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EFFECTS OF SUPPLEMENTAL NEEM (A*zadirachta indica)* AND GARLIC (A*llium sativum)* ON GROWTH AND CARCASS YIELD OF FINISHING BROILER

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ABSTRACT

This study was conducted to investigate the effects of feeding diets containing Neem Leaf Meal (NLM), Garlic Meal (GM) and their combinations (NLM + GM) on growth performance and carcass yield of finishing broiler. A total of 180 day-old Cobb broiler chickens were divided into twelve groups of fifteen chicks with three replicate of five chicks each. The diet contained NLM, GM and NLM + GM at four levels of inclusion (0mg/kg, 500mg/kg, 1000mg/kg and 1500mg/kg). The experiment was arranged in a 3 × 4 factorial layout in a completely randomized design. Additives and levels of inclusion had no significant (P>0.05) influence on performance parameters except feed intake which was influenced (p<0.05) by NLM + GM and 1000mg/kg levels of inclusion. Final live weight (2516.67g/bird), weight gain (1742.00g/bird), daily weight gain (62.2g/bird/day) and feed conversion ratio (2.32) were improved (p<0.05) at 1500mg/kg levels of inclusion of NLM + GM. Thigh (11.68%), wings (8.44), neck (4.23%) and gizzard (2.13%) of birds fed GM were improved (P<0.05) than those of NLM. Carcass weight was influenced (p<0.05) by additives at various inclusion levels with wings (9.01%), head (3.39%), neck (4.52%), shanks (4.49%) and gizzard (2.42%) highest (p<0.05) in birds fed GM at 1500mg/kg levels of inclusion than those of 0mg/kg levels of inclusion. It was concluded that the use of NLM + GM as additives yielded commendable result on performance and carcass weight of finishing broiler birds

Keywords: Neem, garlic, broilers, performance, carcass characteristics.

INTRODUCTION

Broilers are the most efficient in converting raw feed stuffs and by-product into high protein food which is urgently needed to improve the nutritional standards of the humans (Mukhtar, 2007). Approximately 80% of domestic animals have been fed synthetic compounds for the purpose of either medication or growth promotion (Lee *et al*., 2001). After many years, the long term side effects of these products like microbial resistance and increase of the blood cholester-

ol level in the livestock lead to the ban of these commercial antibiotics (Mansoub 2010 and Corcoran *et al.,* 2005). The poultry and pig industries are currently moving towards a reduction in the use of synthetic antibiotics due to public concerns regarding development of antibiotics-resistant bacteria in humans (Barton, 1998). Therefore, renewed interests in alternative feed additives have arisen, particularly using those additives from plant origin which are natural and safe to consumers (Soliman *et al.,* 2003). Recent research works on herbal formulations as feed additives have shown encouraging results as regards weight gain, feed efficiency, lowered mortality and increased liveability in poultry birds (Kumar, 1991; Babu *et al.,* 1992; Mishra and Singh, 2000; Deepak *et al.,* 2002; Jahan *et al.,* 2008). Their anti-biotical potential, hypo-cholestrolemic effects, growth promoting and availability are the most beneficial part of herbs, which have drawn the scientists' attention, themselves (Mansoub 2010). Recently, the concerns of scientists are reducing the abdominal fat and increasing the valuable parts of carcass (Al-kassie, 2009). The beneficial effect of garlic (*Allium sativum*) on human and animal organism, which results from its anti-microbial, anti-oxidative and anti-hypertensive properties, was reported by Konjufca *et al.* (1997). There are evidence that garlic (*Allium sativum*) has cholesterol lowering effect in humans and animals due to the presence of sulphur-containing bioactive compounds in its homogenates (Chowdhury *et al.,* 2002). Neem (*Azadirachta indica*) is the most useful traditional medicinal plant and a valuable natural product for the development of medicinal recipes against various diseases (Biswas *et al.,* 2002). Neems possess Limonoids, protolimonoids, tetranortriterpenoids, pentanortriterpenoids, hexanortriterpenoids and some nonterpenoid (Koul *et al.*, 2006). Dry leaves of Neem are beneficial in IBD affected broilers (Sadekar *et al.*, 1998). This study therefore focused on the effect of neem and garlic used as phytobiotics on growth and carcass yield of finishing broiler birds in a hot humid environment.

