# SUPPLEMENTAL VALUE OF MANGO LEAF MEAL (*Magnifera indica* L) ON GROWTH PERFORMANCE AND HAEMO-BIOCHEMICAL PROPERTIES OF RABBITS

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## ABSTRACT
The study was carried out to determine the effect of dietary supplementation of mango leaf meal on the growth performance, carcass traits and haemo-biochemical parameters of growing rabbits. In total, sixty four weaned rabbits were randomly distributed to four dietary treatments of 16 rabbits to a treatment of 8 replicates of 2 rabbits per replicate. The diets were formulated in such that mango leaf meal was supplemented in the diets at 0 g/kg (control; diet 1), 0.5 g/kg (diet 2), 1.00 g/kg (diet 3) and 1.50 g/kg (diet 4). Results showed that growth rate, carcass traits, blood formation and health status of rabbits were superior in rabbits fed mango leaf meal supplemented diets compared with those on diet without mango leaf meal supplementation (control diet). It could be concluded that supplementation of mango leaf meal up to 1.50 g/kg in rabbit diet significantly improved growth rate and health status of rabbits.
**Keywords**: Haemo-biochemical, mango leaf, phytochemical properties, rabbits

## INTRODUCTION
Commercial rabbit production is fast gaining attention in livestock industry, possibly owing to its attributes such as high prolificacy, fast growth rate, short generation interval, good converter of feeds to flesh, high meat quality, low cholesterol and low sodium contents (Akinfala *et al*., 2003). However, livestock industry in general has been challenged due to use of antibiotics as growth promoting additive. The residual effect of antibiotics on livestock products such as meal and egg is detrimental to human life as consumers of these animal products are liable to degenerative and cardiovascular diseases. Hence, the European Union came up with a ban on the use of antibiotics as growth promoters. Consequent upon this, researchers have continued to aggressively source for natural antibiotics as alternatives to the synthetic antibiotics. Several leaves, spices, herbs and other botanicals had been identified to possess phytochemical and pharmacological properties and growth promoting bioactive components useful in livestock nutrition and production (Laullo *et al*., 2018).
Mango leaves have been reported to contain bioactive compounds such as 3-monosides of delphinidin, paeonidin, cyaniding, leucoanthocyanins, magniferin, kaempferol and quercitin that are vital in health promotion, disease prevention and drug production Okwu and Ezenagu, 2008) and phytochemicals which possess antioxidant, antibacterial and anti-inflammatory properties against tissue oxidation and free radicals. This study aimed to explore the nutritional and pharmacological potential of mango leaf meal in rabbit production.

## MATERIALS AND METHODS
The study was carried out at the Rabbit Unit of the Teaching and Research Farm of Adeyemi College of Education, Ondo.
Mango leaves were collected fresh, washed under running water, air dried under shade, crushed to reduce the particle size to about 1.5 mm. Samples (fine powder) were taken for proximate and phytochemical analysis (Table 1). Samples were analyzed in triplicate

**Table 1. Feed ingredients composition (%) and chemical analysis of mango leaf**

| Ingredients | % | Proximate (%) and Phytochemical Properties of mango leaf | |
|---|---|---|---|
| Maize | 51.37 | Crude protein | 14.05 |
| GNC | 15.33 | Crude fibre | 2.61 |
| SBM | 8.05 | Crude fat | 0.53 |
| Wheat offal | 7.12 | Ash | 11.89 |
| Rice bran | 6.84 | Total Phenolic Content | 0.25 mg/100g |
| PKC | 8.74 | Total Flavonoid Content | 12.05 mg/100g |
| Di-calcium phosphate | 1.00 | Total Tannins Content | 0.51 mg/100g |
| Limestone | 1.00 | Total Saponin Content | 3.18 mg/100g |
| Vitamin & Mineral Premix* | 0.30 | Total Phenolic Content | 0.25 mg/100g |
| DL-Methionine | 0.25 | Total Flavonoid Content | 12.05 mg/100g |

**Supplied per kg of diet: Vit A, 6000 IU; Vit D3, 9000 IU; Vit E, 40 mg; Vit K, 2 mg; Vit B1, 2 mg; Vit B2, 3mg; Vit B12, 0.01 mg; Niacin, 50 mg; Pantothenic acid, 10 mg; Folic acid, 2 mg; Biotin, 0.05 mg; Choline, 250 mg; Fe, 50 mg; Mn, 80 mg; Cu, 5 mg; Co, 0.1 mg; Se, 0.1 mg and Zn, 50 mg*

Sixty four weaned rabbits (average live body weight of 563±2.18 g) were randomly assigned to 4 experimental groups. Each treatment group was replicated 8 times of 2 rabbits to a replicate. Rabbits in group 1 (Diet 1) were fed the reference diet (basal diet) without any leaf supplement (Diet 1, control group). Those on diets 2, 3 and 4 were fed the same diet supplemented with mango leaf meal at 0.5, 1.00 and 1.50 g/kg diet, respectively. The diets were formulated to meet the nutrient requirements for growing rabbits (Table 1). Feeds and water were supplied ad libitum throughout the experimental period (5-13 weeks experimental duration).

