



Effect of Feeding Different Levels of *Luffa aegyptiaca* Extracts on the Growth Performance of Broiler Chicken Fed Corn-Soya Meal Diet

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ABSTRACT

This experiment was carried out to investigate the effect of feeding different levels of *luffa aegyptiaca* extracts (LAP) on the growth performance of broiler chicken fed corn-soya meal diet. The study was carried out between January to March, 2019. A total of two hundred days old broiler chicks of mixed sexes (Ross 308) were allocated into four treatment groups, each group was further divided into five replicates each of ten (10) birds. The measured growth performance parameters are: initial body weight, final body weight, average weight gain, average feed intake, average water intake and mortality. Clean feed and water were provided ad libitum and the experiment lasted for 42 days. Treatment 1 contained 1.25 g/litre of Oxytetracycline, treatment 2, 3 and 4 contained LAP at 10, 20 and 30 mL/litre. There was a significant ($p < 0.05$) difference in the final weight gain (FWG), feed conversion ratio and mortality. Birds in treatment 4 had the FWG of 2000.1 g followed by T3 with 1889.3 g, birds fed 1.25 g/ litre of OXY had the lowest FWG of 1622.1 g. Average feed and water intake were not significantly ($p > 0.05$) influenced by LAP and OXY. It was concluded that LAP could be orally administered up to 30 mL/litre to broiler chickens without any negative effect on the growth and health performance of the animal.

Key words: *Luffa aegyptiaca* extracts, Oxytetracycline, Performance, Broiler chickens, Growth.

Introduction

Plant extract have been used in folk medicinal practices for the treatment of different types of diseases since antiquity (Okanla *et al.*, 1990) and it still encourages the world health organization as a means to substitute or reduce the use of chemical compounds and go back to nature (Allam *et al.*, 1999). Recently, studies on herbal/medicinal plants are now becoming more popular (food safety) because drugs of synthetic origin constitute a negative impact on animal health and the environment (Magi and Sahk, 2003).

Medicinal plants and their extracts have proved to be safe because they contain several bioactive chemicals (phytochemicals) responsible for several activities such as antimicrobial, anti-inflammatory, antifungal, antioxidant, anti-cancer and antiviral (Ghosh

et al., 2008; Ibrahim *et al.*, 2001; Indrayan *et al.*, 2005; Omale and Okafor, 2008). Among the potential medicinal plant is *Luffa aegyptiaca* which is found to be loaded with several secondary metabolites that are safer, natural and useful in maintaining the intestinal health and productivity of birds. Collins (2016) reported that herbs and their extracts are basically classified by their parts, habitat, type of administration and therapeutic value. Plant extracts are less toxic when compared to antibiotics and could also act as natural growth promoters to animals.

Luffa aegyptiaca which belongs to the family Cucurbitaceae is an herbaceous plant of Indian origin. The plant is a vigorous climbing annual vine with several lobed cucumber-like leaves, the mature fruits are used domestically as sponge and they are widely distributed in the tropics and subtropics. It also possess highly medicinal and nutritional property (Lawal *et al.*, 2010). The plant has also been reported to perform several functions such as antimicrobial (Stephen, 2003; Anyasor *et al.*, 2010; Indumathy, 2011), anti-inflammatory (Muthumani, 2010), antifungal (Parkash, 2002; Nagao *et al.*, 1991; Edeoga *et al.*, 2005), anti-parasitic (Partap, 2012), analgesics (Kang *et al.*, 1993), antidiabetes (Bal *et al.*, 2004; Yusha'u, 2010), anti-protozoan (Ng YM, 2011), and antioxidant (Pal and manoj, 2011; Palomb, 2006). Phytochemical screening of *L. aegyptiaca* revealed that the plant possesses several bioactive chemicals such as saponins, alkaloids, flavonoids, tannins, sterols and glycosides (Ngbede *et al.*, 2008; Singh and Bhat, 2003; Farnsworth, 2002; Roble *et al.*, 2002; Chen *et al.*, 2003).

