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GROWTH PERFORMANCE, CARCASS CHARACTERISTICS AND MEAT QUALITY OF BROILER CHICKEN IN RESPONSE TO DIFFERENT LEVELS OF DIETARY *MORINGA OLEIFERA* LEAF MEAL

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ABSTRACT

This study investigated the effects of different levels of dietary *Moringa oleifera* leaf meal on growth performance, carcass characteristics and meat quality of broiler chicken. A total of 144 birds were allocated into four dietary treatment groups, each with three replications of 12 birds. The treatments were: a control diet with no *Moringa oleifera* (T1) and diets supplemented with 0.5% *Moringa oleifera* (T2); 1% (T3) and 1.5% (T4) *Moringa oleifera* leaf meal. The data were analyzed using one-way analysis of variance (ANOVA). The highest body weight was observed in T3 group (1% supplementation). While the yields of neck, wings, breast, back and overall dressing percentage showed no statistically significant differences ($p>0.05$) among treatments, thigh yield was significantly higher ($p<0.05$) in supplemented groups. Analysis of breast meat revealed significant differences ($p<0.05$) in moisture and fat content and protein percentage was not significantly affected ($p>0.05$). The dressing percentage and total offal were comparable between the 0.5 and 1% supplementation group. Similarly, the calcium and phosphorus content of breast meat were identical for 0.5 and 1% treatment. Therefore, it is recommended to add *Moringa oleifera* at 0.5 – 1% in broiler diets to improve performance, carcass quality and meat quality of broiler chicken.

Key words: *Growth performance, dietary, dressing percentage, moringa oleifera*

INTRODUCTION

A miracle tree *Moringa oleifera* known as drumstick tree is a multipurpose tree that thrives in both tropical and sub-tropical conditions. It has high nutritional and medicinal value. In Nepal it is called *Sheetal Chini*. Its different parts are sources of proteins, vitamins and minerals and present different medicinal and nutritional properties. *Moringa oleifera* leaf is reported to contain 25–27% crude protein (Gadzirayi et al., 2012). Its medicinal properties derives from alkaloids, tannins, flavonoids, steroids, saponins, coumarins, quinones and resins

(Anwar et al., 2007). The chemical constituents of *M. oleifera* have bioactive compounds, secondary metabolites such as phenolic acids, gallic acid, ellagic acid, chlorogenic acid, ferulic acid, glucosinolates, quercetin, vanillin and kaempferol, which have nutritional, pharmaceutical and/or antimicrobial properties (Mbikay, 2012 and Brilhante et al., 2017). Some authors have demonstrated its ability to improve growth, weight gain and carcass performance in broiler chickens (Zanu et al., 2012; Nkukwana et al., 2014, Macambira et al., 2022). Therefore, the aim of this study was to assess the growth performance, carcass characteristics and meat quality of broiler chicken in response to incremental levels of dietary Moringa leaf meal.

MATERIALS AND METHODS

Experimental trial

The experimental study which included rearing of broilers chicken was conducted at National Animal Health Research Center (NAHRC), Khumaltar, Lalitpur, Nepal. Laboratory examination was conducted at, NAHRC, Pathology lab.

Experimental design

One hundred and forty-four-day old Cobb 500 broiler chickens (with an average body weight 43.06 ± 2.39) from a commercial hatchery were procured and divided into four treatments groups each consisting of 36 birds. Initially, birds were kept for one week in the experimental house. Each group was replicated three times with replication consisting of 12 birds. Experimental groups were given different treatments which are mentioned in Table1. The birds were allocated randomly to the different groups.