Rabbits were kept under the same management conditions. Data were collected on feed intake and weight gain while feed conversion ratio was calculated as the ratio of feed intake to weight gain. Relative growth rate and performance index were calculated

$$Relative\ growth\ rate = [(W2 - W1)x\ 100]/[½(W2 + W1)]$$

Where: W1 = initial weight and W2 = final body weight

$$Performance\ index = (final\ live\ body\ weight\ (kg)/feed\ conversion\ ratio)x\ 100)$$

At 13 weeks of age, 5 rabbits were taken randomly from each treatment group, fasted for 12 h, weighed, tagged and slaughtered for carcass evaluation and organ determination. Blood samples collected during slaughtering were used for haematological and biochemical constituents determination.

Data collected were statistically analyzed using SAS (2002) and significant differences where observed were separated using Duncan option of the software.

## RESULTS AND DISCUSSION

Table 1 shows the proximate and phytochemical constituents of mango leaf. The proximate and phytochemical values obtained in the present study were similar to the values reported by Laullo *et al*., 2018) and within the range of major fodder leaves. While the crude protein was lower, the phytochemical properties were higher than those reported for unripe mango fruit (Maldonado-Celis *et al*., 2019). Table 2 shows a significantly ($P < 0.05$) higher body weight gain, feed conversion ratio, relative growth rate and performance index of rabbits on mango leaf meal supplement than those fed without mango leaf meal (control). Carcass yield, giblets, total edible parts were significantly $P < 0.05$) heavier while liver and abdominal weights were significantly ($P < 0.05$) lower in rabbits fed mango leaf meal supplement compared with those fed without mango leaf meal supplement (Table 3). On haemo-biochemical parameters, the white blood counts, neutrophils, total serum protein, triglycerides, total cholesterol, high density lipoprotein, low density lipoprotein and creatine were significantly $P < 0.05$) influenced by dietary supplementation of mango leaf meal. The superior performance of rabbits on mango leaf supplemented diets could be attributed to the phytonutrients and pharmacological properties of mango leaf to enhance growth, promote blood syntheses and improve the health status of the rabbits.

**Table 2. Dietary effect of mango leaf meal on the growth performance of rabbits**

| Parameters | Diet 1 | Diet 2 | Diet 3 | Diet 4 | SEM | P value |
|---|---|---|---|---|---|---|
| No. of rabbits | 24 | 24 | 24 | 24 | - | - |
| Initial body weight (g) | 563 | 561 | 563 | 562 | 2.18 | 0.65 |
| Final body weight (g) | 2002$^{c}$ | 2059$^{b}$ | 2111$^{a}$ | 2119$^{a}$ | 9.29 | 0.001 |
| **Weight gain (g/d)** | | | | | | |
| 5-9 weeks | 25.96$^{b}$ | 27.21$^{a}$ | 28.14$^{a}$ | 28.29$^{a}$ | 1.06 | 0.001 |
| 9-13 weeks | 25.43$^{b}$ | 26.28$^{ab}$ | 27.14$^{a}$ | 27.32$^{a}$ | 0.71 | 0.001 |
| 5-13 weeks | 25.70$^{b}$ | 26.75$^{ab}$ | 27.64$^{a}$ | 27.80$^{a}$ | 0.99 | 0.001 |
| **Feed intake (g/d)** | | | | | | |
| 5-9 weeks | 71.07 | 70.25 | 70.88 | 70.61 | 0.37 | 0.47 |
| 9-13 weeks | 98.75 | 99.05 | 98.71 | 98.91 | 0.48 | 0.21 |
| 5-13 weeks | 84.91 | 84.65 | 84.80 | 84.76 | 0.15 | 0.19 |
| **FCR** | | | | | | |
| 5-9 weeks | 2.74$^{b}$ | 2.58$^{a}$ | 2.52$^{a}$ | 2.50$^{a}$ | 0.09 | 0.001 |
| 9-13 weeks | 3.88$^{b}$ | 3.77$^{ab}$ | 3.64$^{a}$ | 3.62$^{a}$ | 0.13 | 0.001 |
| 5-13 weeks | 3.30$^{b}$ | 3.16$^{ab}$ | 3.07$^{a}$ | 3.05$^{a}$ | 0.35 | 0.002 |
| Relative growth rate | 112.20$^{b}$ | 114.35$^{a}$ | 115.78$^{a}$ | 116.42$^{a}$ | 3.01 | 0.002 |
| % Growth rate | - | 1.92 | 3.19 | 3.76 | - | - |
| Performance index (%) | 60.67$^{c}$ | 65.16$^{b}$ | 68.76$^{a}$ | 69.48$^{a}$ | 2.76 | 0.42 |
| Mortality rate (%) | 8.33 | 0 | 0 | 0 | - | - |

