GPS 2014). The area falls within the Northern-Guinea Savannah Zone having an average annual rainfall of 1100mm, which starts from late April or early May to mid-October. The maximum temperature varies from 26°C to 35°C depending on the season while the mean relative humidity during harmattan period and the wet season are 21 and 72%, respectively.

Source and preparation of scent leaf (*Ocimum gratissimum*)

Fresh leaves of *Ocimum gratissimum* were purchased fresh from Sabon Gari Market, Zaria. The leaves were chopped and air-dried. The dried leaves were then ground and stored in bags properly.

Source of Rabbits

A total of twenty four (24) weaned non-descript rabbits of five weeks old were purchased from a commercial rabbit seller in Samaru market Zaria, Kaduna State.

Management of experimental rabbits

The rabbits were quarantined for 1 week. The rabbits were raised in individual cages and also placed on the experimental diet at different levels of inclusion of scent leaf. The rabbits were weighed before the commencement of the study. They were balanced for weight and randomly allocated to the four dietary treatments in a Completely Randomized Design having 6 replicates per treatment. Feed and water was given to the animals on daily basis for 8 weeks.

Experimental Diets

A basal diet was prepared and scent leaf was included at different levels of 0.0, 2.0, 4.0 and 6.0g per kg of feed. Other ingredients in the feed are as shown in table 1 and table 2 shows the nutrient composition of the experimental diet.

Table 1: Composition of formulated diet

Ingredients	Percentage
Maize	25.00
Soyabean meal	5.00
Maize offal	15.00
Brewers dried grains	25.00
Groundnut cake	12.00
Blood meal	2.00
Rice offal	12.00
Bone meal	3.00
Table salt	0.25
Premix*	0.25
L-Lysine	0.25
DL-Methionine	0.25
Total	100

*Provide per kilogram of diet: vitamin A, 10000 IU (retinyl acetate); cholecalciferol, 3000 IU; vitamin E, 8.0 IU (DL -a-tocopheryl acetate); K, 2.0 mg; thiamine, 2.0mg; pyridoxine, 1.2mg; cyanocobalamin, 0.12mg; niacin, 1.0mg; fol ic acid, 0.6mg; choline chloride, 500mg; Fe, 60mg; Mn, 100mg; Cu, 8.0mg; Zn, 50mg; Co, 0.45mg; I, 2.0mg; Se, 0.1mg

Table 2: Nutrient Composition of Experimental Diet

Nutrients	%
Dry matter (%)	94.63
Crude protein (%)	16.02
Crude fibre (%)	14.11
Ether extract (%)	3.91
Ash (%)	10.21
Nitrogen free extract (%)	50.38
Metabolize energy (Kcal/kg)	2607.80

Measurement of growth performance

Feed consumption and body weight of the rabbits were recorded weekly. Body weight gain was calculated as the difference between the final weight and the initial weight. Feed conversion was calculated as the ratio between feed intake and weight gain.

Haematological analysis

At the end of the experiment (8 weeks), blood sample (2 ml) from each replicate was collected aseptically from the marginal ear vein and the blood sample was transferred into well labelled heparinised tubes which was used to determine the haematological parameters (PCV, Hb, red blood cells and white blood cells) at Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria using Abbott

Haematological Analyser (Cell-Dyn 1700®, Abbott Park, Illinois, U.S.A.).

Evaluation of Albumin and cholesterol

Blood samples were taken at slaughter time from each rabbit into heparinized tubes, which was taken to the Department of Histopathology, Ahmadu Bello University Teaching Hospital, Shika, Zaria for the determination of albumin and cholesterol levels which was calorimetrically determined using ELISA multiplex commercial kits (Pfizer Animal Health, New York) following the steps as described by manufactures.

Statistical analysis

Data were subjected to the analysis of variance (ANOVA) using the general linear model procedure of SAS (2001). Significant differences among treatment

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means was separated using the Duncan's Multiple Range Test in the SAS, version 9.0 package.

