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Utilization of *Acacia saligna* as livestock fodder in arid and semi-arid areas in Egypt

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**Summary** - Rehabilitation of the native rangelands and/or cultivation of salt-drought tolerant shrubs could be one of the best approaches to reduce grazing pressure and increase carrying capacity since shrubs provide alternative feed resources. *Acacia saligna* shrubs are one of the most important introduced shrubs that can suit the environmental conditions of the northern coast of Egypt. This article highlights the potentialities of *Acacia saligna* (Leguminous shrubs) as livestock fodders in arid and semi-arid areas in Egypt. Approximately one million *Acacia saligna* seedlings were transplanted along the Egyptian Mediterranean coast through a national program for improving the native rangelands. Most of *A. saligna* are cultivated in marginal lands, saline soils and irrigated with saline water that would otherwise be valueless. The maximum yields of fresh matter, dry matter and other nutrients were attained in the spring season. The fresh *A. saligna* shrubs could provide a diet that hardly can maintain animal body weight although it attained reasonable crude protein (averaged 12.5%). Several attempts were conducted to improve the utilization of *Acacia* through appropriate pre-treatments such as air-drying and ensiling with other feed ingredients. When *A. saligna* was processed as a silage, palatability, intake and nutrient utilization were increased compared to the fresh or air-dried *Acacia*. The general conclusion indicated that using *Acacia saligna* as a silage with some shrubs, i.e. *Atriplex* spp., or other feed ingredients can have a significant role in feeding livestock in arid and semi-arid areas in Egypt. Improving intake, nutrients utilization and reducing the concentrations of anti-nutritional compounds in *Acacia* should be prime of both plant breeding and animal nutrition objectives that need further investigations.

**Key-words:** *Acacia saligna*, leguminous shrubs, livestock, palatability, nutritive value

**Introduction**

The indigenous range vegetation is considered the basic animal feed in the arid and semi-arid areas in Egypt. It is characterized by poor quality, low nutritive value and poor productivity during the dry seasons (El Shaer, 1996). Rehabilitation of the nutritive ranges and/or cultivation with salt-drought tolerant shrubs is recommended, as a national strategy, to improve the native rangelands (El Shaer, 1999), consequently to provide added feed resources. Many species of leguminous shrubs, particularly *Acacia* spp. have proved to be useful multipurpose shrubs in North Africa and Egypt as well (El Lakany, 1987). The same author, also, reported that *A. saligna* is the most successful of the Australian *Acacia* due to its tolerance of drought, ability to grow on poor soil, higher production of biomass and
higher nutritive value. These characteristics makes Acacia an attractive animal fodder source. A. saligna has been the subject of several successive studies dealt with fodder production, palatability and nutrient utilization. Therefore, this article highlights the potentialities of Acacia saligna as animal feed under the arid and semi-arid conditions in Egypt.

**Morphological properties of Acacia saligna**

Acacia saligna (also called Acacia cyanophylla) is from Leguminosae (Mimosaceae) family (Tackholm, 1974). It is a tree or a big perennial shrub; has many branches. The shrub is glabrous with hooked prickles after forming impenetrable thorny thickets; flowers with purple clay and white stamens; legume thin flat, yellowish (Tackholm, 1974). This tree can tolerate all desert environmental conditions and it gives a successful growth under saline conditions of soils and irrigated water (Sheha, 1984). A. saligna is easy to propagate, is fast growing with an abundance of leafy foliage and recover quickly after annual lopping. A. saligna is, often, cultivated in saline soils and mostly irrigated with saline underground water that would otherwise be valueless. It may survive and grow on sites receiving as little as 200 mm of rain annually or even less (El Lakany, 1987).

