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Growth Response and Carcass Characteristics of Weaner Grass cutters Fed Diets Supplemented with *Polyalthia longifolia* Seed Oil as a Natural Growth Promoter

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ABSTRACT

A 42 day feeding trial involving twenty five, seven weeks old male grass cutters with an initial weight of 604.9 – 609.7g was conducted to determine the growth response and carcass characteristics of weaner grass cutters fed diets supplemented with *P. longifolia* seed oil as a natural growth promoter. Five diets were formulated to contain basal diet + 0% *P.longifolia* oil and Oxytetracycline for T1 this served as negative control while T2 was fed basal diet containing Oxyteteracycline (synthetic growth promoter) as positive control at 25mg/kg, T3, T4 and T5 were fed basal diet supplemented with *P. longifolia* oil as natural growth promoter at 0.2%, 0.3% and 0.4% respectively. The grass cutters were randomly divided into five groups of five grass cutters each with each grass cutters serving as replicate in a completely randomized design experiment. Feed and clean water were provided ad libitum. There was a significant (P<0.05) differences among the treatments for final live weight, feed conversion ratio, carcass weight and dressing percentage. There was no significant differences (P>0.05) in mortality, feed intake, daily water intake, feed cost per kg and relative weights of the organs examined (liver, kidney, heart, spleen, testis, intestine and abdominal fat). The result of this study indicates that the inclusion of *P. longifolia* oil up to 0.40% has no deleterious effect on the performance and health status of grass cutters.

INTRODUCTION

The use of antibiotics growth promoter at sub therapeutic level (AGPs) has been practiced in the poultry industry since 1946, but recent research has proven that its continuous use can cause bacteria resistance and possible transmission of the antibiotic residues into the food chain (Kristy Kemmett., 2015; Sanjyal and Sapkota., 2011). Because of food safety concerns, there has been a recent ban in the use of antibiotics (synthetic) in livestock diets by European countries, research are now been channeled on the use of medicinal plants as alternative in animal production, because people are now informed on the dangers of the use of synthetic drugs, its toxicity, high cost and adverse effects in the human body (Adu et al., 2009).

There are several medicinal plants that are widely used by researchers which are continuously revolutionizing the face of the earth through all the distinctive benefits they render (Blessing Okpala, 2016). According to Al-Harthi., 2002; Singh et al., 2007) Herbs and various plant extracts or essential oil are used in livestock feed to control disease, improve performance, carcass characteristics and economic return. Essential oil are compounds produced by plants for defense against external factors and protection against pathogens and predators (Huyghebaert, 2003), their main constituents are lipophilic, liquid and volatile and belongs to chemical group of alcohols, aldehydes, esters, ketones, ethers, terpenes and phenols (Máthé, 2009). Most essential oil exert their antimicrobial effects by affecting bacterial cell wall, breaking down and coagulating proteins (Dorman and Deans, 2000) especially *Polyalthia longifolia* oil which is found to be rich in vitamins A, D and E, saturated fatty acid, mono unsaturated fatty acids and poly unsaturated acids. It is also loaded with Omega-9 fatty acid that is essential in lowering serum cholesterol, prevents the risk of artherosclerosis and maintaining healthy skin.

Polyalthia longifolia is a tall evergreen tree commonly used as ornamental street tree, it posses significant biological and pharmacological activities such as antibacterial, antifungal, antitumor and antioxidant properties. Almost all parts of P.longifolia plants are used in Indian traditional system for the treatment ofvarious ailmentsand the significant medicinal properties was further reported via scientific investigations (Subramanion et al, 2013). Literature report of few phytochemical screening tests on *P. longifolia* shows the presence of saponins, carbohydrates, alkaloids, tannins, resins, steroids, glycosides and flavonoids as major phytochemical constituents (Prateek et al, 2014). Traditionally in India, the plant has been used for the treatment of helminthiasis, skin diseases and digestive disorder in human and animals including grass cutters.

