Short Communication

NUTRITIONAL VALUE AND SUITABILITY OF CARROT WHOLE TOP AS GREEN FODDER

R. Venkataramanan*, S. Gunasekaran, C. Sreekumar, R. Anilkumar and M. Iyue

Postgraduate Research Institute in Animal Sciences, Kattupakkam - 603 203, Kancheepuram District.

ABSTRACT

The carrot tops had high crude protein (144 g/kg), calcium (24.3 g/kg) and phosphorus (7.7 g/kg), comparable to sun hemp (Crotalaria juncea), fodder berseem and oil cakes, respectively. Milk from animals fed with carrot tops were free from residues of organochlorine, carbamate and organophosphorus pesticides. Carrot tops are perishable in nature and hence were preserved as feed blocks to extend shelf life. The nutritional value and keeping quality of the blocks were also studied. The studies revealed that carrot whole tops can be a promising alternate source of green fodder, especially in hilly regions where there is a shortage of green fodder during winter.

Key words: Carrot whole top, fodder, feed block.

In places like the Nilgiri hills, frost-burn in pastures causes acute fodder shortage during winter, and whole carrot tops, which consist of the leaves and stems, are used as a non-conventional green fodder. The ability of the carrot plants to withstand frost under irrigated conditions has made them suitable for cultivation as a horticultural crop throughout the year, including winter. In the tropics, crop residues (paddy straw, wheat straw, sugarcane tops etc.) play a major role in meeting the nutritional requirement of livestock. After harvest, the top of the plant is left over in the field and used by farmers as feed at no cost. A thorough search of literature indicates that, though carrots as such are used to feed animals like horses and cattle (Banerjee, 1998), carrot tops as a type of fodder has not been studied extensively. The present study was carried out to analyse the nutritional composition and pesticide residue in carrot tops and to understand its suitability as an unconventional source of green fodder. Since the carrot tops are perishable in nature, they were converted to feed blocks and the nutritional value and keeping quality of the blocks were studied.

Six samples of carrot tops were collected from different parts of the Nilgiris district namely Butfire, Muttanadmund, Solada, Karumulimund, Neergachimund and Sholur. The samples (3 kg) were collected at the time of harvest (carrot tops left over in the field after removal of carrot roots), i.e. the stage of the plant fed to cattle by farmers. Milk samples (200 ml) were also collected from cattle being fed routinely on carrot leaves for analysis of pesticide residue.
The analysis for proximate composition and pesticide residues of the collected samples were done at the Department of Animal Nutrition, Madras Veterinary College, Chennai and Pharmacovigilance Laboratory for Animal Feed and Food Safety, TANUVAS, Chennai respectively. Analysis for proximate composition was done as per AOAC (2000) using dried and ground samples of carrot tops. Calcium and phosphorous content in carrot tops were also analysed (Talapatra et al. 1940).

The analysis for pesticide residue was done by thin layer chromatography (TLC) according to AOAC (2000) and the samples were screened for presence of organochlorine, organophosphorus and carbamate pesticides.

Since the green carrot tops are perishable in nature, they were dried and stored as feed blocks to extend shelf-life. The leaves were shade dried and made into slurry along with other ingredients as shown in Table 2. The blocks were prepared in the form of casts using a hydraulic press machine at 2500 psi pressure. Proximate composition and palatability of the blocks were studied after 45 days.

The average proximate composition of carrot leaves along with calcium and phosphorus content is presented in Table 1.

The crude protein (CP) content of carrot whole tops (144.0 g/kg) is comparable to that of Sun hemp (150 g/kg) and higher than the CP content of most of the agro-industrial by-products used as fodder for livestock (Banerjee, 1998). Phillip (2005) has estimated the nitrogen content in whole carrot tops and found it to be 24.5 (CP = 150) g/kg dm.

Total ash content of carrot tops in the present study is higher when compared to other roughages fed to animals. Nutritionally, legumes are frequently superior to grasses in protein and mineral content (particularly calcium), while oil cakes and gram husks are good sources for phosphorus. The levels of calcium and phosphorous in carrot leaves, as found in the present study, are high and comparable to that of fodder berseem (14.4-28.9 g/kg) and linseed cake (07.0-08.3 g/kg), respectively (Banerjee, 1998).