Previous report has shown the effect of *Luffa aegyptiaca* extract on the haematological parameters of Swiss albino mice (Emmanuel Asuquo Etim *et al.*, 2018) but there are scanty information on the effect of *L. aegyptiaca* extract on the performance and blood profile of broiler chicks and with the wide medicinal significance of the plants, they can be used in animal nutrition as growth promoters, digestive stimulants, stimulants of physiological functions as well as for the prevention and treatments of certain pathological diseases (Dalle Zotte *et al.*, 2016). Therefore, the aim of this experiment is to evaluate the effect of feeding different levels of *Luffa aegyptiaca* extracts on the growth performance parameters of broiler chicks fed corn-soya meal diet.

Materials and methods

Experimental Site

The experiment was carried out at Division of Animal Nutrition, Sumitra Research Farm, Gujarat, India.

Collection and processing of *Luffa aegyptiaca* leaves

Luffa aegyptiaca leaf was identified and authenticated by a botanist on the research farm. Thereafter, fresh disease free leaves of *L. aegyptiaca* was harvested from the farm, the leaves were thoroughly washed with running tap water to remove the debris and allowed to dry under shade for 11 days, it was then hammer milled into *L. aegyptiaca* powder (LAP). The extract was prepared by soaking 200grams of LAP in one litre of water and kept in an air tight plastic container and the mixture kept in the refrigerator at 4°C for 48 hours and then sieved with a with cheese cloth, then with What Man No1 filter paper (24cm).

Pre-experimental operations

A deep litter poultry house was used for the experiment, the pen was swept, cleaned and well-disinfected with Cid 2000, feed and water troughs were also washed. The electrical fittings (bulb) 200 watts were properly fixed and a vaccination programme was designed before the commencement of the study.

Animal management

One day old 200 (Ross 308) broilers of mixed sexes were obtained from a commercial hatchery in India. The chicks were weighed individually at the beginning of the experiment and wing banded. They were assigned into four dietary treatment group, anti-stress was added in the drinking water of the birds. Each group was further divided into five replicates each of ten (10) birds. The light (electric bulb) was continuous and the initial brooding temperature was 34 °C for the first week of age and it was gradually reduced by 2 °C per week. Vaccines were administered according to the prevailing vaccination schedule in the environment. Vitamins (Mia vit) was added in water a day before and after each vaccination. Clean feed and water was provided unrestricted throughout the experimental period which lasted for 42 days.

Experimental diets and design

Four diets were formulated to meet the nutritional requirements of birds according to NRC (1994).

Treatment 1:1.25 g/ liter OXY (drinking water)

Treatment 2:10 mL/liter of LAP

Treatment 3:20 mL/liter of LAP

Treatment 4:30 mL/liter of LAP

The used experimental design was a completely randomized design. Daily feed intake (g) was calculated by the difference between the offered feed and the left over, feed conversion ratio was determined as feed intake divided by body weight gain. Water consumption was recorded daily, mortality was recorded daily and all the management practices were strictly observed throughout the experimental period.

Laboratory analysis

Phytochemical analysis was carried out on the plants leaf extract using standard methods Sofowora (1993) and AOAC (2000). Percentage composition of flavonoids, saponin, phytate, alkaloids, tannin and oxalate were carried out according to procedures outlined by (Harbone 1984; Boham and Kocipai-Abyazan 1974). Mineral analysis was carried out using Atomic Absorption Spectrophotometer (AAS). Proximate analysis of crude protein, ash, ether extract and crude fibre in the experimental diet were carried out in accordance with the Association of Official Analytical Chemists (AOAC, 2000).

Statistical analysis

The collected Data were subjected to analyze variance (ANOVA) as described by (Steel and Torrie 1996). The differences between means were compared by least significance difference test (Steel and Torrie, 1996).