Grass cutters (*Thryonomys swinderianus*) is a wild hystricomorph rodent widely distributed in the African sub region and exploited in most areas as a source of animal protein (N.R.C., 1991), it is a monogastric herbivore and a good food converter like the rabbit and other rodents. The protein content of grass cutter meat is about 20% which compares favorably with other sources of animal protein (Omole et al., 2011) and it is also rich in essential amino acids such as methionine, lysine, leucine, isoleucine etc

Sharma et al (2011) evaluated the anti-inflammatory activity of ethanolic and aqueous extracts of P. longifolia leaf meal in albino wister rats, results revealed that both anti-inflammatory activity are comparable. Rota et al (2004) reported the antimicrobial properties of essential oil, improvement in growth parameters and carcass yield have been in broilers fed supplemented with garlic essential oil (Langhout et al .,2000). Essential oil has also been found to have antibacterial ability, and also antioxidant, anti-inflammatory, anti carcinogenic, digestion stimulating and hypolipidemic activities (Viuda-Martos et al., 2010).

There is lack of information on regarding the growth response of weaner grasscutters fed diets supplemented with P.longifolia oil. The main objective of this study was to investigate the growth response and carcass characteristics of weaner grass cutters fed diet supplemented with *Polyalthia longifolia* seed oil.

MATERIALS AND METHODS

Site of the experiment

The experiment was carried out at Dan-malafia Farms, Ibadan, Oyo state, Nigeria. The experiment was carried out between the months of January to March, 2017.

Preparation of experimental diets

Fresh seeds of Polyalthialongifolia used for the experimental diets were collected from the farm premises, manually separated from the seed coat; it was then sun dried for 10 days and grinded. Oil was later extracted using soxhlet extraction method.

Experimental animals and management

Twenty five (25) male grass cutters (weaners) with an average weight of 604.9 and 609.7grams were randomly assigned to five treatments of five grass cutters per group in a completely randomized design. The hutches were cleaned and disinfected before the arrival of the animals. The grass cutters were allowed one week adjustment period during which they were fed with control diet and given prophylactic treatment of Promectin against endo and ecto- parasites before they were placed on experimental diets. The grass cutters were individually housed in cages measuring 32cm×35cm×40cm (width×length×height) and equipped

with feeding and watering troughs. Feed and clean water were supplied throughout the experiment which lasted for 42days.

Experimental diets

Five experimental diets were formulated for the experiment as presented on Table 1. The animals in treatment T1 was given basal diet containing 0% *P. longifolia* oil and Oxytetracycline this served as negative control while T2 was fed basal diet containing Oxyteteracycline (synthetic growth promoter) as positive control at 25mg/kg, T3 and T4 were fed basal diet supplemented with *P. longifolia* oil as natural growth promoter at 0.2%,0.3% and 0.4% respectively.

Data collection

The record of weekly body weight, feed intake, feed conversionratio, mortality, feed cost per kilogram and daily water intake were recorded.

Carcass evaluation

At the end of the experiment, three grass cutters were randomly selected from each treatment for carcass evaluation. Prior to slaughter the animal were starved over night to reduce their gut contents only water was given to the animals before their live weights were taken. The grass cutters were stunned and slaughtered by severing the veins. After evisceration, the organs were removed and weighed. The dressing percentage (%) was calculated using the formula:
Dressing percentage = dressed weight of the carcass/live weight × 100.

Proximate Analysis

The proximate components were determined by the A.O.A.C (1990).

Statistical analysis

All the data collected were subjected to analysis of variance (ANOVA) for a Completely Randomized Design (CRD) according to Steel and Torrie (1986).