Table 1: Experimental trial

Treatments	Replication	Feed
T1	3	Basal diet with no *Moringa oleifera*
T2	3	Basal diet with *Moringa oleifera* 0.5% (5gm/kg feed) in feed
T3	3	Basal diet with *Moringa oleifera* 1% (10gm/kg feed) in feed
T4	3	Basal diet with *Moringa oleifera* 1.5% (15gm/kg feed) in feed

General management

The birds were reared on a deep litter system open-sided wire mesh constructed poultry house to allow for adequate ventilation and maintained with all recommended husbandry norms in relation to light, feed and water. Commercial mash feeds were acquired from a commercial feed mill. The *Moringa oleifera* leaf powder was sourced from a reputed company, Annapurna Organic Agricultural Udhoyug, Kapilvastu, Nepal. Feed and water were given to the bird's ad-libitum. All the groups were reared on commercial feeds with fulfillment of all its requirements according to the increasing life time and days of life. They were fed with broiler starter feed (B1) from zero day to 3rd weeks, broiler grower feed (B2) after 3rd week up to 5th weeks and broiler finisher (B3) from 5th week onwards. Provision of fresh water with proper arrangement of space and light were managed for all

the birds. Light, medications, vaccinations and other routine management practices were followed as per standard commercial broiler management guidelines.

Laboratory examination

Body weight gain

Weekly body weight was measured during the trial.

Dressing percentage

Carcass weight and live weight of one bird from each replicate was taken and dressing percentage was calculated on 42 days after completion of trial as follows:

$$\text{Dressing \%} = \frac{\text{Carcass weight} \times 100}{\text{Live weight}}$$

Carcass characteristics

One bird of each replication was slaughtered on 42 days of age, eviscerated and edible and non-edible viscera were measured. Measurement of individual head, shank, feather, liver, heart empty gizzard, neck, wings, breast, back, and thigh was recorded to find out the percent share of different parts, percent share of offal, percent share of giblets.

Proximate and mineral analysis of powder form of *Moringa oleifera* leaf

The *Moringa oleifera* leaves were send to National Animal Nutrition Research Center, Khumaltar, Lalitpur, Nepal for proximate and mineral analysis of *Moringa oleifera*. Analysis was carried out according to the procedure of Association of Official Analytical Chemist to determine the moisture, dry matter, crude protein, natural detergent fiber, acid detergent fiber, hemicellulose, cellulose, calcium and phosphorus (A.O.A.C, 2000).

Proximate and mineral analysis of breast meat of broiler

A 42 days old broiler from each replication was eviscerated and breast meat was send to Food Technology Lab, Khumaltar, Lalitpur, Nepal for proximate and mineral analysis. Moisture, crude fat, crude protein, connective tissue, total ash, calcium, iron & phosphorus content of meat.

Bio-statistics and data analysis

Statistical analysis was carried out using ANOVA using SPSS-20 version, at a significance level of 0.05. The treatments were assigned randomly following the Complete Randomized Design (CRD).

RESULTS AND DISCUSSION

Effect of *Moringa oleifera* leaf feeding on body weight gain

Average body weight gain of experimental broilers been presented in table 2. On 1st, 7th, 14th, 21th, 28th, 35th & 42th days average mean body weight was found to be statistically non-significant ($p>0.05$). On 28th, 35th and 42nd days highest body weight was 1587.33±97.39gm, 2371.33±93.39gm, 2776.67±148.36gm in T3 (1% *Moringa oleifera*) group and lowest weight was found 1100.67±285.38gm 2181.33±143.97gm and 2490±110gm in T1 (control) group. The body weight at 14, 28, 35 & 42 days was higher in third treatment i.e basal diet with *Moringa oleifera* 1% in feed in compare to other treatments and control group. This

improvement in growth performance may be attributed to the rich nutrient profile of *Moringa* leaves, which supply high-quality proteins, essential amino acids, vitamins (such as A, C, and E), and minerals that support tissue development and overall growth. In addition, the presence of bioactive compounds like flavonoids and phenolics enhances antioxidant status, reducing oxidative stress and thereby improving metabolic efficiency. Saponins and other secondary metabolites in *Moringa* may also exert antimicrobial effects in the gut, leading to improved intestinal health, better nutrient absorption, and enhanced feed conversion efficiency. Furthermore, *Moringa* supplementation has been reported to stimulate digestive enzyme activity and modulate the gut microbiota, both of which promote efficient nutrient utilization and weight gain in broilers. From table 2 we can say that body weight is higher in broiler chicken treated with *Moringa oleifera* leaf powder than control group.

