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# Evaluation of Neem *(Azadirachta Indica*) Leaves Meal Supplementation on Growth Performance of Broiler Finishers in Cold and Hot Seasons in Kebbi State Sudan Savanna, Nigeria

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## ABSTRACT

The use of plant resources in poultry production has gained popularity as growth promoters especially as a result of increasing cost of conventional additives in developing nations. Similarly, weather fluctuations were reported to affect the performance of birds under conventional management. On this backdrop, two feeding trials were conducted in the cold and hot seasons of 2023/2024, involving 144 unsexed day old broiler chicks each to determine the optimum level of supplementation of Neem Leaf Meal (NLM) in broiler finisher diets in cold and hot seasons. The experiment was laid-out in a completely randomized design (CRD). The birds were randomly allocated to four treatment groups of thirty six birds per treatment; each treatment was replicated three times with twelve birds per replicate. The four groups were randomly allocated to four diets containing varying levels of NLM of 0, 3, 6, and 9% representing diets 1 to 4, respectively. The bird's performances were measured and calculated in terms of body weight gain, feed intake, water intake and Feed conversion ratio (FCR). There were no significant differences in cold season ($P>0.05$). Similarly, in the hot season, supplementing finisher diets with levels of NML shows no significant effect ($P>0.05$) on all the parameters measured except in FCR. Feed conversion ratio had better (lower) values in T2 (1.71) and T3 (1.71). High values for FCR were recorded in T4 (1.90). This result indicated a trend showing that additional NLM leads to poor FCR. The result of T-test to compare the seasons shows no significant effect ($P>0.05$) when NLM is supplemented on the performance of finisher birds. It is concluded that supplementing broilers with NLM finisher stage in both cold and hot seasons can improve performance since it influenced better FCR of 1.71. It is recommended that NLM supplementation should be adopted in hot season in an inclusion of up to 6% for broiler production since it improved better feed utilization.

**Keywords:** neem leaf meal, growth performance, broiler finisher, cold and hot seasons, sudan savanna

## INTRODUCTION

Poultry meat among other foods of animal origin, make a valuable contribution to human nutrition worldwide and poultry meat contains a lower amount of saturated fatty acids (33% of total) and a higher amount of polyunsaturated fatty acids (PUFA) (14%) than lean meat of mammals, which contains 45% saturated fatty acids (SFA) and PUFA 4% [1]. However, feeding of both main ingredients and additives is one of the most important management practice that ensures quality of poultry meat.

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High prices of conventional feed additives used in poultry feed has resulted into research of alternative cheaper sources. It was reported by [2] that the need for alternative sources of feeds has led to the exploitation of leaf meals of tropical legumes and browse plants as ingredients in poultry diets [3][4]. In an effort to develop new feedstuff for animal feeding, a number of researchers have investigated the proximate composition of neem seed, leaves and cake and its use as feedstuff in poultry and rabbits [5] [6] [7][8].

*Azadirachta indica*, commonly known as neem, and *dogonyaro* (local name (hausa)) belong in the mahogany family Meliaceae. This highly prolific tree which is native to India, is widely distributed in Asia, Africa and other tropical parts of the world [3]. Neem leaf contains between 17.5-20.69% CP, 4.12% EE and 752 kcal/kg metabolizable energy [9] 92.42 dry matter, 7.58 moisture 7.10 ash,43.91% nitrogen free extract thus can be used as an alternative source of feed for poultry, [4]. Essentially, all parts of the plant (stem, leaves and seeds) and its products (neem seed oil) has been used for different purposes by man most importantly for pharmaceutical and purposes animal feeding [10] [11]. In animal husbandry, various research findings indicated that neem leaves have been reported to offer a multiple of benefits as antimicrobial [9], anti-parasitic, immune system booster, appetite stimulants, growth promoters, reproductive enhancers [12][13]. This is owing to its richness in significant biomolecules and nutritional value [14][15]. Such organic substances, including phenolic compounds, nitrogen compounds, vitamins, and terpenes. These compounds contribute to the herbs medicinal properties, flavors and aromas.

Many organic substances have been included in the poultry feed industry as supplements and replacers, antimicrobial agent and antioxidants [9], organoleptic enhancers and growth promoters [12], reproductive enhancers [13], and general performance of poultry. However, little or no available information was documented on the effect of such organic supplements in relation to seasons. This research was therefore designed to evaluate the inclusion of neem leaf meal in finisher diet in order to access the overall performance of poultry in both cold and hot seasons.