Table 1: Percentage composition of the experimental diets

Ingredients	Diets				
	T1	T2	T3	T4	T5
Maize	40.50	40.50	40.50	40.50	40.50
Wheat offal	30.00	30.00	30.00	30.00	30.00
Brewers dry grain	12.50	12.50	12.50	12.50	12.50
Soya meal	8.00	8.00	8.00	8.00	8.00
Fish meal (72%)	6.00	6.00	6.00	6.00	6.00
Di calcium phosphate	2.00	2.00	2.00	2.00	2.00
Growers premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
P. longifolia oil (%)	-	-	0.20	0.30	0.40
Oxytetracycline(mg/kg)	-	25	-	-	-
Total	100.0	100.0	100.0	100.0	100.0
Determined analysis					
Protein (%)	18.09	18.10	18.10	18.10	18.10
Crude fibre (%)	7.70	7.70	7.70	7.70	7.70
ME (Kcal/kg)	2456.0	2458.0	2458.0	2458.0	2458.0

Premix supplied per kg diet :- Vit A, 8,000 I.U; Vit E, 5mg; Vit D3, 3000I.U, Vit K, 3mg; Vit B2, 5.5mg; Niacin, 25mg ; Vit B12, 16mg ; Choline chloride, 120mg ; Mn, 5.2mg ; Zn, 25mg ; Cu, 2.6g ; Folic acid, 2mg ; Fe, 5g ; Pantothenic acid, 10mg ; Biotin, 30.5g ; Antioxidant, 56mg

Table 2: Growth Performance of weaner grass cutters fed varying levels of Oxytetracycline and P.longifolia oil

	Diets					
Parameters	1	2	3	4	5	SEM
Number of grass cutters	5	5	5	5	5	-
Initial body weight (g)	607.0	604.9	609.7	606.1	605.1	13.4
Final body weight (g)	1280.1^{c}	1406.1^{b}	1507.2^{b}	1507.3^{ab}	1566.7^{a}	33.1
Final weight gain (g)	673.1	801.2	897.5	901.2	961.6	30.8
Daily weight gain (g)	16.03	19.07	21.37	21.45	22.90	0.39
Feed intake (g)	70.01	70.88	71.01	71.23	71.29	2.70
Feed conversion ratio	4.37^{a}	3.66^{ab}	3.17^{b}	3.13^{b}	3.00^{c}	0.40
Daily water intake (ml)	870.0	872.0	871.0	870.0	873.0	20.1
Mortality	0	0	0	0	0	-
Cost per kg (N)	74.1	74.6	74.9	75.0	75.1	-

^{abc} means different superscript along rows differs significantly at P<0.05

Table 3: Carcass characteristics and relative organ weights of weaner grass cutters different levels of Oxytetracycline and P.longifolia oil.

	MLM					
Parameters	T1	T2	T3	T4	T5	SEM
Final body weight (g)	1280.1^{c}	1406.1^{b}	1507.2^{b}	1507.3^{ab}	1566.7^{a}	33.1
Carcass weight (g)	680.1^{c}	806.1^{b}	907.2^{b}	907.3^{a}	966.7^{a}	20.4
Dressing percentage (%)	53.10^{c}	57.32^{c}	60.19^{b}	60.20^{a}	61.70^{a}	0.40
Head (% five weight)	7.21	7.11	7.14	7.06	7.11	0.68
Liver (g)	3.48	3.17	3.28	3.19	3.18	0.21
Kidney (g)	1.59	1.46	1.44	1.41	1.50	0.01
Heart (g)	0.59	0.56	0.58	0.51	0.50	0.20
Lungs (g)	1.09	1.04	1.06	1.01	1.02	0.02
Spleen (g)	0.35	0.30	0.36	0.32	0.37	1.06
Testis (g)	0.26	0.23	0.27	0.25	0.23	1.12
Abdominal fat (g)	2.41	2.17	2.11	2.13	2.10	0.09