MATERIALS AND METHODS

This experiment was carried out at the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Ogun State. The area lies on latitude $7^{0}10'$N and longitude 3^{0} 2'E. It is 76m above sea level and located in the tropical rain forest vegetation zone with an average temperature of 34.7^{0}C and relative humidity of 82% (Google Earth, 2012). *Allium sativum* (garlic) powder was prepared by cutting garlic bulbs into small pieces, followed by sun-drying for 14 days (≤ 90% DM) and pulverised using laboratory mill (1mm sieve) while *Azadirachta indica* leaves were removed from the stalk and air dried under a shed (29 ± 2^{0}C) until they are crispy to touch, while still retaining their greenish colouration, milled using a laboratory mill (1mm).

Management of Experimental birds and diets

Twelve experimental diets were formulated with the inclusion of neem, garlic and their combination for finishing broiler.

Diet 1 - 4 contains inclusion of NLM at 0 mg/kg, 500 mg/kg, 1000 mg/kg, and 1500 mg/kg, Diet 5 - 8 contains inclusion of GM at 0 mg/kg, 500 mg/kg, 1000 mg/kg, and 1500 mg/kg, Diet 9 - 12 contains 0NLM+0GM mg/kg, 250NLM+250GM mg/kg, 500NLM+500GM mg/kg and 750NLM+750GM mg/kg.

One hundred and eighty (180) unsexed day old Cobb broilers were used for the experiment. They were divided into twelve treat-

ment groups of fifteen birds. Each treatment group was replicated thrice with five birds per replicate in a 3×4 factorial experimental design. Brooding of birds was done for three weeks using charcoal and bulbs as source of heat. The birds were fed *ad libitum* and managed intensively throughout the duration of the experiment.

Data collection

Records of weight gain (g)/bird: (final weight - initial weight), feed intake (g)/bird: (feed supplied – left over/ number of birds), mortality: (number of dead birds/ total number of birds × 100) and feed conversion ratio: (total feed intake/total body weight gain) were obtained. At 56 days of age, two birds per replicate whose weight were closest to the mean replicate weight were selected per replicate and slaughtered. The weights of the cut off parts were expressed as a percentage of the live weight, dressing percentage was calculated by dividing dressed weight/ live weight multiply by 100 and plucked weight was determined by weighing the birds after slaughtering and defeathering.

Statistical analysis

Data collected were subjected to 3×4 factorial arrangement in a completely randomized design. Significant ($p<0.05$) differences among treatment means were determined using Duncan Multiple Range Test (Duncan 1955) as contained in Statistical Analysis Software (SAS 2000) package.

RESULTS

Data on main and interaction effects of additives and levels of inclusion on growth performance of finishing broiler are presented in Table 4 and 5. Feed intake was ($P<0.05$) affected by both additives and levels of inclusion. Feed intake of birds fed NLM + GM (138.39g/bird) were significantly ($P<0.05$) influenced but similar to NLM (131.96g/bird/day) compared to GM, which was lowered (128.63g/bird/day). Inclusion at 1000mg/kg affected ($P<0.05$) feed intake of birds (136.54g/bird/day) but statistically similar to 1500mg/kg (134.87g/bird/day) compared to 0mg/kg and 500mg/kg which was depressed. The interaction of additives and levels of inclusion on growth performance of finishing broiler revealed significant effects ($P<0.05$) on final live weight, weight gain, daily weight gain, feed intake and feed conversion ratio. Final live weight of birds fed 1500mg/kg of NLM + GM (2516.67g/bird) were improved ($P<0.05$) than those of 500mg/kg GM (2153.33g/bird). However, inclusion levels of NLM + GM at 1500mg/kg on weight gain followed the same trend as daily weight gain compared to inclusion of NLM + GM at 1000mg/kg which was significantly ($P<0.05$) depressed. Inclusion level of NLM + GM at 1000mg/kg significantly ($P<0.05$) influenced feed intake (153.25g/bird/day) but was lowered at 1500mg/kg inclusion level of GM. Feed conversion ratio was influenced ($P<0.05$) by various additives at different inclusion levels but superior in birds fed NLM at 1000mg/kg. Data on main effects of additives and levels of inclusion on carcass characteristics of finishing broiler are presented in Table 6. The thigh, drum stick, wings, neck, gizzard, liver, lungs and large intestine were significantly ($P<0.05$) improved by additives. Thigh of birds fed GM were significantly ($P<0.05$) influenced (11.68%) than those of NLM and GM. The inclusion of NLM + GM in the diets of birds affected ($P<0.05$) drum stick (11.42%) compared to that obtained at NLM (9.72%). Improved ($P<0.05$) values (8.44%, 4.23%) were obtained in wings and neck of bird fed GM but lowered in birds fed NLM (7.59%, 3.43%), respectively. Gizzard of birds fed GM was significantly ($P<0.05$) affected