Carrot tops, with a high content of calcium and phosphorus, are suitable for feeding livestock in the Nilgiri region where mineral mapping had revealed Ca and P deficiency (Report, 2008). While the nitrogen free extract (NFE) and ether extract contents of carrot leaves were not different from the values found in other roughages fed to livestock, the crude fiber content was low. The level of nutrient elements in the tissue of carrot plants at different stages is given by Phillip (2005). At 12 weeks of the crop, the level of nitrogen, calcium, phosphorus, magnesium and potassium in whole tops were found to be 2.40, 3.20, 0.36, 0.33 and 3.10 per cent respectively. CP estimated from nitrogen content (N*6.25 = 150 g/kg dm) is almost similar, while calcium and phosphorus levels were higher and lower respectively, than those found in the present study.

Analysis for pesticide residue did not reveal organochlorine, organophosphorus or carbofuran in samples of carrot tops or milk from cattle fed with carrot tops.

The carrot tops collected at the time of harvest also includes some of the leftover low grade carrots. Carrots have a pleasant odour and peculiar, sweet, mucilaginous flavour. The sugar content in carrots was high and found to be 496 g/kg DM (Steenfeldt et al. 1940).
2007). The presence of carotenoids and sugars in carrots improve the nutritional value in terms of energy and palatability (Baranskii et al. 2011). The protein content in carrots was found to be 98.3 g/kg DM (Singh et al. 2001). Above all, carrots are well known as a source of vitamin A, which is essential for pregnant animals. Thus, carrots fed together with carrot tops, add to the nutritional value and palatability.

Carrot is not only cultivated during winter, but throughout the year and the excess tops available during other seasons can be stored as feed blocks and fed during seasons of fodder shortage. Both stems and leaves of the plant are more or less clothed with stout, coarse hairs. The leaves crumble on drying and form a good mix with jaggery, maida flour and salt. The larger stems are removed as they hinder the formation of a uniform cast.

The higher CP and TA and lower CF content in the blocks (Table 1) could be due to the fact that leaves formed the major portion in the preparation of block. Carrot leaves are richer in protein and TA and lower in fibre than the whole plant inclusive of stems. Phillip (2005) has reported higher values of nitrogen content in carrot leaves than in whole top. The values for the leaves and whole tops were 35.5 (CP=221.9) and 24.0 (CP=150.0) g/kg dm respectively. Similarly higher values of 225.0 g/kg protein and 460 g/kg TA were found in leaf protein concentrate of carrot plants (Carlsson and Hanczakowski, 1989). The stems contain more fibre than the leaves and thus the CF content is found to be lower in the blocks. The additives in the form of maida flour and jaggery also add to the TA content of the block. These blocks can also be fortified with other agents like molasses or urea to improve the nutritional value. Molasses will be a cheaper alternative to jaggery. The blocks prepared were stable and palatable after 45 days.

Further studies on digestibility in ruminants and presence of anti-nutritional factors like tannins, phenol, hydrocyanic acid and saponins if any, in carrot tops will ensure its safety and suitability as a livestock feed.

<table>
<thead>
<tr>
<th></th>
<th>CP</th>
<th>EE</th>
<th>CF</th>
<th>NFE</th>
<th>TA</th>
<th>AIA</th>
<th>Calcium</th>
<th>Phosphorus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot tops</td>
<td>144.0</td>
<td>25.1</td>
<td>150.8</td>
<td>493.4</td>
<td>189.2</td>
<td>20.2</td>
<td>24.3</td>
<td>07.7</td>
</tr>
<tr>
<td>Carrot block</td>
<td>227.7</td>
<td>24.6</td>
<td>93.1</td>
<td>447.5</td>
<td>207.1</td>
<td>11.1</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note: All values in g/kg DM
NA-not analysed.
Table 2. Composition (g/kg) of carrot top feed block

<table>
<thead>
<tr>
<th>S.No</th>
<th>Materials</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carrot leaves (dried)</td>
<td>800</td>
</tr>
<tr>
<td>2</td>
<td>Jaggery</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>Salt</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Maida flour</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Water</td>
<td>q.s.</td>
</tr>
</tbody>
</table>

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REFERENCES