Table 1. Percentage composition of experimental diets

Ingredients	Diets	
	Starter (0-3 weeks)	Finisher (4-7 weeks)
Maize	52.00	58.00
Soya meal	38.60	31.60
Groundnut cake	3.00	2.00
Fish meal (72%)	1.00	0.00
Bone meal	3.00	3.00
Limestone	1.50	1.50
Lysine	0.15	0.15
Methionine	0.20	0.20
Toxin binder	0.01	0.01
Premix	0.25	0.25
Salt	0.30	0.30
Total	100.0	100.0

Calculated analysis

ME (Kcal/kg)	2801.9	2991.5
Crude protein (%)	23.23	20.60
Ether extract (%)	6.11	5.02
Crude fibre (%)	3.14	4.03

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

Table 2. Proximate composition of *Luffa aegyptiaca* leaf meal

Components	Quantity (%)
Crude protein	0.25
Crude fibre	11.54
Ether extract	0.13
Ash	0.41
Dry matter	97.67

Table 3. Mineral composition of *Luffa aegyptiaca* leaf meal

Components	Quantity (mg/100g)
Calcium	4.31
Phosphorus	0.12
Potassium	2.16
Magnesium	0.44
Sodium	0.31
Manganese	0.01
Zinc	0.011
Iron	0.03

Table 4. Phytochemical components of *Luffa aegyptiaca* leaf meal

Phytochemicals	% composition
Saponin	4.89
Flavonoids	2.10
Alkaloids	1.03
Phytate	0.81
Oxalate	1.51
Tannin	1.41
Phenol	6.77

Table 5. Phytochemical components of *Luffa aegyptiaca* leaf extract

Parameters	% composition
Saponin	6.22
Flavonoids	3.02
Phytate	1.01
Alkaloids	2.81
Tannin	3.11
Oxalate	1.01
Phenol	11.43

Table 6. Performance of broilers chicken given OXY and LAP orally

Parameters	T1	T2	T3	T4	SEM	p-value
No of birds	40	40	40	40	-	-
Initial body wgt (g)	45.21	44.90	45.00	44.11	0.06	ns
Final body wgt. (g)	1622.1 ^c	1833.7 ^c	1889.3 ^b	2000.1 ^a	22.75	*
AWG (g)	1576.9 ^c	1788.8 ^c	1844.3 ^b	1956.0 ^a	12.44	*
AWWG (g)	262.81	298.13	307.38	326.00	6.13	ns
AFI(g)	3400.1	3400.5	3401.3	3401.9	41.44	ns
FCR	2.09 ^a	1.85 ^b	1.80 ^b	1.70 ^c	0.02	*
TWI (mL)	1701.1	1700.6	1700.1	1702.1	10.51	ns
MORT	3/40	0/40	0/40	0/40	0.01	*

^{a, b, c} Means with different superscripts along the same row are significantly (P<0.05) different

AWG: Average weight gain; AWWG: Average weekly weight gain; AFI: Average feed intake; FCR: Feed conversion ratio; TWI: Total water intake; ns: No significant difference (p>0.05); *: significant difference (p<0.05).

Results and discussion

The results on the proximate composition of broiler starter and finisher diets are presented in Table 1. Broilers starter ration contained crude protein 23.23%, ether extract 6.11%, crude fibre 3.14 and metabolizable energy 2801 Kcal/kg respectively while those of broiler finisher diet contained 20.60%, 5.02%, 4.03% and 2991.5 MEkcal/kg for crude protein, ether extract, crude fibre and metabolizable energy respectively. All diets were formulated to meet the NRC (1994) standards for birds.

Table 2 reveals the proximate analysis of *Luffa aegyptiaca* leaf meal. The proximate components are 0.25%, 11.54%, 0.13%, 0.41% and 97.67% for crude protein, crude fibre, ether

extract, ash and dry matter respectively.

