**Enhancing Broiler Growth: Effects of *Moringa oleifera* Leaf Extract and Indigenous Cow Urine Supplementation**

**ABSTRACT**

The present study was conducted to assess the effects of *Moringa oleifera* methanolic leaf extract (MLE) and indigenous cow urine distillate (CUD) on growth performance, carcass and organ weight in broiler birds. 150 nos. day-old broiler chicks (Ross AP strain) were divided into 5 treatment groups, each with 3 replicates of 10 birds were reared for 42days. The treatment groups were as follows: Group C (Control) consisted of a basal diet, group S (Standard) consisted of a basal diet with Enradin as an antibiotic @ 0.025% in feed, group T1 consisted of *M. oleifera* @ 1g/L in drinking water (0.1%) + basal feed, group T2 consisted of Cow urine distillate @ 10ml/L in drinking water (1%) + basal feed, and group T3 consisted of a combination of *M. oleifera* @ 1g/L (0.1%) and cow urine distillate @ 10ml/L in drinking water (1%) + basal feed. Although, at 3rd, 4th, 5th and 6th week it was significantly (P˂0.05, ˂0.01 and ˂0.001) increased body weight in the birds of S, T1, T2 and T3 groups as compared to the C (Control) group. Also, the average weekly body weight gain at 1st and 2nd week, while it was significantly (P˂0.05, <0.01 and <0.001) increased in the birds of S, T1, T2 and T3 groups as compared to the C (control) during 3rd and 4th week of administration. It is concluded that incorporation of Moringa oleifera methanolic leaf extract and indigenous cow urine distillate alone and in combination through drinking water is beneficial in terms of growth performance.

**Keywords:** *Moringa oleifera* methanolic leaf extract, growth, cow urine distillate, Enradin, Ross AP strain.

**INTRODUCTION**

India, a highly populated country with 1.39 billion (2021) (**worldometers.info**). Chicken meat and eggs are the alternative food source. Almost all communities consume chicken meat and eggs. The Indian poultry industry is growing rapidly like other sectors. Poultry production is the most widely disseminated of all livestock industries; it is a key pillar of food security improvement, as well as socio-cultural and economic development in most nations (Alders, 2005; Dieye *et al.,* 2010). Antibiotics are commonly used in drinking water as a growth promoter and to prevent or control pathogenic bacterial diseases in poultry (Zeweil*et al.,* 2006). The benefit of such a method is that it promotes good health, reduces bird mortality, promotes maximum growth through enhanced nutrient usage and eventually improves profitability. Antibiotics as growth promoters (AGP) were quickly discovered to have adverse side effects (Makanjuola *et al.,* 2014). To overcome that situation herbal growth promoters are mostly recommended. However, there is a paucity of research on the influence of *M. oleifera* methanolic leaf extract and indigenous cow urine distillate and their combined effect on growth performance based on hematobiochemical, immunological and oxidative stress parameters and more research is needed.

**MATERIALS AND METHODS:**

The current study was carried out at the College of Veterinary Science and Animal Husbandry, DSVCKV, Durg, Chhattisgarh, poultry shed of Department of Veterinary Pharmacology and Toxicology. On broiler chickens, the study was conducted using a completely randomised design. For 42 days, 150 broiler chicks (Ross AP strain) were raised. The day-old chicks were split into five groups, each with three replicates of ten birds. The following were the treatment groups: Group C (Control) had a basal diet without any feed additives, group S (Standard) had a basal diet with Enradin as an antibiotic @ 0.025 % in feed, group T1 had *M. oleifera* @ 1g/L in drinking water (0.1%) + basal feed, group T2 had Cow urine distillate @ 10ml/L in drinking water (1%) + basal feed and group T3 had a combination of the above. The experimental design for the research studies in broiler birds is demonstrated in Table 1. The feed and feed formulation were procured from the State feed factory, Dhamdha, Chhattisgarh, India. Twice a day, ad libitum clean drinking water and feed were provided and raised on floors in a deep litter system. As per BIS 2007, the table 2, shows the experimental diets for broiler pre-starter (1-2 weeks), stater (3-4 weeks), and finisher (5-6 weeks).