Obtained data were agreed with David et al. (2012) who found that the effect of dietary supplemental herbal preparations on growth performance of broiler chicks from 0-42 day was 2744g, at treatment 0.05% of *Moringa* fruit powder. Similarly, according to Gakuya et al. (2014) who did study on effect of supplementation of *Moringa oleifera* (LAM) Leaf Meal in layer chicken found the average total feed intake per replicate (kg), of treatment (0, 1.25, 2.5, 5, 7.5 and 10%) *Moringa Oleifera,* were 2.213, 2. 457, 2.089, 2.436, 2.099 and 2.164kg, after 28days. Likewise, Hassan *et al.* (2016) found the effect of different levels *of Moringa oleifera* leaves meal on body weight of broiler chicks, were 1307, 1408, 1488 and 1543gm, of treatment MOLM (0, 0.1, 0.2 and 0.3%), after 35days, respectively.

Table 2: Effect of *Moringa oleifera* leaf feeding on body weight gain, gm (Mean± SE) at different days of broiler

Treatments	1 day	7 days	14 days	21 days	28 days	35 days	42 days
T1	46±0.00	140.67±13.68	454±16.04	930.67±69.29	1100.67±285.38	2181.33±143.97	2490±110
T2	42.67±1.33	146±13.61	458±29.96	983.33±49.83	1147.33±389.67	2234.67±88.17	2546.67±193.42
T3	42.67±0.7	151.33±8.35	482.67±24.04	1014±75.02	1587.33±97.39	2371.33±93.39	2776.67±148.36
T4	40.67±3.53	162.67±0.67	478±22	1042±42.02	1438.67±79.79	2235.33±84.57	2513.33±68.39
p value	0.330^{ns}	0.528^{ns}	0.779^{ns}	0.622^{ns}	0.493^{ns}	0.636^{ns}	0.476^{ns}
CV%	8.06	11.79	7.92	10.01	32.22	7.63	9.15

Means in column with different superscripts are significantly different. ^{s}significant at 5% ($p < 0.05$); ^{ns}non significant.

Dressing percentage and percent share of different parts

The result of neck, wings, breast, back and dressing percentage was found statistically non-significant ($p>0.05$) differences among the treatment and control group throughout the observation period. But thigh percentage was found to be statistically significant ($p < 0.05$). Average dressing percentage and percent share of different parts of experimental broilers been presented in table 3. The highest dressing percentage was found 71.74±0.64 in T3 group. While the lowest dressing percentage was almost similar in T1 & T4 group i.e 70% which may be attributed to improved nutrient utilization and reduced visceral fat deposition, leading to a greater proportion of carcass yield relative to live body weight. Similarly, highest thigh percentage was found 22.13±0.00 in T3 group and lowest thigh percentage was found 18.76±0.16 in T4 group may be due to enhanced protein accretion and muscular growth in the leg quarters, which are known to respond positively to diets with balanced amino acid and phytogenic supplementation. However, Ayssiwede et al. (2011) and Ochi

et al. (2015) who studied the effect of *Moringa oleifera* seed powder on broiler chickens did not observe significant differences in the dressing percentage among the treatments. The variation could be attributed to the difference in the supplementation form of *Moringa oleifera* leaf meal. Highest back percentage was found 14.03±0.75 in T1 group and decrease in back percentage was observed in the *Moringa*-treated groups, which could indicate a favorable redistribution of muscle deposition towards more edible and market-preferred cuts. Similarly, breast and wings percent was found similar in all treatments i.e 27% and 6%. From this we can say *Moringa* supplementation did not compromise the development of the most valuable meat portions. Highest neck percentage was found 4.03±0.033 in T4 group followed by 3.94±0.06, 3.86±0.14 in T1 and T2 group. The lowest value was found 3.46±0.28 in T3 group. Which suggest that differences in protein partitioning and muscular development in less economically important regions of the carcass. Dietary inclusion of *Moringa* had no significant effect on neck, wings, breast back and thigh weight in the current trial. However, our study does not match with the findings of Melesse et al. (2013) who found significantly higher thigh, drumsticks, breast, and wing weight and yield in slow-growing South African Koekoek chickens that were fed a dietary inclusion of *Moringa stenopetala.* Nevertheless, these authors also reported a significantly higher slaughter weight without a covariate analysis, which might have influenced the statistical significance.