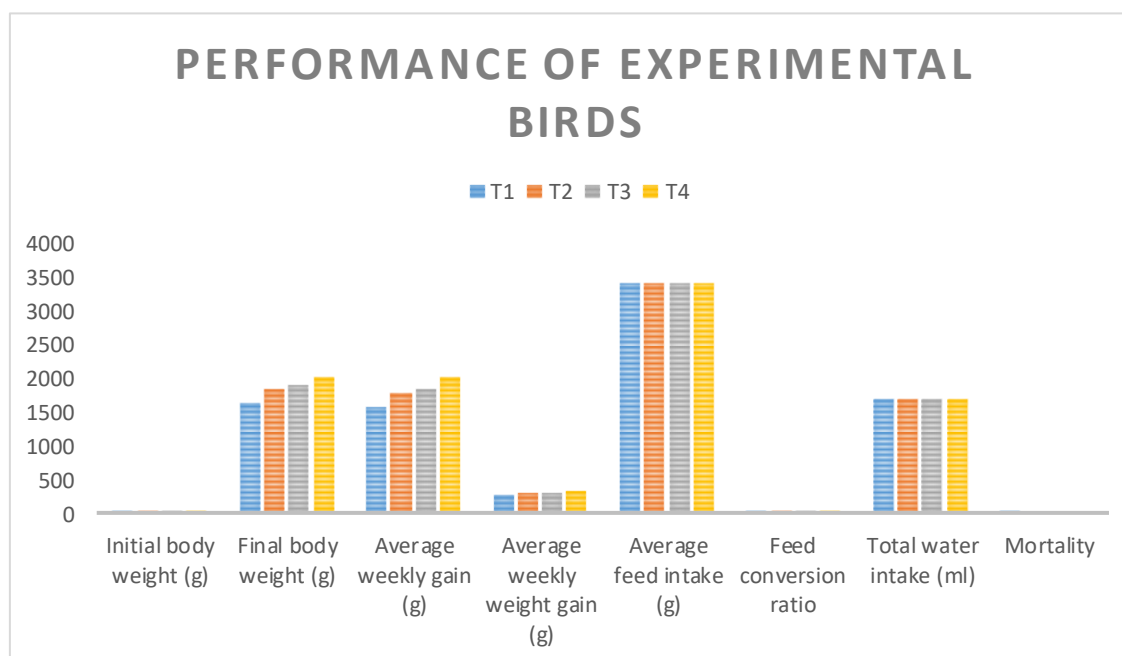


Figure 1. Performance traits of experimental birds

This was parallel with the finding of (Osuagwu and Edeoga 2014; Aletor *et al.*, 2012). *Luffa aegyptiaca* leaf meal has low level of protein, ash and ether extract but high level of crude fibre. Protein in diet helps in structural formation of cells, lipids serves as a source of energy and contribute to the transport of fat –soluble vitamins (Pamela *et al.*, 2005). Crude fibre plays a vital in digestion, thus reducing the risk of gastro intestinal disorder.

Mineral composition of *Luffa aegyptiaca* leaf meal showed that it contained 4.31, 0.12, 2.16, 0.44, 0.31, 0.01, 0.001 and 0.03 (mg/100 g) for calcium, phosphorus, potassium, magnesium, sodium, manganese, zinc and iron, respectively, in Table 3. The leaf contains high level of calcium followed by potassium, magnesium, sodium, phosphorus and iron. Zinc is the lowest mineral present in the leaf. The low level of iron is an indication that the leaf cannot be used in the treatment of anaemia which is contrary to the reports of (Orwa *et al* 2009; Alagbe Seyi Valerie 2017). According to (Park *et al.*, 2004) high level of zinc in diet have been reported to increase hatchability, protecting genetic material (Brown and Pentland, 2007) but the result is consistent with the findings of (Edeoga *et al.*, 2010; Pandey *et al.*, 2006); Taylor 2005). *L. aegyptiaca* leaf meal contains significant amount of calcium (Agbaje *et al.*, 2007; Igwe *et al* 2010), which are useful in proper bone formation.