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| **Table 1: Experimental design for the research studies in broiler birds** | | | | | |
| **Particulars** | **Groups** | | | | |
| **C**  **(Control)** | **S**  **(Standard)** | **Treatment** | | |
| **T1** | **T2** | **T3** |
| Total birds | 30 | 30 | 30 | 30 | 30 |
| Replicate | 3 | 3 | 3 | 3 | 3 |
|  | 10 | 10 | 10 | 10 | 10 |
| Basal feed | + | + | + | + | + |
| Enradin (0.025%) | - | 0.25mg/kg feed | - | - | - |
| MLE in water (0.1%) | - | - | 1g/L | - | 1g/L |
| CUD in water (1%) | - | - | - | 10ml | 10ml |

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| **Table 2: Ingredient composition of broiler diet** | | | |
| **Ingredients** | **Pre-starter** | **Starter** | **Finisher** |
| Yellow maize (kg) | 54.80 | 55.00 | 55.32 |
| Deoiled soybean meal (kg) | 37.00 | 32.40 | 28.47 |
| Rice polish (kg) | 2.6 | 7.00 | 10.00 |
| Soybean meal oil (kg) | 2.0 | 2.00 | 2.50 |
| Dicalcium phosphate (DCP) (kg) | 1.60 | 1.60 | 1.60 |
| Limestone powder (LSP) (kg) | 0.70 | 0.70 | 0.70 |
| Methionine (kg) | 0.28 | 0.26 | 0.24 |
| Lysine (kg) | 0.04 | 0.02 | 0.17 |
| Sodium bicarbonate (kg) | 0.14 | 0.15 | 0.16 |
| Common salt (kg) | 0.28 | 0.29 | 0.26 |
| Mineral mixture (kg) | 0.56 | 0.58 | 0.58 |
| Total (kg) | 100 | 100 | 100 |
| CP (%) | 23.05 | 21.50 | 20.00 |
| ME (kcal/kg) | 2975.6 | 3017 | 3084 |

**Organ morphometry:** 6 birds of each group (2 birds/replicate) were randomly chosen, weighed and slaughtered, after that the digestive and nondigestive organs were weighed separately. The weights (g) of pre-slaughter live body, eviscerated carcass, breast muscle, wing, drumstick, giblet (i.e., liver, gizzard and heart), neck, bursa, abdominal fat. For dressing % carcass weight was recorded after removing the organs like head, feathers, lungs, shank and viscera. The dressing percentage will be calculated by the formula:

Dressing % = × 100

**Preparation of *M oleifera* methanolic leaf extract and cow urine distillate**

**Extract preparation:** *M. oleifera* plant leaves were collected from Krishi Vigyan Kendra’s Medicinal Plant Garden in Anjora. DSVCKV, Durg (C.G.). The Department of Botany, Govt. V.Y.T.P.G. Autonomous College, Durg, acknowledged it botanically (C.G.). Freshly collected leaves were dried in the shade at room temperature before being powdered in a mixer grinder. The leaf powder was then extracted with methanol using the Soxhlet apparatus.

**Cow urine distillate preparation:** Early in the morning fresh urine was collected from the non-descriptive indigenous cow of Chhattisgarh, locally known as Kosali cow from a village, Mahmara, Durg. Then the urine was distilled or refined by using the simple distillation apparatus. At least 2L of cow urine distillate was collected in a sterile glass bottle for further use.

The experimental design was followed (Table 2) throughout the research was, a total of 5 groups (C, S, T1, T2 and T3), each group consisted of 3 replicate and each replicate with 10 birds, a total of 150 birds.

**Dietary treatments:**

Group C (Control) consisted of a basal diet, group S (Standard) consisted of a basal diet with Enradin as an antibiotic @ 0.025% in feed, group T1 consisted of *M. oleifera* @ 1g/L in drinking water (0.1%) + basal feed, group T2 consisted of Cow urine distillate @ 10ml/L in drinking water (1%) + basal feed, and group T3 consisted of a combination of *M. oleifera* @ 1g/L (0.1%) and cow urine distillate @ 10ml/L in drinking water (1%) + basal feed.

**Statistical analysis:**

Statistical analysis was carried out using a completely randomised design (CRD), and data were analysed using analysis of variance (ANOVA) (Snedecor & Cochran, 1987) and Duncan's multiple range test with probability P<0.05 (Duncan, 1955) for significant differences between treatments. The Statistical analysis was carried out by IBM SPSS (23.0).

**RESULTS AND DISCUSSION**

**Growth performance:**

The dietary supplementation of both MLE and CUD individually and combined effect on broiler birds’ growth performance (live body weight, body weight gain, feed consumption).

