Effect of dietary inclusion of *Moringa oleifera* leaf meal on and Hemato-biochemical profile of Sahiwal calves

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Abstract

This study was conducted to investigate the impact of dietary inclusion of *Moringa oleifera* leaf meal as a substitute for concentrate mixture on the growth performance and haemato-biochemical profile of Sahiwal calves. Twenty-four Sahiwal female calves, six to ten months of age, with an average body weight of approximately 77.41±0.93 kg, were randomly distributed through three equal dietary treatments. *Moringa oleifera* leaf meal inclusion replacing the concentrate mixture was made @ 0% (M0), 10% (M10), and 20% (M20), respectively. The results indicated that dietary inclusion of 10 and 20% *Moringa oleifera* leaf meal significantly improved (p<0.001) final body weight, dry matter intake, daily weight gain, feed conversion efficiency, and haemo-biochemical profile as compared to control (M0). It can be concluded that *Moringa oleifera* leaf meal is a source of nutritional and therapeutic advantages when replacing @ 10-20% of the concentrate mixture without any adverse effects on growing Sahiwal female calves.

Keywords: Growth performance, haemato-biochemical profile, *Moringa oleifera*, Sahiwal calves

Introduction

The necessity to implement cost-effective and easily accessible alternative feedstuffs to facilitate the advancement of livestock development has become imperative (Aye and Adegun, 2013) [3]. Leaf protein sources derived from the foliage of vegetables, legume trees, browse plants, fodder trees, and shrubs have emerged as highly nutritious feed options for all categories of livestock. These resources have garnered significant attention due to their immense potential (Asaolu et al., 2011) [4]. *Moringa oleifera* is commonly used as animal feed, with its leaves being the preferred component for feeding animals in the form of leaf meal. *Moringa oleifera* is widespread and readily accessible in India. The tree is cultivated in India for both human food and animal feed (Anjorin et al., 2010) [1].

Leaves are often considered a protein source. The protein content of fodder varies from 15% to 30% on a dry matter basis, depending on the stage of maturity and the proportions of leaflets, petioles, and stems. Moreover, Moringa leaves possess a high biological value and show outstanding promise as a feed source for ruminant animals as it contain a wide range of essential nutrients such as protein, amino acids, fatty acids, minerals, vitamins, calcium, potassium, phenolics, and oxycarotenoids, which are fundamental components of the animal body (Pradhan, 2016) [17]. These nutrients play a crucial role in osmotic adjustment, enzyme activation, growth hormone regulation, and other organic processes that contribute to growth, functionality, and the overall maintenance of life (Anjorin et al., 2010) [3]. Numerous studies have examined the impact of Moringa leaves on the productivity of dairy cows (El-Esawy, 2015) [10], sheep and goats (Fayomi et al., 2015) [12], as well as the growth and carcass characteristics of rabbits (El-Badawi et al., 2014) [9] and the productivity of broilers and laying hens (Abbas, 2013) [1]. This study was aimed to assess the impact of feeding rations with varying levels of dry *Moringa oleifera* leaves on the feed intake, growth performance, and haemato-biochemical constituents of Sahiwal female calves.
Effect of dietary supplementation of Moringa oleifera leaf meal on performance of growing Sahiwal female calves

Table 1: Effect of dietary supplementation of Moringa oleifera leaf meal on performance of growing Sahiwal female calves

<table>
<thead>
<tr>
<th>Items</th>
<th>Control (M₀)</th>
<th>M₁₀ (%)</th>
<th>M₂₀ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial body weight (kg)</td>
<td>77.41±0.93</td>
<td>77.30±1.15</td>
<td>77.22±0.91</td>
</tr>
<tr>
<td>Final body weight (kg)</td>
<td>102.3±1.11&lt;sup&gt;a&lt;/sup&gt;</td>
<td>112.1±1.16&lt;sup&gt;a&lt;/sup&gt;</td>
<td>109.8±1.04&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Average body weight (kg)</td>
<td>3.14±0.03&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.64±0.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.82±0.03&lt;sup&gt;ab&lt;/sup&gt;</td>
</tr>
<tr>
<td>Average daily weight gain (kg)</td>
<td>0.207±0.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.242±0.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.255±0.00&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total DM intake (kg/day)</td>
<td>2.273±0.01&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.47±0.01&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.396±0.01&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Feed conversion ratio</td>
<td>11.05±0.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>10.26±0.04&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.458±0.04&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Mean ± SE values bearing different superscript (a, b, c) in a row differ significantly (p<0.001). DM: Dry matter M₀, M₁₀ and M₂₀, Moringa oleifera leaf meal at 0, 10 and 20% of the concentrate mixture.