## MATERIALS AND METHODS

### Experimental Site

The study was carried out at the poultry Unit of the Department of Animal Science, Kebbi State University of Science and Technology Aliero (latitude $12^0$ 12.997'N; longitude $004^0$ 29.848' Elevation 262) in Sudan Savannah ecological zone of Nigeria. The climate of the area is semi-arid with average annual rainfall of about 500mm-650mm per annum, relative humidity ranges from 21-47% and temperature ranges from 20-$30^0$C during cold dry season (November to February) and 27-$41^0$C during hot dry season (March to June) [16].

### Experimental Diets

Four experimental broiler starter and finisher diets were formulated containing 22 and 19% CP respectively. The neem leaf meal was then incorporated at 0, 3, 6 and 9percent levels respectively. The ingredient composition of the experimental diets is shown in Table 3.1. The diets were balanced for crude protein and caloric to meet the requirements of broilers starter and finisher in the tropics.

### Source and Processing of Neem Leaves

Fresh green neem leaves used for the experiment were harvested within the University fom the same plant. The collected leaves were then air dried under room temperature. They were considered adequately dried when they became crispy to the touch as described by [5].

### Ingredient Composition of Broiler Finisher Experimental Diets

The Ingredient composition of broiler finisher experimental diets is shown in Table 1 below.

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Table 1. Ingredient Composition of Broiler Finisher Experimental Diets

| Ingredient | $T_1$ (0%) | $T_2$ (3%) | $T_3$ (6%) | $T_4$ (9%) |
|---|---|---|---|---|
| Maize | 59.93 | 60.89 | 61.80 | 65.00 |
| GNC | 13.30 | 13.11 | 13.20 | 14.00 |
| Soy beans | 5.00 | 5.00 | 5.00 | 5.00 |
| NLM | 0.00 | 3.00 | 6.00 | 9.00 |
| Wheat offal | 15.00 | 11.00 | 7.00 | 0.00 |
| Blood meal | 3.00 | 3.00 | 3.00 | 3.00 |
| Bone meal | 1.00 | 1.00 | 1.00 | 1.00 |
| Lime stone | 2.00 | 2.00 | 2.00 | 2.00 |
| Lysin | 0.25 | 0.25 | 0.25 | 0.25 |
| Methionine | 0.25 | 0.25 | 0.25 | 0.25 |
| Premix | 0.25 | 0.25 | 0.25 | 0.25 |
| Salt | 0.25 | 0.25 | 0.25 | 0.25 |
| Total | 100 | 100 | 100 | 100 |

Calculated analysis for broiler finisher diet

| Diet | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| Crude protein | 19 | 19 | 19 | 19 |
| Crude fiber | 3.51 | 3.66 | 3.81 | 3.77 |
| Either extract | 3.91 | 3.88 | 4.17 | 3.85 |
| ME Kcal/kg | 2901 | 2885 | 2865 | 2888 |

**Experimental Birds and Design**

One hundred and forty four (144) broiler finishers were employed for this experiment, and were randomly assigned to four treatments group in a completely randomized design (CRD). Each treatment was replicated three times such that each replicate had 12 birds.

**Management of Experimental Birds**

Prior to the arrival of the chicks, pens for the experiment were washed and disinfected. Heat sources ware provided using 100 watt electric bulbs, wood shavings were used as litter material. Temperature and relative humidity were monitored. Feed and water was given ad-libitum. Vaccination and medication schedules had been administered.

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**Data Collection**

The birds were weighted at the beginning of the trial and weekly thereafter. Daily feed intake per pen were determine by weighing feed offered and left over following the morning, water consumption was determined by measuring the water offered and left over following the morning.

**Data Analysis**

Data collected on growth performance, were subjected to analysis of variance ANOVA. Significant means were separated using Tuckey test at 5% level of significance. Student T-test was used to compare all parameters between cold and hot seasons.

## RESULTS AND DISCUSSION

**Performance of Broiler finisher Fed Neem Leaf Meal (NLM) in Cold and hot Season.**

The effect of graded levels of neem leaf meal on the performance of broiler finisher in cold and hot seasons is shown in Table 2. Result shows that in cold season there were no significant differences (P> 0.05) between treatments in all parameters observed when birds were fed graded levels of NLM. Results for hot season shows that with the exception feed conversion ratio, there were no significant difference (P< 0.05) between treatments in all parameters observed when birds were fed (NLM). The T-test result shows that supplementing broiler finishers with NLM had not shown any significant effect on the general performance of the birds.