^{abc} means different superscript along rows differs significantly at P<0.05

Figure 1: WeanersGrasscutters

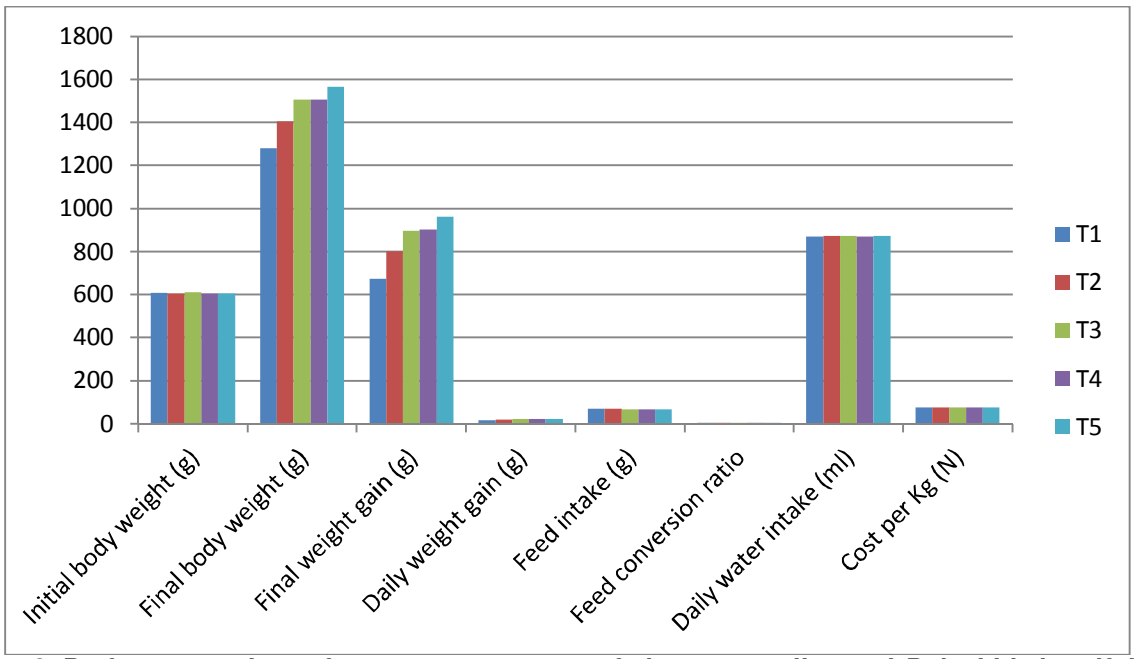

Figure 2: Performance chart of weaner grass cutters fed oxytetracyline and *Polyalthia longifolia* oil

RESULTS

Table 1 reveals the composition of experimental diet. The proximate components shows that the crude protein of the experimental diet ranges between 18.09-18.10% while those of the energy is between 2456.0 – 2458.0 ME kcal/kg however, all values fall within the range reported by Kusi et al (2012) for growing grass cutters.

The growth performance as influenced by the diets is presented on Table 2. The average final weight of the grass cutters ranges between 1280.1 – 1566.7 g, there was a significant difference ($P<0.05$) among the treatments in terms of the live weight. The daily weight gain values obtained are 16.03, 19.07, 21.37, 21.45 and 22.90 (g) for treatments 1, 2, 3, 4 and 5 respectively while those of feed intake are 70.01, 70.88, 71.01, 71.23

and 71.29 (g) for treatments 1, 2, 3, 4 and 5. The feed intake slightly increased from treatment 1 to 5, however, there were no significant (P>0.05) differences among the dietary treatment. The feed conversion ratio values obtained are 4.37, 3.66, 3.17, 3.13 and 3.00 for treatments 1, 2, 3, 4 and 5 respectively while those of daily water intake values are 870.0, 872.0, 871.0, 870.0 and 873 (ml) for treatment 1, 2, 3, 4 and 5 respectively.The costs per kg rates are 74.1, 74.6, 74.9, 75.0 and 75.1 (N). No mortality was recorded throughout the experimental period.

The carcass characteristics and relative organ weights of weaner grass cutters fed oxytetracycline and P. longifolia oil is presented on Table 3. The carcass weight values obtained are 680.1, 806.1, 909.2, 909.3 and 966.7 (Kg) for treatments 1, 2, 3, 4 and 5 respectively while the dressing percentage (%) values obtained are 53.10, 57.32, 60.19, 60.20 and 61.70 for treatments 1, 2, 3, 4 and 5. The relative weights of the head, liver, heart, lungs, spleen, testis and abdominal fat of the grass cutters were not significantly (P>0.05) different from the control diet.