(2.13) compared to that of NLM (1.89%). Birds on NLM diets recorded an improved (P<0.05) liver (1.65%) than that obtained at NLM + GM (1.35%). However, the value of lungs was statistically (P<0.05) influenced (0.62%) in birds fed GM compared to that of NLM + GM (0.50%). Levels of inclusion revealed significant (P<0.05) effects on gizzard and spleen. Gizzard of birds fed 1500mg/kg levels of inclusion was significantly (P<0.05) affected (2.15%) than those of 0mg/kg levels of inclusion (1.79%). Birds on 1500mg/kg inclusion levels recorded improved (P<0.05) spleen compared to 1000mg/kg level.

Data on interaction of additives and levels of inclusion on the carcass characteristics of finishing broiler are presented in Table 7. The plucked weight, dressing percentage, thigh, drum stick, wings, head, neck, shanks, gizzard, liver, heart, spleen, small intestine and large intestine were significantly (P<0.05) affected. Plucked weight of birds (2366.67g) at 1500mg/kg inclusion of NLM + GM was influenced (P<0.05) compared to 500mg/kg inclusion of NLM (2000g). Inclusion levels of NLM at 1500mg/kg affected (P<0.05) dressing percentage of birds (81.95%) but lowered (67.78%) at 1000mg/kg inclusion. Thigh of birds (12.83%) at 1500mg/kg inclusion of GM were improved (P<0.05) compared to those of NLM + GM at 500mg/kg and 1500mg/kg inclusion levels (9.05%, 9.05%). Significantly (P<0.05) improved drum stick (11.65%, 11.19%, 11.65% and 11.19%) were recorded at various inclusion levels of NLM + GM compared to that of 0ppm inclusion levels of NLM (8.43%). Wings, head, neck, shanks and gizzard of birds at 1500mg/kg inclusion of GM were significantly (P<0.05) affected (9.01%, 3.39%, 4.51%, 4.49% and 2.42%) compared to those of 0ppm inclusion of NLM (7.04%, 2.58%, 2.65%, 3.37% and 1.61%) which were depressed respectively. The inclusion of 1000mg/kg inclusion of NLM in birds significantly (P<0.05) influenced (1.87%) the liver than those of 1500mg/kg inclusion of NLM + GM at 0mg/kg and 1000mg/kg inclusion levels. Heart of birds (0.50%) at 1500mg/kg inclusion of GM were affected (P<0.05) compared to 1000mg/kg inclusion levels of GM (0.32%). Inclusion levels of NLM at 1500mg/kg improved (P<0.05) spleen of birds (0.13%) than those at 500mg/kg (0.06%). Birds fed diets containing 1500mg/kg inclusion of GM affected (P<0.05) small intestine (3.86%) compared to that of 500mg/kg inclusion levels of NLM (2.55%). Large intestine of birds at 1500mg/kg inclusion of NLM were better (P<0.05) than those of NLM + GM (0.12%, 0.13%, 0.12% and 0.13%) respectively.