Results

Table 3 shows the phytochemical analysis of scent leaf. The feed intake and growth performance of the rabbits fed *Ocimum gratissimum* are presented in table 4. There were significant increase ($P<0.05$) in the feed intake and final body weight. The lowest (3441.3g) feed intake was recorded in the control group while no statistical difference observed in treatment group fed 2.0 and 4.0g/kg *Ocimum gratissimum*

leaves. The feed intake of treatment group fed 6.0g/kg *Ocimum gratissimum* leaves was statistically similar to treatment groups fed 2.0 and 4.0g/kg.

Rabbits fed 4.0g/kg feed had the highest (851.17g) weight gain while the least (641.6g) weight gain is in the control group. The best feed conversion ratio (2.79) was recorded in the treatment group fed 4.0g/kg *Ocimum gratissimum* while the highest (3.08) feed conversion ratio was recorded in the control group.

No mortality was recorded in all the treatment groups during the experimental period.

Table 3: Phytochemical analysis of scent leaf (*Ocimum gratissimum*)

Phytochemicals	Test	Results
Carbohydrate	Molish test	++
Saponin glycosides	Frothing test	+
Phenolic compounds	Ferric chloride test	+
Flavonoids	NaOH test	++
Tannin	Ferric chloride test	+
Cardiac glycoside	Kellakiliani test	++
Alkaloids	Wargner's test	++
Anthracenes derivatives	Bontrager's test	-

Key: ++ = highly positive, + = positive, - = negative

Table 4: Effect of Scent leaf (*Ocimum gratissimum*) fed to rabbits on growth performance

Parameters	Treatments				SEM
	T1(0.0g)	T2(2.0g)	T3(4.0g)	T4(6.0g)	
Initial body weight (g/rabbit)	477.40	470.67	476.83	483.83	41.1
Final body weight (g/rabbit)	1119.0 ^c	1202.5 ^b	1328.0 ^a	1223.8 ^b	25.1
Total body weight gain(g/rabbit)	641.6 ^c	731.83 ^b	851.17 ^a	739.97 ^b	25.1
Total feed intake (g/rabbit)	3441.3 ^b	3760.7 ^a	3705.7 ^a	3597.7 ^{ab}	117.5
Feed conversion ratio	3.08 ^b	3.13 ^a	2.79 ^d	2.94 ^c	0.2
Mortality (%)	0.0	0.0	0.0	0.0	0.0

^{abc}Means within the same rows with similar superscripts are not significantly different

Table 5 shows the haematological parameters of the experimental rabbits. The haemoglobin (Hb) concentration, packed cell volume (PCV) and white blood cells (WBC) had significant ($P<0.05$) difference across the treatment. No statistical difference was observed in treatment groups fed 0.0, 2.0 and 4.0g/kg scent leave in terms of PVC and Hb. WBC was higher

(11.10 x 10¹²/L) in treatment group fed 4.0g/kg scent leaves while the least was recorded in the treatment group fed 6.0g/kg scent leaves.

Table 6 shows biochemical parameters of the experimental rabbits. Significant ($P<0.05$) differences were recorded among the treatment means in albumin. Albumin level was higher (51.67g/dl) in treatment

group fed 4.0g/kg scent leaves while the least is in the control group. Higher levels (3.77mg/DL) of cholesterol was recorded in the control group while no significant

($P>0.05$) difference was observed in treatment group fed 2.0, 4.0 and 6.0g/kg scent leaves. No significant difference observed in terms of total protein in all the treatment groups.