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| **Table 3-Effect of dietary supplementation of MLE and indigenous CUD and combination of both on mean live weight (g) of broiler birds (n=30).** | | | | | |
| **Age** | **C** | **S** | **T1** | **T2** | **T3** |
| **0 day** | 51.43**±**0.84a | 52.03**±**0.78a | 52.37**±**0.66a | 51.97**±**0.57a | 51.33**±**0.75a |
| **1st Week** | 160.07**±**3.57a | 165.83**±**4.57a | 168.17**±**4.74a | 159.63**±**5.11a | 164.37**±**4.22a |
| **2nd Week** | 345.20**±**8.31a | 355.17**±**11.29a | 368.97**±**4.78a | 344.40**±**10.66a | 357.07**±**8.96a |
| **3rd Week** | 627.80**±**10.93a | 681.20**±**21.87b**\*** | 811.33**±**13.42c**\*\*** | 706.53**±**21.84b**\*\*** | 731.03**±**22.45b**\*\*** |
| **4th Week** | 916.17**±**16.77a | 1104.23**±**28.57b**\*\*** | 1319.57**±**24.87d**\*\*** | 1202.93**±**23.02c**\*\*** | 1279.50**±**25.46d**\*\*** |
| **5thWeek** | 1423.07**±**18.39a | 1549.53**±**26.34b**\*\*** | 1798.57**±**29.08d**\*\*** | 1685.80**±**12.68c**\*\*** | 1767.57**±**30.57d**\*\*** |
| **6th Week** | 1845.23**±**19.61a | 1928.40**±**38.49a | 2144.03**±**34.92b**\*\*** | 2086.79**±**21.83b**\*\*** | 2146.47**±**37.12b**\*\*** |
| Means having different superscripts at a particular period of treatment differs significantly (P<0.05)  \*- Significant (P<0.05), \*\*- Highly significant at P<0.01 and <0.001 | | | | | |

**Organ morphometry and carcass characteristics:**

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| **Table 4: Effect of dietary supplementation of MLE and indigenous CUD and combination of both on the avg. organ weight (g) of broiler birds (n=6)** | | | | | |
| **Average Organ Weight (g) (Mean ± SE)** | | | | | |
| **Organ** | **C** | **S** | **T1** | **T2** | **T3** |
| **Live body weight (g)** | 1559.83**±**14.51a | 1709.50**±**24.93b,c\*\* | 1751.67**±**11.41b,c\*\* | 1697.50**±**22.83b\*\* | 1789.50±50.53c\*\* |
| **Dressing %** | 69.33**±**0.49a | 70.67**±**0.49a,b | 71.00**±**0.36 b \* | 70.00**±**0.58a,b | 71.17±0.60b\* |
| **Eviscerated carcass (g)** | 1365.00**±**18.32a | 1474.55**±**37.01b\* | 1560.55**±**10.60b,c\*\* | 1476.53**±**24.06b\*\* | 1573.91±40.47c\*\* |
| **Breast muscle (g)** | 381.00**±**7.02a | 421.33**±**16.24b\*\* | 420.83**±**4.37b\*\* | 406.00**±**2.25a,b | 421.67±11.23b\*\* |
| **Wing (g)** | 57.67**±**1.17a | 68.17**±**1.70a,b | 70.67**±**4.32a,b | 71.00**±**2.06a,b\* | 80.33±8.60b\*\* |
| **Drumstick (g)** | 81.83**±**0.94a | 88.67**±**1.78a | 91.67**±**1.91a,b | 88.17**±**1.05a | 99.17±6.99b\*\* |
| **Liver (g)** | 33.50**±**1.89a | 41.67**±**1.08b\*\* | 41.67**±**0.95b\*\* | 39.67**±**1.20b\*\* | 42.33±2.15b\*\* |
| **Gizzard (g)** | 19.27**±**0.28a | 21.78**±**0.56b\*\* | 22.60**±**0.32b\*\* | 21.73**±**0.11b\*\* | 22.73±0.85b\*\* |
| **Heart (g)** | 7.20**±**0.21a | 8.88**±**0.36b \*\* | 10.03**±**0.16c\*\* | 9.52**±**0.11b,c\*\* | 9.45±0.43b,c\*\* |
| **Neck (g)** | 95.00**±**0.73a | 98.33**±**1.05a,b | 97.33**±**0.71a | 96.00**±**0.93a | 101.00±1.93b\*\* |
| **Bursa (g)** | 1.73**±**0.02a | 1.89**±**0.11a,b | 1.89**±**0.06a,b | 1.78**±**0.06a | 2.09±0.14b\*\* |
| **Abdominal fats (g)** | 37.00**±**0.73a | 40.17**±**1.38a,b | 43.33**±**0.80b\*\* | 40.33**±**0.95a,b | 41.67±1.89b\* |
| Means having different superscripts at a particular period of treatment differs significantly (P<0.05)  **\***- Significant (P<0.05), **\*\***- Highly significant at P<0.01and <0.001 | | | | | |