DISCUSSION

The grass cutters fed P. longifolia oil had a higher weight than those fed the negative control diet, however, there was a significant (P>0.05) difference in final live weight across the treatment groups. The best performance was observed in grass cutters fed 0.3% (T5) dietary P. longifolia oil; they attained the highest feed consumption, daily weight gain and better feed conversion ratio, those fed 0% (T1) oxytetracycline and P.longifolia oil (negative control) had the lowest weight gain of 16.03g/grass cutter/day. This observation may be as a result the presence of cis-9-octadecenoic acid and essential vitamins (A, tocopherols and D) in P. longifolia oil, according to Oyediji et al (2012), cis-9-octadecenoic has a lot of influences when present in a diet and it also plays a vital role in strengthening the immune system of an animal. The results are in accordance to the results of Alagbe, J.O (2017) when P.longifolia leaf meal was included in the diets of broilers and Eaved et al (2012) when garlic powder was supplemented in the diets of broiler chicks. According to Ghosh et al (2008) the antibacterial activity of P. longifolia was higher than the antibacterial activity of ethyl acetate and n-butanol fractions of ethanol fractions of ethanol extract of Bacopamonnieri against P. aeruginosa.

The presence of organic compounds like terpenoids and diterpenoids which gives the characteristic smell in P. longifolia oil did not significantly (P<0.05) the feed intake of the animals across the treatment groups, this observation agrees with the views of Yalcin et al (2009) and Onibi et al (2009). According to Ogunbinu et al (2007) terpenoids and diterpenoids are present in the leaves, root and barks of Polyalthialongifolia. According to Ghosh et al (2008) P. longifolia contains alkaloids, quercetin, bulbocapnin, campesterol, susquiterpenoids and diterpenes which contribute to the analgesic activity. According to Omole et al (2012) the quantity of feed consumed by grass cutters depends on the age of the grass cutter, quality of feed, environmental condition, genetic factor and health status.

The feed conversion ratio (FCR) resulting from the dietary treatment range between 3.00and 4.37. The best FCR was recorded in grass cutters fed 0.03% P. longifolia oil while the poorest value of FCR was displayed by grass cutters fed 0% oxytetracycline and P.longifolia oil. This report is in harmony with the findings of Alagbe (2017) when Polyalthialongifolia – Garlic powder mixture was used to feed laying Japanese quails.

No mortality was recorded was recorded among the treatment different treatment groups throughout the experimental period. This could be due to the medicinal nature of P. longifolia, *P. longifolia*performs several functions such as antibacterial, antifungal, anti diabetic, antitumor, anti-ulcer, antioxidant and used in the treatment of the digestive system. Pharmacological studies on the bark and leaves of the plants shows display effective antimicrobial activity (Faizi et al, 2003), cytotoxic function (Chang et al, 2006; Chen et al, 2006), hypotensive effects (Saleem et al, 2005).

The non-significant (P>0.05) differences in the values obtained for daily water consumption and feed per kg is contrary to the reports of Alagbe, J.O (2016) on the nutritional evaluation of sweet orange peel as a replacement for maize in the diets of growing grass cutters.

The study shows that the dressing percentage of the grass cutters which ranged from 53.10 -61.10 were not significant (P>0.05) different from each other. According to Bamgbose et al (2004) dress weight and internal organ weight characteristics are veritable indicators of the level of reduction or otherwise of anti - nutritional factors. This result is in accordance with the reports of Shittu et al (2013) when processed mango seed kernel meal was used as a replacement for maize in the diet of growing rabbits.

CONCLUSION

It is concluded from the result of this experiment that the inclusion of P.longifolia oil up to 0.40% in the diet of grass cutters has no detrimental effect on the growth, performance and health status of the animal.

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