Table 2. Effect of graded level of neem leaf meal on the performance of broiler finisherin coldseason

| Parameters | | | | | Treatments* | | | | SEM | |
|---|---|---|---|---|---|---|---|---|---|---|
| | T1 | | T2 | | T3 | | T4 | | | |
| | Cold | Hot | Cold | Hot | Cold | Hot | Cold | Hot | Cold | Hot |
| IBW (g)/b | 351 | 371 | 359 | 359 | 384 | 416 | 375 | 395 | 0.36 | 0.25 |
| FBW (g)/b | 1744 | 1230 | 1800 | 1252 | 1890 | 1316 | 1839 | 1287 | 0.25 | 0.02 |
| ADG (g)/b | 48.03 | 30 | 51.4 | 32 | 53.78 | 31 | 52.28 | 31 | 0.09 | 0.001 |
| ADFI (g)b | 81 | 55.7 | 87 | 56.6 | 80 | 55.4 | 90 | 56 | 0.006 | 0.013 |
| ADWI (ml)b | 184 | 109 | 193 | 104 | 181 | 112 | 208 | 108 | 0.016 | 0.031 |
| FCR | 1.81 | $1.71^{a}$ | 1.905 | $1.71^{a}$ | 1.976 | $1.72^{ab}$ | 2.023 | $1.90^{ab}$ | 0.208 | 0.052 |
| T–test – 0.05 (*P-value*) | $0.376^{ns}$ | | $0.382^{ns}$ | | $0.381^{ns}$ | | $0.378^{ns}$ | | | |

IBW=Initial body weight (g)/b, FBW=Final body weight (g)/b, ADG=Average daily weight gain (g)/b, ADFI=Average daily feed intake (g)b, ADWI=Aver, daily water intake (ml)b, FCR=Feed conversion ratio

*T1 =0%NLM; T2 = 3%NLM; T3 =6%NLM T4=9%NLM

a,b=Means on the same row with different superscripts are significantly(P<0.05) different.

Results shows that in both cold and hot seasons, there was no significant difference on average daily feed intake, water intake, feed conversion ratio, average daily weight gain, and final body weight across all treatments. Similar researches also observed no significant difference on daily weight gain per bird, average daily feed intake

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per bird, daily water intake per bird when fed similar ingredients at different inclusion levels and forms [17][13][12][18]. Though, none of the researches relates their findings to seasonal effects.

In hot season, the result shows significant effect in feed conversion ratio. Feed conversion ratio is the ability of a bird to convert a least amount of feed to weight. Therefore, lower values of feed conversion ratio are desirable and indication that for better performance. Birds fed diets from T1 and T2 were the same with lowest better feed conversion ratio (1.71). Treatment 3 with 6% level of neem leaf meal has feed conversion ratio that is slightly high than treatment 1 and 2, treatment 4 with 9% level of neem leaf meal has the highest level of feed conversion ratio. It has been observed that additional level of NLM in diets lead to poor feed conversion ratio and this may be due to the higher level of neem leaf meal present in the diet. Similar trend of feed conversion ratio was also reported by [18] that the best value of feed conversion ratio and protein efficiency were recorded in control while the other group had similar value. It was also observed by [12] that at finisher phase of his study all the parameters reduced in value across dietary treatment as the inclusion levels of neem leaf meal increase.

Though the T-test indicated no significant difference between the cold and hot seasons, it was observed that numerical values for all parameters were better among the birds raised under cold season than hot season. According to [19][20], temperature significantly affects general broiler performance where both low and high temperatures negatively impacting growth, feed efficiency, and overall productivity. High temperatures leads to decrease feed intake to minimize heat production, which can hinder growth [20].

## CONCLUSION

From the findings of the study, it was concluded that though supplementing NLM in broiler finisher diets had not significantly influenced their performance at finisher stage in both cold and hot seasons, FCR was significantly influenced by 3% supplementation at finisher stage in hot season. Similarly, increase in NLM levels have shown a trend in increasing weight gain, feed intake and water intake in cold season, indicating that the cold season is more desirable in raising poultry in the study area.

### Ethical Consideration

Proper documentation was made with the institutions ethics committee before conducting the research.

### Conflict of interest

There is no conflict of interest between the authors.

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