DISCUSSION

The result of the proximate composition of NLM and GM and their combination is presented in Table 3. The crude protein obtained for NLM in this study is lower than 20.68% and 24.06% respectively reported by Esonu *et al.* (2007) and Onyimonyi *et al.* (2009). The crude fibre obtained is also lower than 16.6% reported by Esonu *et al.* (2007) and Onyimonyi *et al.* (2009). The values obtained for the proximate composition of garlic powder in this work were lower than values obtained in the analysis of garlic powder done at Research 900 Laboratory as reported in the Encyclopaedia of Chemical Technology (1980) (moisture, 5.4%; protein, 17.5%; lipid, 0.6% and NFE (73.3%). The differences could result from type and part of plant used and their physical properties, time of harvest, preparation method of phytogenic additive and compatibility with other food components as reported by (Yang *et al.,* 2009). The significant increase in feed intake

of finishing broiler fed NLM + GM was not in line with the findings of Demir *et al.* (2003) who concluded that the supplementation of thyme and garlic powder to broilers diet did not affect growth, feed intake and feed conversion rate. An increase in levels of inclusion resulted in an increased feed intake of finishing broiler birds. The result was in contrary with the report of Chowdhury *et al.* (2002) who added different levels of garlic to layers diet and reported no significant effects of this supplementation on growth rate, feed intake and feed efficiency. The gradual increase in feed intake could also be due to the fact that the birds consumed more feed to meet their daily and energy requirement (Odeniya, 2002). The result of interaction of NLM + GM at 1500mg/kg levels of inclusion revealed significant effects on final live weight, weight gain and daily weight gain of finishing broiler. The improvement in the mixture could be related to the findings of Cullen *et al.* (2005) who reported that the susceptibility of pathogenic gram positive bacteria to the antibacterial component of garlic and ginger are higher than that of the physiological desirable intestinal bacteria. However, the inclusion of GM which had the least result in feed intake is not surprising, it could be attributed to organoleptic properties of garlic that are responsible for the decreased feed intake (Cullen *et al.,* 2005). Also the reduced mortality by GM at 1500mg/kg levels of inclusion agreed with the findings of Tollba *et al.* (2003) who reported improved broiler growth, feed conversion ratio (FCR), and decreased mortality rate. Improved feed conversion ratio in birds fed 500mg/kg levels inclusion of NLM + GM suggests that the antimicrobial action of neem and garlic may be sufficient to inhibit microbial fermentation (Ankri and Mirelman, 1999). There was significant difference on cut off parts of carcass in additives. Improved drumstick by combined inclusion levels of NLM + GM and the highest value in thigh meat of birds fed GM opposed the findings of Elangovan *et al.* (2001), who reported that neem have no changes in carcass characteristics. The positive influence of these additives achieved by GM on gizzard and lungs and NLM on liver could be related to the biological function of these additives which enhance immune response (El-Ghamry, 2004). Improvement achieved in percentage weight of gizzard and spleen at levels of inclusion of 1500mg/kg was in agreement with Esonu *et al.* (2006) who recorded the highest liver and gizzard weight at 5% dietary levels of NLM. Since carcass yield is an indication of the quality and utilization of the ration Bamgbose and Niba, (1998), it could be seen that birds fed NLM + GM better utilized their feed as evidenced by significant higher plucked weight. The dressing percentages were within the range reported for broilers by Sogunle *et al.* (2009) who reported range values of 70-75%. The drumstick which is part of the most economically important portion of the carcass composition also provides the greatest portion of edible meat in broilers Fanimo *et al.* (1996) was greatly favoured by the combined inclusion levels of NLM + GM. The highest value in thigh meat in birds fed GM at 1500mg/kg levels of inclusion was in contrary with report of Raeesi *et al.* (2010) who reported that garlic supplementation at 1% causes higher thigh yield that than 3% garlic group. The inclusion of GM at 1500mg/kg did affect the development of gizzard and heart. These changes could be attributed to respond in change of diet (Svihus 2011). However, the significant effect was against the findings of Raeesi *et al.* (2010) who reported that garlic at levels of 1% and 3% had no significant effects on relative weights of

carcass, fat pad, and digestive organs among different treatments except for the small intestine. But the effects of inclusion of NLM at 500mg/kg on small intestine and the inclusion of GM at 500mg/kg on large intestine agreed with earlier reports of (Raeesi *et al.,* 2010).