$^{abc}$ Means with different superscripts are significantly different at ($P < 0.05$)

**Table 3. Dietary effect of mango leaf meal on carcass attributes, organ description (g/kg body weight) and haemo-biochemical properties of growing rabbits**

| Parameters | Diet 1 | Diet 2 | Diet 3 | Diet 4 | SEM | P value |
|---|---|---|---|---|---|---|
| Carcass yield | 51.09$^{b}$ | 53.15$^{a}$ | 53.72$^{a}$ | 54.03$^{a}$ | 1.47 | 0.002 |
| Liver | 3.22$^{a}$ | 3.15$^{ab}$ | 2.96$^{b}$ | 2.74$^{b}$ | 0.25 | 0.001 |
| Kidney | 0.83 | 0.84 | 0.85 | 0.91 | 0.10 | 0.32 |
| Heart | 0.57 | 0.58 | 0.60 | 0.61 | 0.15 | 0.16 |
| Giblets | 4.48$^{c}$ | 4.71$^{b}$ | 5.29$^{a}$ | 5.31$^{a}$ | 0.21 | 0.001 |
| Abdominal fat | 1.11$^{a}$ | 0.73$^{bc}$ | 0.69$^{c}$ | 0.62$^{c}$ | 0.03 | 0.002 |
| Total edible parts (TEP) | 55.18$^{c}$ | 57.83$^{ab}$ | 58.91$^{a}$ | 59.42$^{a}$ | 1.28 | 0.001 |
| **Blood profile** | | | | | | |
| PCV (%) | 36.47 | 36.62 | 37.03 | 37.25 | 0.42 | 0.29 |
| RBC (x10$^{6}$/µl) | 5.21 | 5.26 | 5.29 | 5.34 | 0.11 | 0.15 |
| Haemoglobin (g/dl) | 11.25 | 11.41 | 11.47 | 11.50 | 0.07 | 0.09 |
| Platelets (x10$^{3}$/µl) | 419.65 | 423.13 | 439.87 | 441.74 | 9.35 | 0.17 |
| WBCs (x10$^{3}$/µl) | 7.24$^{a}$ | 6.21$^{b}$ | 6.14$^{b}$ | 5.98$^{b}$ | 0.68 | 0.001 |
| **WBCs fractionation (%)** | | | | | | |
| Neutrophils | 36.58$^{a}$ | 35.13$^{ab}$ | 34.21$^{b}$ | 34.06$^{b}$ | 0.18 | 0.001 |
| Eosinophils | 1.76 | 1.73 | 1.71 | 1.54 | 0.21 | 0.09 |
| Lymphocytes | 55.09 | 54.67 | 54.20 | 53.83 | 0.37 | 0.12 |
| Monocytes | 4.11 | 4.07 | 4.12 | 4.02 | 0.05 | 0.08 |
| Basophils | 3.26 | 3.19 | 3.07 | 3.01 | 0.07 | 0.18 |
| **Biochemical indices** | | | | | | |
| Total serum protein (g/dl) | 3.45$^{b}$ | 3.61$^{a}$ | 3.69$^{a}$ | 3.72$^{a}$ | 0.13 | 0.001 |
| Triglycerides (mg/dl) | 89.64$^{a}$ | 85.03$^{b}$ | 84.79$^{b}$ | 84.17$^{b}$ | 2.15 | 0.001 |
| Total cholesterol (mg/dl) | 83.91$^{a}$ | 81.14$^{ab}$ | 78.76$^{b}$ | 77.38$^{b}$ | 1.02 | 0.002 |
| HDL (mg/dl) | 30.79$^{b}$ | 32.06$^{ab}$ | 33.82$^{a}$ | 33.97$^{a}$ | 0.87 | 0.001 |
| LDL (mg/dl) | 45.47$^{a}$ | 43.38$^{b}$ | 41.93$^{c}$ | 40.74$^{c}$ | 0.93 | 0.001 |
| Creatine (mg/dl) | 2.46$^{a}$ | 2.35$^{b}$ | 2.32$^{b}$ | 2.31$^{b}$ | 0.09 | 0.002 |

$^{abc}$ Means with different superscripts are significantly different at (P< 0.05)

## CONCLUSION AND RECOMMENDATION

The result of this study showed that dietary supplementation of mango leaf meal at 1.50 g/kg diet promoted better weight gain and improved the health status of growing rabbits. Rabbit farmers are encouraged to utilize this abundant fodder leaf as dietary supplement in rabbit diet.

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