Table 3: Dressing percentage and percent share of different parts (Mean± SE) of broiler

Treatment	Neck	Wings	Breast	Back	Thigh	Dressing %
T1	3.94±0.06	6.14±0.79	27.17±0.12	14.03±0.75	19.11±0.26^{a}	70.39±0.19
T2	3.86±0.14	6.27±0.53	27.49±0.12	12.98±0.62	20.68±0.77^{b}	71.28±0.26
T3	3.46±0.28	6.26±0.23	27.31±0.63	12.40±0.66	22.13±0.00^{c}	71.74±0.64
T4	4.03±0.033	6.13±0.44	27.79±0.46	13.42±0.29	18.76±0.16^{ab}	70.14±0.41
p value	0.401^{ns}	0.99^{ns}	0.72^{ns}	0.34^{ns}	0.02^{s}	0.08^{ns}
CV%	7.27	12.81	2.32	8.23	8.40	1.29

Means in column with different superscripts are significantly different. ^{s}significant at 5% ($p < 0.05$); ^{ns}non significantly different.

Percent share of offal

Average mean percentage share of offal of broilers been presented in table 4. The highest offal percentage was found 25.04±0.33 in T4 group followed by 24.49±0.22 in control. The lowest offal percentage was almost similar (23%) in T2 & T3 group. Mean percent of head (3%), shank (4%) & feather (6%) was observed almost similar in all treatments and control group, indicating no effect on integument or appendage yields. Total viscera percentage and total offal percent was higher in the in the 1.5% *Moringa* diet. The elevation at 1.5% *Moringa* likely reflects greater gastrointestinal fill and increased gut tissue mass due to the higher fiber and secondary metabolites in *Moringa* leaf meal. The result of head, shank, feather and total offal was found non- significant ($p>0.05$) differences among the treatment and control group throughout the observation period. But total viscera percentage was found to be significant ($p < 0.05$).

Table 4: Mean percent share of offal (Mean± SE) of broiler

Treatment	Head	Shank	Feather	Total Viscera	Total offal
T1	3.13±0.03	4.11±0.03	6.53±0.23	10.77±0.00^{b}	24.49±0.22
T2	3.19±0.13	4.35±0.13	6.14±0.52	9.84±0.00^{a}	23.52±0.77
T3	3.17±0.11	4.38±0.05	6.24±0.52	9.42±0.00^{ab}	23.21±0.65
T4	3.16±0.08	4.34±0.06	6.51±0.25	11.04±0.00^{c}	25.04±0.33
p value	0.98^{ns}	0.13^{ns}	0.87^{ns}	0.00^{s}	0.14^{ns}
CV%	4.59	3.81	9.81	6.63	4.6

Means in column with different superscripts are significantly different. ^{s}significant at 5% ($p < 0.05$); ^{ns}non significant.

Percent share of giblets

The result of liver, heart, empty gizzard and total giblet was found statistically non-significant ($p>0.05$) differences among the treatment and control group throughout the observation period. Average mean percentage share of giblets of broilers been presented in table 5.The total giblet percentage was almost similar in control, T2 & T3 group but lowest value was observed 4.83±0.39 in T4 group. The percent share of giblets was not markedly influenced by *Moringa oleifera* leaf meal supplementation in broiler diets. Total giblet percentage was almost similar in control and *Moringa oleifera* treated diets (0.5 and 1%) indicating that low-level inclusion of *Moringa* supports normal development of visceral organs without causing undesirable enlargement. This stability suggests efficient nutrient utilization at these inclusion levels. This indicates that supplementation with *Moringa* leaf meal at these levels did not significantly affect the development or relative weight of visceral organs. The stability of giblet percentage suggests efficient nutrient utilization and normal organ development.