Table1: Gross Composition % of Experimental Diets (Starter 0-4 weeks)

Dietary treatments	NLM (mg/kg)				GM(mg/kg)				NLM + GM (mg/kg)			
Ingredients	0	500	1000	1500	0	500	1000	1500	0	500	1000	1500
Maize	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Wheat offal	8.00	7.95	7.90	7.85	8.00	7.95	7.90	7.85	8.00	7.95	7.90	7.85
SBM	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
PKC	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
GNC	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30
FM (72%)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Oyster shell	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
NLM	-	0.05	0.10	0.15	-	-	-	-	-	-	-	-
GM	-	-	-	-	-	0.05	0.10	0.15	-	-	-	-
NLM+GM	-	-	-	-	-	-	-	-	-	0.05	0.10	0.15
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Determined Chemical Composition												
ME(kcal/kg)	2835.13	2755.00	2745.35	2775.00	2835.13	2785.00	2715.25	2755.35	2835.13	2755.40	2765.20	2775.25
Crude Protein	21.80	21.70	21.73	21.74	21.80	21.76	21.79	22.00	22.80	21.84	21.86	22.89
Crude Fibre	3.98	3.80	3.85	3.88	3.98	3.82	3.86	3.88	3.98	3.80	3.75	3.78
Fat	4.29	3.80	3.90	3.95	4.29	3.90	3.92	3.97	4.29	3.98	4.00	4.09

Table2: Gross Composition % of Experimental Diets (Finisher 4-8 weeks)

Dietary treatments	NLM (mg/kg)				GM(mg/kg)				NLM + GM (mg/kg)			
Ingredients	0	500	1000	1500	0	500	1000	1500	0	500	1000	1500
Maize	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00
Wheat offal	10.00	9.95	9.90	9.85	10.00	9.95	9.90	9.85	10.00	9.95	9.90	9.85
SBM	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
PKC	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
GNC	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30
FM (72%)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Oyster shell	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
NLM	-	0.05	0.10	0.15	-	-	-	-	-	-	-	-
GM	-	-	-	-	-	0.05	0.10	0.15	-	-	-	-
NLM +GM	-	-	-	-	-	-	-	-	-	0.05	0.10	0.15
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Determined Chemical Composition												
ME(kcal/kg)	2875.33	2765.00	2775.20	2795.20	2875.33	2765.33	2775.45	2800.00	2875.33	2778.33	2790.50	2798.90
Crude Protein	20.24	19.50	19.64	19.70	20.24	19.75	19.78	19.80	20.24	19.54	19.57	19.59
Crude Fibre	4.03	3.82	3.85	3.87	4.03	3.78	3.81	3.83	4.03	3.80	3.83	3.85
Fat	4.27	3.82	3.84	3.88	4.27	3.88	3.90	3.93	4.27	3.82	3.85	3.87

Table 3: Proximate Composition of Test Ingredient (%)

Parameter	NLM	GM	NLM + GM
Moisture	12.50	21.62	15.06
Dry matter	87.50	78.38	84.94
Ether extract	2.15	7.35	4.36
Crude fibre	2.24	1.73	1.98
Crude protein	4.16	9.13	7.07
Ash	1.68	1.23	1.29
NFE	75.27	58.92	70.24

Table 4: Main Effects of NLM, GM, NLM + GM and Levels of Inclusion on Growth performance of Finishing Broiler

	Additives				Levels of inclusion (mg/kg)				
Parameters	NLM	GM	NLM + GM	SEM	0	500	1000	1500	SEM
Initial Weight (g /b)	47.00	46.50	45.58	0.764	45.89	46.22	47.11	46.22	0.882
Final Live Weight (g/b)	2301.67	2231.67	2334.99	50.153	2292.22	2236.67	2260.00	2368.89	57.911
Weight Gain (g/b)	1575.97	1543.75	1570.61	44.220	1551.37	1529.44	1566.48	1606.48	51.061
Daily Weight Gain (g/b/d)	56.29	55.13	56.14	1.580	55.46	54.62	55.95	57.37	1.824
Feed Intake (g/b/d)	131.96b	128.63b	138.39a	1.519	128.22b	132.36b	136.54a	134.87a	1.754
Mortality (%)	0.00	0.00	3.33	1.361	0.00	2.22	2.22	0.00	1.571
Feed Conversion Ratio	2.36	2.35	2.49	0.070	2.316	2.44	2.48	2.37	0.081