Effect of Moringa oleifera leaves on Haematobiochemical parameters

The haematobiochemical parameters of growing calves were significantly influenced by the dietary supplementation of Moringa leaf meal (Table 2). The concentrations of serum calcium, total protein, albumin, and globulin in the calves of the M₁₀ and M₂₀ (%) groups were significantly higher (p<0.001) compared to the control group (M₀). Additionally, the blood parameters, including haemoglobin, erythrocyte, and leukocyte count, showed a significant increase (p<0.001) in calves that were supplemented with 10% and 20% Moringa leaf meal compared to the calves in the control group.

In general, haematobiochemical parameters are used to assess the overall health and vitality of animals. In this study, there was an increase in Hb, TLC, and erythrocyte values in both treatment groups after 120 days of treatment. This might be due to the high levels of Fe, Cu, and...
antioxidants such as ascorbic acids, polyphenols, flavonoids, and organosulfur compounds present in Moringa (Bharti et al., 2007) [7]. Supplementation of Moringa leaves resulted in a significant increase ($p<0.001$) in serum total protein, albumin, globulin, and calcium levels at 10% and 20% in $M_{10}$ and $M_{20}$, respectively, than those of control group. Our results corroborated well with Aja et al. (2014) [2], who stated that Moringa contains various compounds that possess hepatoprotective effects due to their antioxidant properties. The addition of dried Moringa leaves to the diet of cattle calves resulted in a notable rise ($p<0.001$) in calcium levels, a finding that was also observed by Ranjan et al. (2009) [18] in their study on rabbits. The potential positive impact of Moringa could be attributed to its high calcium content, as suggested in previous studies (Kawo et al., 2009; Anjorin et al., 2010) [13, 3].

### Table 2: Effect of dietary supplementation of Moringa oleifera leaf meal on haemato-biochemical parameters of growing Sahiwal female calves

<table>
<thead>
<tr>
<th>Items</th>
<th>Control (M)</th>
<th>$M_{10}$ (%)</th>
<th>$M_{20}$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total protein (g/dL)</td>
<td>6.83±0.04*</td>
<td>6.94±0.07*</td>
<td>7.02±0.04*</td>
</tr>
<tr>
<td>Albumin (g/dL)</td>
<td>3.42±0.02*</td>
<td>3.52±0.01*</td>
<td>3.64±0.01*</td>
</tr>
<tr>
<td>Globulin (g/dL)</td>
<td>3.30±0.02*</td>
<td>3.42±0.01*</td>
<td>3.49±0.01*</td>
</tr>
<tr>
<td>Calcium (mmol/L)</td>
<td>2.26±0.00*</td>
<td>2.37±0.02*</td>
<td>2.45±0.01*</td>
</tr>
<tr>
<td>Leukocyte count (10$^3$/mm$^3$)</td>
<td>6.37±0.09*</td>
<td>7.21±0.01*</td>
<td>7.71±0.01*</td>
</tr>
<tr>
<td>Erythrocyte (10$^6$/mm$^3$)</td>
<td>5.59±0.04*</td>
<td>5.99±0.01*</td>
<td>6.33±0.01*</td>
</tr>
<tr>
<td>Haemoglobin (g/dL)</td>
<td>11.16±0.06*</td>
<td>11.43±0.10*</td>
<td>11.74±0.05*</td>
</tr>
</tbody>
</table>

Mean ± SE values bearing different superscript (a, b, c) in a row differ significantly ($p<0.001$). $M_{0}$, $M_{10}$ and $M_{20}$, Moringa oleifera leaf meal at 0, 10 and 20% of the concentrate mixture.

### Conclusions

On the basis of the findings of the present investigation, it can be concluded that dry Moringa leaf meal can effectively replace a portion of the concentrate mixture. Moringa oleifera leaves can be used as a substitute for up to 10–20% of the concentrate mixture in Sahiwal female calves. This substitution has been found to enhance body weight gain, feed intake, and the blood profile of the calves. Due to its affordability and accessibility, the addition of Moringa leaf meal to the diet of Sahiwal calves is feasible.

### Acknowledgements

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### Conflict of Interest: None

### References

14. Kholfi AE, Gouda GA, Morsy TA, Salem AZM, Lopez S, Kholfi AM. Moringa oleifera leaf meal as a protein source in lactating goat’s diets: feed intake, digestibility, ruminal fermentation, milk yield and composition, and
its fatty acids profile. Small Ruminant Research. 2015;129:129-137.