The effect of MLE and CUD administration alone and in combination on the organ morphometry (dressing percentage, carcass yield and the weights of the drumstick, wing, abdominal fat, breast muscle, liver, gizzard, heart, neck and bursa of fabricius) of broiler birds are presented in Table 4. The pre-slaughter live weights of the birds from the Standard, CUD, MLE and T3 (MLE+CUD) groups were significantly (P<0.01) higher for organ morphometry than the Control group. The dressing percentages of slaughtered birds in the MLE and T3 (MLE+CUD) groups were significantly (P<0.01) higher than in the control diet birds. However, there were no significant differences in the dressing percentages of the standard and CUD groups at 42 days of age. The eviscerated carcass weights of slaughtered birds from the Standard, CUD, MLE and T3 (MLE+CUD) groups were found to be significantly (P<0.05) higher than birds fed control diets. The weights of the breast muscles of slaughtered birds from the S (Standard), T1 (MLE) and T3 (MLE+CUD) groups were found to be significantly (P<0.05) higher than birds fed control diets. The wings of slaughtered birds from the T2 (CUD) and T3 (MLE+CUD) groups were found to be significantly (P<0.05) heavier than birds fed control diets. Drumstick weights were significantly (P<0.01) higher in the T3 (MLE+CUD) group than in the control diet birds. There were no significant differences in the weights of the drumsticks between the S (standard), T1 (MLE) and T2 (CUD) groups at 42 days of age. Liver weights were significantly (P<0.01) higher in the S (standard), T2 (CUD), T1 (MLE) and T3 (MLE+CUD) groups than in the control diet birds. Gizzard weights were significantly (P<0.01) higher in the S (standard), T1 (MLE) and T3 (MLE+CUD) groups than in the control diet birds. Heart weights were significantly (P<0.01) higher in the S (standard), T1 (MLE), T2 (CUD) and T3 (MLE+CUD) groups than in the control diet birds. Neck weights were significantly (P<0.01) higher in the T3 (MLE+CUD) group only than in the C (control) diet birds. Bursa of fabricius weight was significantly (P<0.01) higher in the T3 (MLE+CUD) group only than in the C (control) diet birds. The weights of the abdominal fats of slaughtered birds from the T1 (MLE) and T3 (MLE+CUD) groups were found to be significantly (P<0.05) higher than birds fed control diets.

In contrary to Mehala *et al*. (2021) and Eze *et al*. (2012), who found no effect on carcass weight and relative organ weight among the treatment groups due to dietary supplementation of panchagavya, phytogenic and methanolic *M. oleifera* leaf extract as feed additives, our findings showed that both CUD alone and the combination (MLE+CUD) administered groups showed a significant improvement in carcass weight and relative organ weight. Similarly, David *et al*. (2012) reported that increasing the live weight, weight after bleeding and weight after defeathering were all improved after using *M. oleifera* leaves and fruit powders. According to Khempaka *et al*. (2009), the percentages of eviscerated carcasses and giblets found in broilers fed dried cassava pulp were not significantly different from those found in the control. Fabricius’ bursa was the largest in T3 birds and was significantly (P ≤0.05) larger than in T2 birds, which was much lower than the usual set standards for a good bursa to bodyweight ratio ranging between 0.18 and 0.30 (Cazaban and Gardin, 2012). The bursa plays an important role in boosting immunity in young birds. Ideally, the bursa to body wt ratio of meat-type breeds increases linearly to a strong bursa development against a relatively slow body development; then, from 6 weeks onwards, when body growth is optimal, bursa development stabilises and it gradually declines in weight (Cazaban and Gardin, 2012).

In the current case, possibly the T3 birds had synergistic effects in bodyweight growth and visceral organ development, increasing bursa weight. Hernández *et al*. (2011) found that broilers fed sorghum had significantly larger gizzards and higher gizzard content than those fed wheat diets. On the plus side, according to a review by Wallace *et al*. (2010), dietary inclusion of plant extracts did not affect feed consumption and FCR, despite positive effects on body weight, body weight gain, organ weight and/or energy utilisation. Coarse ingredients have been shown to benefit the development of the gizzard by ensuring complete grinding, a well-regulated digester flow and the secretion of digestive juices without compromising intestinal health and/or the bird's genetic potential (Selle *et al*., 2010; Sacranie*et al*., 2012).