[ab] means on the same row having different superscript were significantly different (P<0.05) NLM = Garlic Meal, NLM = Neem Leaf Meal

Table 5: Interaction Effects of NLM, GM, NLM + GM and Levels of Inclusion on Growth Performance of Finishing Broilers

	NLM				GM				NLM + GM				
Inclusion Levels (mg/kg)	0	500	1000	1500	0	500	1000	1500	0	500	1000	1500	SEM
Initial Weight (g/b)	46.67	47.33	48.00	46.00	46.00	46.00	47.33	46.67	45.00	45.33	46.00	46.00	1.528
Final Live Weight (g/b)	2293.33ab	2250.00ab	2316.67ab	2346.67ab	2290ab	2153.33b	2240.00ab	2243.33ab	2293.33ab	2306.67ab	2223.33ab	2516.67a	100.305
Weight Gain (g/b)	1541.00ab	1540.00ab	1655.00ab	1568.00ab	1560.00ab	1478.00ab	1627ab	1510.00ab	1553.00ab	1570.00ab	1418.00b	1742.00a	88.440
Daily Weight Gain (g/b/d)	55.04ab	55.00ab	59.11ab	55.99ab	55.71ab	52.79ab	58.10ab	53.92ab	55.64ab	56.07ab	50.63b	62.2a	3.159
Feed Intake (g/b/d)	126.89ef	132.00cde	129.97cdef	139.00bc	128.90def	138.25bcd	130.59ef	120.96f	128.85def	126.81ef	153.25a	144.64ab	3.038
Mortality (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67	6.67	0.00	2.722
Feed Conversion Ratio	2.31b	2.40b	2.22b	2.51b	2.31b	2.65ab	2.27b	2.25b	2.32b	2.28b	3.04a	2.32b	0.140

[abc] means on the same row having different superscript were significantly different (P<0.05) NLM= Neem Leaf Meal, GM= Garlic Meal

Table 6: Main Effects of NLM, GM, NLM + GM and Levels of Inclusion on Carcass Yield of Finishing Broiler (0-8 weeks)

	Additives				Levels of inclusion (mg/kg)				
Parameters	NLM	GM	NLM + GM	SEM	0	500	1000	1500	SEM
Plucked Weight (g)	2070.83	2087.50	2166.67	50.101	2111.11	2055.556	2094.44	2172.22	57.852
Dressed Weight (g)	1686.25	1659.17	1712.50	63.925	1627.78	1649.44	1622.22	1844.44	73.814
Dressing percentage	73.13	74.29	73.35	2.064	70.90	73.84	71.88	77.73	2.384
Thigh (%)	10.03b	11.68a	10.18b	0.370	11.17	10.16	10.67	10.54	0.428
Drum stick (%)	9.72b	10.58ab	11.42a	0.391	10.33	10.74	10.80	10.42	0.451
Breast (%)	22.56	23.90	21.34	1.074	22.92	21.73	21.19	24.56	1.241
Back (%)	16.73	19.01	16.99	0.924	17.84	16.96	17.06	18.44	1.067
Wings (%)	7.59b	8.44a	8.14ab	0.197	7.77	7.86	8.25	8.34	0.227
Head (%)	2.75	2.96	2.79	0.107	2.74	2.74	2.88	2.97	0.124
Neck (%)	3.43b	4.23a	4.05a	0.202	3.66	4.18	3.56	4.20	0.233
Shanks (%)	4.00	4.01	3.92	0.158	3.82	3.86	4.21	4.03	0.182
Gizzard (%)	1.89b	2.13a	1.98ab	0.052	1.79b	1.99a	2.05a	2.15a	0.060
Liver (%)	1.65a	1.52ab	1.35b	0.094	1.44	1.61	1.52	1.45	0.109
Lungs (%)	0.59a	0.62a	0.50b	0.025	0.59	0.59	0.55	0.57	0.029
Heart (%)	0.38	0.41	0.39	0.022	0.43	0.38	0.36	0.39	0.025
Kidney (%)	0.14	0.16	0.15	0.021	0.15	0.16	0.12	0.16	0.024
Abdominal fat (%)	0.59	0.69	0.64	0.138	0.51	0.87	0.47	0.71	0.159
Spleen (%)	0.08	0.09	0.08	0.008	0.09ab	0.08ab	0.07b	0.11a	0.009
Small intestine (%)	3.09	3.49	3.46	0.176	3.24	3.18	3.57	3.42	0.203
Large intestine (%)	0.19	0.14	0.13	0.016	0.16	0.15	0.13	0.17	0.018
Caeca (%)	0.79	0.70	0.86	0.096	0.77	0.81	0.63	0.94	0.111