Table 5: Effect of Scent leaf (*Ocimum gratissimum*) fed to rabbits on haematological parameters

Parameters	Treatments				SEM
	T1(0.0g/kg)	T2(2.0g/kg)	T3(4.0g/kg)	T4(6.0/kgg)	
PCV (%)	33.00 ^a	32.33 ^a	33.33 ^a	28.33 ^b	1.8
Hb (g/dl)	10.97 ^a	10.77 ^a	11.07 ^a	9.40 ^b	0.6
WBC ($\times 10^{12}/L$)	8.80 ^b	8.00 ^{bc}	11.10 ^a	7.27 ^c	0.5

^{abc}Means within the same rows with similar superscripts are not significantly different

Table 6: Effect of Scent leaf (*Ocimum gratissimum*) fed to rabbits on blood biochemical parameters

Inclusion levels (g/kg diet)	Parameters		
	Albumin (g/dl)	Cholesterol (mg/dL)	Total protein (g/dL)
0.0	43.67 ^{bc}	3.77 ^a	5.80 ^a
2.0	39.00 ^c	3.03 ^b	5.87 ^a
4.0	51.67 ^a	3.47 ^b	5.67 ^a
6.0	45.67 ^b	3.53 ^b	5.67 ^a
SEM	2.7	0.3	0.2

^{abc}Means within the same columns with similar superscripts are not significantly different

Discussion

The increase in the weight gain observed in the treatment groups fed scent leaves could be due to positive effect of scent leaves on feed quality and health of animals as well as increase in the feed consumption of the birds. This is in agreement with McMullin (2000) that observed that most herbs and extracts of spices work as growth promoters by killing parasites that hinder digestibility and growth performance of birds. Also, According to Adepoju and Oyewole, (2008), *Ocimum gratissimum* leave is rich in minerals and vitamins which helps stimulate appetite when fed to rabbits. Ibrahim *et al.*, (1997) reported that *Ocimum gratissimum* could be used for spicing and seasoning of food and as such could increase the palatability of food. The aroma from the *Ocimum gratissimum* leaves which are mainly eugenol methyl cinnamate, camphor and thymol (Nakamura *et al.*, 1999), might have some feed digestive properties that increase the

appetite of the animals. Also the increase in growth noticed in the treatment group fed 4.0g/kg *Ocimum gratissimum* could be due to the absorption of fat which lead to more gain when compared with control group as reported by (El-Shenawi 1992)

Also the better feed conversion ratio observed in the *Ocimum gratissimum* treated groups could be attributed to their positive effects on nutrient digestibility as reported by (Madrid *et al.*, 2003 and Hernandez *et al.*, 2004). Similarly Ibrahim *et al.*, (2000) reported an increase in feed conversion when male weaned New Zealand White rabbits fed diets supplemented with Peppermint leaves at 0.5%.

The mean values of Haemoglobin, PCV, and WBC obtained from all the experimental rabbits are within the range of haematological values of rabbits. The difference observed in the mean WBC values of rabbits fed 4.0g/kg *Ocimum gratissimum* implies differences in the

intrinsic body defense system as reported by (Ganong, 1991). Similar result was also reported by Ibrahim *et al.* (2000) that found significant increase in RBCs count, Hb and PCV% in males of New Zealand rabbits fed diet for eight weeks supplemented with 0.5% of peppermint

The reduction in cholesterol could be the effect of flavonoids which are found in *Ocimum gratissimum* and are known to reduce cholesterol level. The reduced level of cholesterol observed in the *Ocimum gratissimum* treated groups agrees with the report of Rai *et al.* (1997) which showed that the administration of *Ocimum gratissimum* reduced serum total cholesterol in rabbits. Similarly, El-Manylawi *et al.* (2005) reported that total lipid and cholesterol of growing rabbits fed diets containing 6 or 9% of spearmint and geranium by-product were significantly decreased.

Conclusion and recommendation

The results of this study revealed that *Ocimum gratissimum* leaf extracts can be used to improve growth performance and some blood components of rabbits. The result also provided a hope to the natural and safe alternative to the antibiotics drugs that are commonly used in many developing countries like Nigeria. It is therefore recommended that inclusion of scent leaf in diet of rabbits at 4g/kg feed can improve their growth performance and also reduce the cholesterol level.

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Received: 20th September, 2016

Accepted: 23rd February, 2017