**Weekly live bodyweight:** The effect of dietary inclusion of Indigenous CUD and MLE alone and in combination on the average weekly live weight of broiler birds are showing in Table 5. No significant (P<0.05) differences were observed in the average weekly live weight of broiler birds of S (Standard), T1 (MLE), T2 (CUD) and T3 (MLE+CUD) groups at day old (0 day) showing completely random design (CRD) of the groups. At the 1st and 2nd weeks of the experiment, no significant difference was found among the groups. While at 3rd, 4th, 5th and 6th week it was significantly (P˂0.05, P<0.01 and P<0.001) increased body weight in the birds of S, T1, T2 and T3 groups as compared to the C (Control) group. Similarly, Sushma *et al.* (2021) reported that the average body weight of the CUD (obtained from Ongole, Sahiwal and HF crossbred) fed groups were higher compared to the control group. Also, Faluyi*et al.* (2018) *M. oleifera* aqueous leaf extract resulted in a significant (P≤0.05) increase in the final bodyweight of the experimental birds.

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| Table 5: Effect of dietary supplementation of MLE and indigenous CUD and combination of both on average weekly live weight (g) of broiler chicks (n=30). | | | | | |
| Average weekly live weight (g) (Mean ± SE) | | | | | |
| Age | **C** | **S** | **T1** | **T2** | **T3** |
| 0 day | 51.43**±**0.84a | 52.03**±**0.78a | 52.37**±**0.66a | 51.97**±**0.57a | 51.33**±**0.75a |
| 1st Week | 160.07**±**3.57a | 165.83**±**4.57a | 168.17**±**4.74a | 159.63**±**5.11a | 164.37**±**4.22a |
| 2nd Week | 345.20**±**8.31a | 355.17**±**11.29a | 368.97**±**4.78a | 344.40**±**10.66a | 357.07**±**8.96a |
| 3rd Week | 627.80**±**10.93a | 681.20**±**21.87b**\*** | 811.33**±**13.42c**\*\*** | 706.53**±**21.84b**\*\*** | 731.03**±**22.45b**\*\*** |
| 4th Week | 916.17**±**16.77a | 1104.23**±**28.57b**\*\*** | 1319.57**±**24.87d**\*\*** | 1202.93**±**23.02c**\*\*** | 1279.50**±**25.46d**\*\*** |
| 5thWeek | 1423.07**±**18.39a | 1549.53**±**26.34b**\*\*** | 1798.57**±**29.08d**\*\*** | 1685.80**±**12.68c**\*\*** | 1767.57**±**30.57d**\*\*** |
| 6th Week | 1845.23**±**19.61a | 1928.40**±**38.49a | 2144.03**±**34.92b**\*\*** | 2086.79**±**21.83b**\*\*** | 2146.47**±**37.12b**\*\*** |

**Weekly body weight gain:** At the 1st and 2nd weeks, there were no significant (P<0.05) differences in average cumulative body gain between the S (Standard), T1 (MLE), T2 (CUD), and T3 (MLE+CUD) groups, but it was significantly (P<0.05, <0.01 and <0.001) increased in the S, T1, T2 and T3 groups compared to the C (control) group during the 3rd and 4th weeks of administration. However, there was no significant change among the treatment groups by the 5th week, but by the 6th week, the T1 (MLE) group's birds were substantially (P<0.05) demonstrating greater mean weekly body weight growth across the treatment groups as compared to the control group (Table 5).

In a similar study, Eze *et al*. (2012) found that the MLE-treated group gained more weight than the control group. Birds on the aqueous *M. oleifera* leaf extract treatment also had the highest ultimate bodyweight and daily body weight gain, according to Alabi *et al.,* (2017). Similarly, the MLE-treated group gained more weight than the control group, according to our data. Sushma *et al.* (2021) reported that the average body weight of the CUD treated groups was 16.95 %, 10.72 %, and 2.12 % higher than the control group in T-2, T-3, and T-4, respectively.

The reason for the improved bodyweight gain could be due to the high protein content of *M. oleifera* leaf meal as claimed by Agashe *et al.* (2017) and cow urine also contains Na, N, S, Vit A, B, C, D, E, minerals, citric, succinic, Ca salts, phosphate, lactose, carbolic acid, enzymes, creatinine, and hormones (Jain *et al.,* 2010) may be due to that birds of T1, T2 and T3 groups have higher avg. body weight gain.