[ab] means on the same row having different superscript were significantly different ($P<0.05$)

Table 7: Interaction Effect of NLM, GM, NLM + GM and Inclusion Levels on Carcass Yield of Finishing Broiler (0-8 weeks)

Additives	NLM				GM				NLM + GM				
Inclusion Levels (mg/kg)	0	500	1000	1500	0	500	1000	1500	0	500	1000	1500	SEM
Plucked Weight (g)	2100.00ab	2000.00b	2066.66ab	2116.67ab	2100.00ab	2050.00ab	2166.67ab	2033.33ab	2133.33ab	2116.67ab	2050.00ab	2366.67a	100.202
Dressed Weight (g)	1600.00	1645.00	1566.67	1933.33	1583.33	1670.00	1666.00	1716.67	1700.00	1693.33	1633.33	1883.33	127.850
Dressing Percentage	69.56ab	73.21ab	67.78b	81.95a	68.99ab	77.52ab	74.39ab	76.27ab	74.15ab	70.79ab	73.46ab	74.97ab	4.129
Thigh (%)	10.70ab	10.25b	9.36b	9.734b	11.41ab	11.18ab	11.32ab	12.83a	11.30ab	9.05b	11.31ab	9.05b	0.741
Drum stick (%)	8.43b	10.00ab	9.83ab	10.57ab	10.92ab	10.99ab	10.92ab	9.49ab	11.65a	11.19a	11.65a	11.19a	0.781
Breast (%)	25.30	19.77	20.51	24.64	23.97	22.22	23.59	25.83	19.47	23.19	19.47	23.19	2.149
Back (%)	17.28	15.55	15.72	18.33	20.06	17.51	19.29	19.16	16.16	17.82	16.16	17.82	1.848
Wings (%)	7.04c	7.35ab	7.92abc	8.04abc	7.97abc	8.25abc	8.52ab	9.01a	8.31abc	7.94abc	8.31abc	7.96abc	0.393
Head (%)	2.58c	2.54b	2.95ab	2.92ab	2.64b	3.09ab	2.69ab	3.39a	2.99ab	2.59b	2.99ab	2.59b	0.215
Neck (%)	2.65c	4.08ab	2.86bc	4.14ab	4.20ab	4.52a	3.70abc	4.51a	4.13ab	3.96ab	4.13ab	3.96ab	0.404
Shanks (%)	3.37b	4.11ab	4.45a	4.10ab	3.74ab	3.99ab	3.82ab	4.49a	4.35ab	3.48ab	4.35ab	3.48ab	0.316
Gizzard (%)	1.61e	1.63e	2.26abc	2.05bcd	1.84de	2.33ab	1.95cde	2.42a	1.95cde	2.02bcd	1.95cde	2.02bcd	0.104
Liver (%)	1.71ab	1.58ab	1.87a	1.41ab	1.44ab	1.74ab	1.49ab	1.42ab	1.18b	1.53ab	1.18b	1.53ab	0.189
Lungs (%)	0.65	0.59	0.57	0.57	0.62	0.65	0.58	0.64	0.49	0.50	0.49	0.51	0.051
Heart (%)	0.47ab	0.36abc	0.36abc	0.33bc	0.39abc	0.42abc	0.32c	0.50a	0.42abc	0.36abc	0.42abc	0.36abc	0.044
Kidney (%)	0.18	0.08	0.15	0.17	0.18	0.21	0.13	0.13	0.09	0.19	0.09	0.19	0.042
Abdominal fat (%)	0.30	0.95	0.42	0.71	0.75	0.95	0.35	0.71	0.47	0.73	0.65	0.73	0.276
Spleen (%)	0.08abc	0.06b	0.07b	0.13a	0.11ab	0.09abc	0.06b	0.11ab	0.08abc	0.09abc	0.08abc	0.09abc	0.016
Small intestine (%)	2.88ab	2.55b	3.71ab	3.45ab	3.07ab	3.83a	3.21ab	3.86a	3.77a	3.15ab	3.77a	3.15ab	0.352
Large intestine (%)	0.22ab	0.17ab	0.17ab	0.24a	0.16ab	0.14ab	0.11b	0.14ab	0.12b	0.13b	0.12b	0.13b	0.032
Caeca (%)	0.75	0.82	0.53	1.09	0.78	0.67	0.59	0.77	0.77	0.95	0.77	0.95	0.192