Table 5: Percent share of giblets (Mean± SE) of broiler

Treatment	Liver weight	Heart weight	Empty gizzard	Total giblet
T1	2.33±0.24	0.64±0.11	2.19±0.15	5.16±0.43
T2	2.45±0.27	0.81±0.07	2.09±0.17	5.35±0.50
T3	2.51±0.66	0.63±0.15	2.03±0.12	5.17±0.89
T4	2.14±0.36	0.70±0.04	1.99±0.07	4.83±0.39
p value	0.92^{ns}	0.61^{ns}	0.18^{ns}	0.94^{ns}
CV%	26.93	23.96	10.23	17.44

Means in column with different superscripts are significantly different. ^{s}significant at 5% ($p < 0.05$); ^{ns}non significant.

Weight of liver was almost similar in control and treatment group. Highest weight of heart was observed 0.81±0.07 in T2 group followed by 0.70±0.04, 0.64±0.11 T4 & T1 group. But lowest weight of heart was observed 0.63±0.15 in T3 group. Similarly, weight of empty gizzard was almost similar in control, T2 and T3 group and lowest value was observed 1.99±0.07in T4 group. In broiler chickens fed diets supplemented with *Moringa oleifera* leaf meal, the percentages of liver and empty gizzard were almost similar to those of the control group. This suggests that dietary inclusion of *Moringa* leaves did not adversely affect the development or function of these digestive and metabolic organs. The similarity in liver weight indicates normal metabolic and detoxification activity, without causing organ hypertrophy. For instance, the gizzard is a vital organ for feed grinding and nutrients and

digestive fluid mixing (Svihus et al., 2014). Several authors have observed significant effects of *Moringa oleifera* leaf meal on broilers' gizzard, liver, or heart weight and yield yield (Onunkwo et al., 2015; Nduku et al., 2020; Sarker et al., 2017; Igugo et al., 2014; Antyev et al., 2020) others found no *Moringa oleifera* leaf effects on the same internal organs (Antyev et al., 2020). The effect of *Moringa oleifera l*eaf on the heart and liver and gizzard in the current study showed non-significant, which is supported by reports of Sebola and Mokoboki (2019) and Ayssiwede et al. (2011) who observed no effect of *Moringa oleifera* leaf meal on such organs of indigenous chickens.

Proximate and mineral compositions of powder form of Moringa oleifera leaf

The poximate analysis of powder form of *Moringa oleifera* leaf (table 6) which was used in the research trial showed protein (28.11%), neutral detergent fiber (54.39%), acid detergent fiber (37.69%), acid detergent lignin (20.42%), hemicellulose (16.69%) & cellulose (17.27%). *Moringa oleifera* leaves contained essential minerals, Calcium (0.80%), phosphorus (0.20%). Furthermore, crude protein results of 28.11% obtained in this study was within the 20 to 33 % reported by Foidl & Paull (2008). According to Evaris et al., (2022) natural detergent fiber, acid detergent fiber, acid detergent lignin was 48.78, 25.43 & 5.70% which was higher than our study. However minor differences in the compositions could be due to environmental factors which play a minor role in determining the nutritive value of *Moringa oleifera* leaf.

Table 6: Proximate and mineral compositions of powder form of Moringa oleifera leaf

Parameter (%)	Proximate and mineral compositions (%)
Moisture	N/A
Crude protein (CP)	28.11
Neutral detergent fiber (NDF)	54.39
Acid detergent fiber (ADF)	37.69
Acid detergent lignin (ADL)	20.42
Hemicellulose (HC)	16.69
Cellulose (C)	17.27
Calcium (Ca)	0.80
Phosphorus (P)	0.20

Proximate and mineral analysis of breast meat

Proximate analysis of breast meat at 42 days of experimental broilers been presented in table 7**.** Moisture, crude fat, crude protein, calcium, iron & phosphorous percentage of breast meat was found to be statistically significant ($p<0.05$). But total ash percentage was found to be statistically non-significant ($p>0.05$) among the treatment and control group throughout the observation period. The protein percentage of breast meat was found almost similar in T1, T2 & T3 groups. Whereas lowest 18.79±0.01 in T4 group. Similarly, highest fat percentage of breast meat was found 2.29±0.01 in control as compared to *Moringa oleifera* treated diets. The highest and lowest moisture percentage was found 78.12±0.02 in T4 group and 75.01±0.01 in control group. There was no any connective tissue found on any treatments and control group broiler.