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| Table 6: Effect of dietary supplementation of MLE and indigenous CUD and combination of both on average weekly body weight (g) gain of broiler chicks (n=30). | | | | | |
| Average weekly body weight gain (g) (Mean ± SE) | | | | | |
| Age | **C** | **S** | **T1** | **T2** | **T3** |
| 1st Week | 108.63**±**3.86a | 113.80**±**4.94a | 115.80**±**4.82a | 107.67**±**5.19a | 113.03**±**4.18a |
| 2nd Week | 185.13**±**8.40a | 189.33**±**13.00a | 200.80**±**7.69a | 184.77**±**12.47a | 192.70**±**11.18a |
| 3rd Week | 282.60**±**14.36a | 326.03**±**21.78a,b | 442.37**±**13.79c**\*\*** | 362.13**±**26.79b**\*\*** | 373.97**±**25.79b**\*\*** |
| 4th Week | 288.37**±**18.36a | 423.03**±**40.14b**\*\*** | 508.23**±**27.68b,c**\*\*** | 496.40**±**31.79b,c**\*\*** | 548.47**±**38.87c**\*\*** |
| 5thWeek | 506.90**±**24.33a | 445.30**±**43.35a | 479.00**±**31.77a | 482.87**±**28.32a | 488.07**±**44.20a |
| 6th Week | 422.17**±**15.81b | 378.87**±**17.26a,b | 345.47**±**30.22a**\*** | 400.99**±**15.61a,b | 378.90**±**31.48a,b |

**Weekly FCR:** Table 6 shows the mean SE values of FCR in different experimental groups at weekly intervals of the experiment, which are graphically displayed in. At the 1st, 2nd, 5th, and 6th weeks of administration, there were no significant variations in the average weekly feed conversion ratio of broiler chickens from the S (Standard), T1 (MLE), T2 (CUD), and T3 (MLE+CUD) groups. During the third and fourth weeks of administration, however, it was significantly (P<0.05, <0.01, and <0.001) lower in the S (Standard), MLE (T1), CUD (T2), and MLE+CUD (T3) treated groups compared to the control group (table 7).

Similarly, Akhouri*et al*. (2013) found that the M. oleifera leaf fed group had a higher feed conversion ratio (P<0.05) than both the control and standard groups. In addition, Allam *et al*. (2016) found that Moringa leaf extracts, both watery and alcoholic, resulted in a significant increase in body weight, weight gain, and enhanced feed conversion rate. Moreover, according to Sushma *et al*. (2021), the FCR of the various treatment groups ranged from 1.50 to 1.61, with the Ongole and Sahiwal CUD groups having the highest FCR.

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| Table 7: Effect of dietary supplementation of MLE and indigenous CUD and combination of both on average weekly feed conversion ratio (FCR) of broiler chicks (n=30). | | | | | |
| Weekly average FCR (Mean ± SE) | | | | | |
| Age | **C** | **S** | **T1** | **T2** | **T3** |
| 1st Week | 1.16**±**0.08a | 1.15**±**0.04a | 1.15**±**0.03a | 1.15**±**0.02a | 1.09**±**0.07a |
| 2nd Week | 1.80**±**0.02a | 1.80**±**0.05a | 1.67**±**0.05a | 1.73**±**0.03a | 1.70**±**0.10a |
| 3rd Week | 1.98**±**0.16c | 1.69**±**0.02b **\*** | 1.19**±**0.03a**\*\*** | 1.49**±**0.03b**\*\*** | 1.44**±**0.06a,b**\*\*** |
| 4th Week | 2.25**±**0.10c | 1.55**±**0.13b**\*\*** | 1.28**±**0.07a,b**\*\*** | 1.31**±**0.05a,b**\*\*** | 1.19**±**0.10a**\*\*** |
| 5th Week | 1.89**±**0.10a | 2.30**±**0.28a | 1.79**±**0.04 a | 1.76**±**0.05a | 2.03**±**0.35a |
| 6th Week | 2.54**±**0.12a | 2.82**±**0.04a | 3.02**±**0.23 a | 2.51**±**0.11a | 2.85**±**0.23a |

1. **Conclusions:**

The present study concluded that incorporation of *Moringa oleifera* methanolic leaf extract and indigenous cow urine distillate alone and in combination through drinking water is beneficial in terms of growth performance.

1. **References:**

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