[abc] means on the same row having different superscript were significantly different (P<0.05)

Table 8: Significant Levels in Analysis of Variance of Growth Performance and Carcass Yield of Finishing Broiler

	Additives			Levels				
of inclusion			Interaction					
	NLM	GM	NLM + GM	0	500	1000	1500	Additives×levels
Growth performance								
Initial weight	NS	NS	NS	NS	NS	NS	NS	NS
Final live weight (g/b)	NS	NS	NS	NS	NS	NS	NS	*
Weight gain (g/b)	NS	NS	NS	NS	NS	NS	NS	*
Daily weight gain (g/b)	NS	NS	NS	NS	NS	NS	NS	*
Feed intake (g/b/d)	*	*	*	*	*	*	*	*
Mortality%	NS	NS	NS	NS	NS	NS	NS	
Feed conversion ratio	NS	NS	NS	NS	NS	NS	NS	*
Carcass yield								
Plucked weight (g)	NS	NS	NS	NS	NS	NS	NS	*
Dressed weight (g)	NS	NS	NS	NS	NS	NS	NS	NS
Dressing percentage %	NS	NS	NS	NS	NS	NS	NS	*
Thigh (%)	*	*	*	NS	NS	NS	NS	*
Drum stick (%)	*	*	*	NS	NS	NS	NS	*
Breast (%)	NS	NS	NS	NS	NS	NS	NS	NS
Back (%)	NS	NS	NS	NS	NS	NS	NS	NS
Wings (%)	*	*	*	NS	NS	NS	NS	*
Head (%)				NS	NS	NS	NS	*
Neck (%)	*	*	*	NS	NS	NS	NS	*
Shanks (%)				NS	NS	NS	NS	*
Gizzard (%)	*	*	*	*	*	*	*	*
Liver (%)	*	*	*	NS	NS	NS	NS	*
Lungs (%)	*	*	*	NS	NS	NS	NS	
Heart (%)	NS	NS	NS	NS	NS	NS	NS	*
Kidney (%)	NS	NS	NS	NS	NS	NS	NS	NS
Abdominal fat (%)	NS	NS	NS	NS	NS	NS	NS	NS
Spleen (%)	NS	NS	NS	*	*	*	*	*
Small intestine (%)	NS	NS	NS	NS	NS	NS	NS	*
Large intestine (%)	NS	NS	NS	NS	NS	NS	NS	*
Ceaca (%)	NS	NS	NS	NS	NS	NS	NS	NS

NS= Not Significant *= Significant
GM= Garlic Meal NLM= Neem Leaf Meal

CONCLUSION

It was concluded that the use of NLM + GM as additives yielded commendable result on performance and carcass yield of finishing broiler.

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