In the T2 group, the highest value of calcium was observed 98.67±0.01 followed by 92.17±0.01 & 87.04±0.01 in T3 and control group. Lowest value was found 83.28±0.01 in

T4 group. Similarly, the highest value of iron was observed 0.76±0.01 in control followed by0.62±0.01, 0.40±0.06 in T3 and T2 group. While the lowest value was found 0.19±0.01 in T3 group. In T2 group, the highest phosphorous content of breast meat of broiler was observed 336.08±0.00 followed by 218.19±0.00 & 192.85±0.00 in T3 and control. Lowest value was found 104.29±0.0 in T4 group.

Table 7: Proximate and mineral analysis of breast meat (Mean ±SE) of 42 days broiler chicken

Treatment	Moisture %	Crude fat %	Crude protein %	Connective tissue	Total ash%	Calcium (mg/100g)	Iron (mg/100g)	Phosphorous (mg/100g)
T1	75.01±0.01^{a}	2.29±0.01^{a}	21.64±0.01^{b}	0.00±0.0	1.16±0.01	87.04±0.01^{a}	0.76±0.01^{a}	192.85±0.00^{c}
T2	76.08±0.01^{b}	1.37±0.01^{b}	21.64±0.01^{a}	0.00±0.0	1.15±0.01	98.67±0.01^{b}	0.40±0.06^{b}	336.08±0.00^{a}
T3	76.07±0.01^{ab}	1.50±0.06^{ab}	21.52±0.01^{c}	0.00±0.0	1.18±0.01	92.17±0.01^{c}	0.62±0.01^{c}	218.19±0.00^{b}
T4	78.12±0.02^{c}	1.32±0.01^{c}	18.79±0.01^{ab}	0.00±0.0	1.18±.01	83.28±0.01^{ab}	0.19±0.01^{ab}	104.29±0.00^{ac}
p-value	0.00^{S}	0.00^{S}	0.00^{S}	NA	0.14^{ns}	0.00^{s}	0.00^{s}	0.00^{s}
CV%	1.54	25.37	6.08	NA	1.37	6.68	46.82	40.61

Means in column with different superscripts are significantly different. ^{s}significant at 5% ($p < 0.05$); ^{ns}non significantly different.

The proximate and mineral composition of breast meat in broilers fed *Moringa oleifera* leaf supplemented diets showed a decrease in fat percentage, an increase in calcium and phosphorus levels, and a reduction in iron content. The reduction in fat percentage may be attributed to the hypolipidemic effects of bioactive compounds present in *Moringa* leaves, such as flavonoids, phenolics, and saponins, which are known to modulate lipid metabolism and reduce fat deposition. The increase in calcium and phosphorus concentrations could be linked to the high mineral content of *Moringa* leaves, particularly their rich supply of calcium and phosphorus, which enhances mineral deposition in muscle tissues when included in the diet. Moreover, *Moringa* is a good source of phytochemicals that may improve intestinal absorption and utilization of minerals. The observed decrease in iron content may be explained by the presence of antinutritional factors such as tannins and phytates in *Moringa* leaves, which can form insoluble complexes with iron and reduce its bioavailability. Another possibility is a nutrient partitioning effect, where the enhanced growth performance associated with *Moringa* supplementation results in a redistribution of iron towards hemoglobin synthesis rather than storage in muscle tissues.