Phytochemical analysis of the aqueous extract and leaf meal showed the presence of alkaloids, saponin, phytate, tannins, flavonoids and oxalate as presented in Tables 4 and 5. The phytochemical components of LAP revealed that it contained 6.22%, 3.02%, 1.01%, 2.81%, 3.11%, 1.01% and 11.43% for saponin, flavonoids, phytate, alkaloids, tannins, oxalate and phenol. The current study was in line with (Kirbag *et al.*, 2009; Uttu *et al.*, 2015; Shakeri *et al.*, 2012; Hassan *et al.*, 2004) who reported similar results on the preliminary phytochemical and antimicrobial investigation of the crude extract on the bark of Deterium

microcarpum. In contrast, (Mhya, 2014) reported the presence of Glycosides, this could be due to the differences in variety as well as age of plants.

The flavonoids play a key role as antioxidants, antidiarrheal, antimutagenic, anticarcinogenic and antibacterial (Galleoti *et al.*, 2008; Adisa *et al.*, 2004). Phenolic compounds have a high antioxidant activity through three mechanisms: free-radical scavenging activity (Zheng *et al.*, 2009), transition-metal-chelating activity (Andjel kovicet *al.*, 2006), and/or singlet-oxygen quenching capacity (Mukai *et al.*, 2005). According to (Budriesi *et al.*, 2010; Schiavone *et al.*, 2006) tannins are known to improve the feed efficiency, weight gain, intestinal health and can be added to poultry feed at the rate of 0.5-1.0 kg/tonne. Tannins are also known to possess antibacterial and antiviral functions. Saponins are used commercially in the production of vaccines (adjuvants) (Asl and Hosseinzadeh, 2008).

The performance of the birds showed significant ($P < 0.05$) differences among the treatment groups in terms of final body weight, total body weight gain, daily body weight gain, feed conversion ratio and mortality as presented in table 6. Although the treatment given 30ml/litre LAP performed better than all other treatment groups with respect to feed conversion ratio of 1.70, daily feed intake of 3401.9 g and average weekly weight gain of 326.0g followed by birds in treatment 3 given 20 mL/litre of LAP with a feed conversion ratio of 1.80, feed intake of 3401.3 and average weekly weight gain of 307.38 g. Addition of (LAP) at 30 mL/litre showed a significant effect on their body weight change and feed conversion ratio (FCR) in the current study. This was similar to the finding of (Alabi *et al.*, 2017) who noted that addition of 150 mL/litre of *Moringa olifera* leaf extract in the water of broilers increases these parameters. Similarly, (Farahat *et al.*, 2016) reported that feeding green tea extract to broilers at 250-500 mg significantly increased feed intake and FCR. The result of the current study was also consistent with those reported for quails, when their diet was supplemented with 20 ppm turmeric extract showed significantly better feed conversion ratio as compared to the 0, 5, 10 and 15 ppm turmeric extract.

(Nurani and Ade 2017) reported that the use of Marigold flower extract in the diet of quails (*Coturnix coturnix japonica*) at 15 ppm causes a significant increase in feed intake, increased egg production, increased egg colour and FCR when compared to a control diet. But contrary to the reports of (Al-Mashhadani 2015) when turmeric powder was supplemented in the diets of broiler (Chicken and Abbas *et al.*, 2014) as citrus peel extract was added to the feed of broilers.

The improvement in body and feed conversion in the present study could be attributed to high level of phytochemical components in LAP, their synergistic activities as well the presence of some vital nutrients in *Luffa aegyptiaca* plant. According to (Kamba and Hassan 2010; Okwu 2004; Okwu and Ekeke 2003) reported that phytochemicals alongside with vitamins and minerals in plants performs enhances growth in animals. Low mortality recorded in treatment 2, 3 and 4 could be attributed to the presence of tannins and flavonoids and phenol in LAP. According to (Redondo *et al.*, 2016; Benchaar *et al.*, 2008; Vasoncelos and Galyean 2008) tannins can act as a gut modulator, improve feed utilization, prevent coccidiosis and nitrogen excretion.

Conclusion

From the obtained results, it can be concluded that LAP can be orally administered to broiler chicken up to 30ml/litre without any deleterious effect on the growth performance

and health status of the birds. Therefore, plant extracts/ medicinal plants are best replacers of antibiotics because of their low cost, non-residual effect on carcass and high efficacy in the treatment of various diseases. This is one of the ways to ensure food safety.

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