CONCLUSION

The result of our studies showed that birds feed with *Moringa oleifera* leaf have effect on production performance. The body weight was higher in third treatment i.e basal diet with *Moringa oleifera* 1% in feed in compare to other treatments. Neck, wings, breast, back and dressing percentage was found statistically non- significant ($p>0.05$) differences among the treatment groups as compared to the control group throughout the observation period. But thigh percentage was found to be statistically significant ($p<0.05$). Moisture and fat percentage of breast meat was found to be statistically significant ($p<0.05$) and protein percentage was found to be statistically non- significant ($p>0.05$). From this we can conclude that weight was higher in broiler chicken treated with *Moringa oleifera* leaf powder than control group. The dressing percentage and total offal of broiler was found almost similar in *Moringa oleifera* (0.5 and 1%) leaf treated diet. Calcium and Phosphorus percent of breast meat at 42 days was

almost similar in *Moringa oleifera* (0.5 and 1%) treated diet but there was no difference in protein percent of *moringa oleifera* leaf treated and non-treated diet of broiler chicken.

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REFERENCES

Antyev, M., Wafar, R., & Akyume, T. T. (2020). Evaluation of Moringa *(Moringa oleifera)* leaf meal as a feed additive in broiler chickens' diets. *International Journal of Veterinary Science and Animal Husbandry, 5*(1), 12–17.

Anwar, F., Latif, S., Ashraf, M., & Gilani, A. H. (2007). *Moringa oleifera*: A food plant with multiple medicinal uses. *Phytotherapy Research, 21*(1), 17–25.

Association of Official Analytical Chemists. (2000). *Official methods of analysis* (17th ed.). AOAC International.

Augustine, P. C., & Thomas, O. P. E. (1979). *Eimeria meleagrimitis* in young turkeys: Effect on weight, blood and organ parameters. *Avian Diseases, 23*(4), 854–862.

Ayssiwede, S. B., Dieng, A., Bello, H., Chrysostome, C. A. A. M., Hane, M. B., Mankor, A., Dahouda, M., Houinato, M. R., Hornick, J. L., & Missohou, A. (2011). Effects of *Moringa oleifera* (Lam.) leaf meal incorporation in diets on growth performance, carcass and economic characteristics of growing indigenous Senegal chickens. *Pakistan Journal of Nutrition, 10*(12), 1132–1145.

Brilhante, R. S. N. (2017). Research advances on the multiple uses of *Moringa oleifera*: A sustainable alternative for socially neglected population. *Asian Pacific Journal of Tropical Medicine, 10*(7), 621–630.

David, L. S., Vidanarachchi, J. K., & Samarasinghe, K. (2012). Effects of moringa-based feed additives on the growth performance and carcass quality of broiler chicken. *Tropical Agricultural Research, 24*(1), 12–20.

Evaris, E. F., Franco, L. S., Castro, C. S., Correa, J. S., & Maldonado, J. A. C. (2022). Male layer chickens' response to dietary *Moringa oleifera* meal in a tropical climate. *Animals, 12*(14), 1843. https://doi.org/10.3390/ani12141843

Foidl, N., & Paull, R. (2008). *Moringa oleifera*. In J. Janick & R. E. Paull (Eds.), *The encyclopedia of fruit and nutrition* (pp. 509–512). CABI.

Gadzirayi, C. T., Masamha, B., Mupangwa, J. F., & Washaya, S. (2012). Performance of broiler chickens fed on mature *Moringa oleifera* leaf meal as a protein supplement to soybean meal. *International Journal of Poultry Science, 11*(1), 5–10.

Gakuya, D. W., Mbugua, P. N., Mwaniki, S. M., Kiama, S. G., Muchemi, G. M., & Njuguna, A. (2014). Effect of supplementation of *Moringa oleifera* (Lam.) leaf meal in layer chicken feed. *International Journal of Poultry Science, 13*(7), 379–384.

Hassan, H. M. A., El-Moniary, M. M., Hamouda, Y., El-Daly, E. F., Youssef, A. W., & Abd El-Azeem, N. A. (2016). Effect of different levels of *Moringa oleifera* leaves meal on productive performance, carcass characteristics and some blood parameters of broiler chicks reared under heat stress conditions. *Asian Journal of Animal and Veterinary Advances, 11*(2), 60–66. https://doi.org/10.3923/ajava.2016.60.66

Igugo, R. U. (2014). An assessment of the use of varying levels of *Moringa oleifera* leaf meal as a substitute for vitamin-mineral premix in finisher broiler diet. *Journal of Experimental Research, 2*(2), 88–92.

Macambira, G. M., Rabello, C. B. V., Navarro, M. I. V., Costa Lopes, C. D., Lopes, E. C., Nascimento, G. R. D., Holanda Oliveira, H. S. D., & Silva, J. C. R. (2022). Effects of *Moringa oleifera* leaf meal on performance and carcass yield of broilers. *Brazilian Journal of Animal Science, 51,* e20220029. https://doi.org/10.37496/rbz5120220029

Melesse, A., Getye, Y., Berihun, K., & Banerjee, S. (2013). Effect of feeding graded levels of *Moringa stenopetala* leaf meal on growth performance, carcass traits and some serum biochemical parameters of Koekoek chickens. *Livestock Science, 157*(2–3), 498–505.

Mbikay, M. (2012). Therapeutic potential of *Moringa oleifera* leaves in chronic hyperglycemia and dyslipidemia: A review. *Frontiers in Pharmacology, 4,* 1–12. https://doi.org/10.3389/fphar.2012.00024

Nantapo, C. W. T., Muchenje, V., Marume, U., & Hoffman, L. C. (2024). Effect of phytogenic *Moringa oleifera* leaf powder on performance, carcass characteristics, immune indicators, gut microbial population and economic viability of broiler chickens. *Discover Agriculture, 2*(1), 85. https://doi.org/10.1007/s44279-024-00104-4

Nduku, X. P., Mabusela, S. P., & Nkukwana, T. T. (2020). Growth and meat quality of broiler chickens fed *Moringa oleifera* leaf meal, a probiotic and an organic acid. *South African Journal of Animal Science, 50*(6), 710–718.

Nkukwana, T. T., Muchenje, V., Pieterse, E., Masika, P. J., Mabusela, T. P., Hoffman, L. C., & Dzama, K. (2014). Effect of *Moringa oleifera* leaf meal on growth performance, apparent digestibility, digestive organ size and carcass yield in broiler chickens. *Livestock Science, 161*(1), 139–146.

Ochi, E. B., Elbushra, M. E., Fatur, M., Abubakr, O., & Ismail, H. A. (2015). Effect of *Moringa* (*Moringa oleifera* Lam.) seeds on the performance and carcass characteristics of broiler chickens. *Journal of Natural Sciences Research, 5*(8), 1–6.

Onunkwo, D. N., & George, O. S. (2015). Effects of *Moringa oleifera* leaf meal on the growth performance and carcass characteristics of broiler birds. *Journal of Agriculture and Veterinary Science, 8*(5), 63–66.

Sarker, S. K., Rana, M., Khatun, H., Faruque, S., Sarker, N. R., Sharmin, F., & Islam, N. (2017). Moringa leaf meal as natural feed additives on the growth performance and meat quality of commercial broiler chicken. *Asian Journal of Medical and Biological Research, 3*(2), 240–244.

Sebola, N. A., & Mokoboki, H. K. (2019). Influence of dietary *Moringa oleifera* leaf meal on haematological parameters, serum biochemical indices and weight of internal organs of chickens. *Advances in Animal and Veterinary Sciences, 7*(11), 1042–1048.

Svihus, B. (2014). Function of the digestive system. *Journal of Applied Poultry Research, 23*(2), 306–314.

Venkatratnam, A., Reddy, K. R., & Hafeez, M. (1985). Caecal coccidiosis experimental transmission through cloaca and pathogenesis. *Cheiron, 14*(2), 95–97.

Zanu, H. K., Asiedu, P., Tampuori, M., Abada, M., & Asante, I. (2012). Possibilities of using *Moringa (Moringa oleifera)* leaf meal as a partial substitute for fishmeal in broiler chickens' diets. *Online Journal of Animal and Feed Research, 2*(1), 70–75.