**Acacia saligna usages**

Acacia saligna plays a number of important roles for Bedouins and their livestock. They could serve as a windbreak, control soil erosion, and a source of fuel wood. The Acacia trees could provide a natural shed and timber (Tiedman and Johanson, 1992). Afforestation with Acacia shrubs with different herbaceous crops for increasing yield potentiality in the west desert of Egypt is the interest of several investigators (Abd Alla, 1999). Cultivated annual winter crops, especially cereals, within rainfed agroforestry system could be an additional income to the Bedouins using Acacia spp. tree as forestry in the north western coast of Egypt (Hassan, 1994). The edible parts of Acacia shrubs could be used as animal feed resources, particularly in dry seasons. The major use of A. saligna is through browsing or feeding to sheep, goats and camels which convert these shrubs into valuable animal products. Their admixture into rations for feeding animals are, also, recommended. Blending A. saligna with other feed ingredients can extend their usefulness. More than one million Acacia seedlings were transplanted along the Mediterranean coasts in Egypt for native range rehabilitation. Nowadays, intensive extension packages on utilization of A. saligna have been implemented in different locations along the Mediterranean coast.

**Biomass and nutrients production of A. saligna**

Data on overall averages of fresh, dry and other nutrients yields for A. saligna during the four seasons of the year (Table 1) indicated that the maximum yields were, in general, recorded in the spring, whereas the lowest ones were attained in the winter, except for CP content (Abd Alla, 1999).

<table>
<thead>
<tr>
<th></th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
<th>Autumn</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh matter</td>
<td>803</td>
<td>1298</td>
<td>722</td>
<td>756</td>
<td>3579</td>
</tr>
<tr>
<td>Dry matter</td>
<td>264</td>
<td>441</td>
<td>330</td>
<td>344</td>
<td>1379</td>
</tr>
<tr>
<td>Crude protein</td>
<td>29.54</td>
<td>42.09</td>
<td>34.66</td>
<td>19.45</td>
<td>126.55</td>
</tr>
<tr>
<td>Total carbohydrate</td>
<td>24.25</td>
<td>47.32</td>
<td>34.99</td>
<td>33.16</td>
<td>139.99</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>56.23</td>
<td>76.54</td>
<td>60.07</td>
<td>71.89</td>
<td>268.73</td>
</tr>
<tr>
<td>Total ash</td>
<td>13.85</td>
<td>32.94</td>
<td>22.42</td>
<td>24.62</td>
<td>93.83</td>
</tr>
<tr>
<td>Ether extracts</td>
<td>30.29</td>
<td>46.81</td>
<td>29.02</td>
<td>30.05</td>
<td>136.17</td>
</tr>
</tbody>
</table>

However, dry foliage yield was insignificantly affected by different ages of Acacia shrubs during all seasons (Adb Alla, 1999). The total biomass production and other nutrient yields could be affected by several factors, mainly age of shrubs, harvesting date and procedure,
rainfall precipitation, soil type (El Shaer, 1996). It seems from data derived by Abd Alla (1999) and others that A. saligna has a great potentiality to produce abundant amounts of fresh and dry biomass all-the year round which may play a significant role in feeding ruminants.

**Nutritive value and utilization of A. saligna**

Data in Table 2 present overall average values of chemical nutrients of A. saligna as fresh, air-dried and silage diets. It seems that the fresh Acacia attained the highest CP value (12.5%) compared to that of the dried and silage forms. Silage 2 (S2), which contained 70% of a mixture of A. saligna and Atriplex nummularia ensiled with 20% broiler litter and 10% of molasses, showed also higher CP level (11.9%) compared to silage 1 (S1) which made of 90% a mixture of A. saligna and A. nummularia and 10% molasses.

### Table 2: Overall averages of chemical composition of Acacia saligna (%DM basis) in different forms.

<table>
<thead>
<tr>
<th>Acacia forms</th>
<th>DM</th>
<th>CP</th>
<th>CF</th>
<th>EE</th>
<th>Ash</th>
<th>NFE</th>
<th>NDF</th>
<th>ADF</th>
<th>ADL</th>
<th>Cellulose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>43.5</td>
<td>12.5</td>
<td>26.4</td>
<td>4.80</td>
<td>13.9</td>
<td>42.4</td>
<td>58.0</td>
<td>39.4</td>
<td>14.3</td>
<td>25.1</td>
</tr>
<tr>
<td>Hay</td>
<td>86.4</td>
<td>10.1</td>
<td>28.1</td>
<td>4.40</td>
<td>13.3</td>
<td>44.1</td>
<td>60.0</td>
<td>44.7</td>
<td>16.8</td>
<td>27.9</td>
</tr>
<tr>
<td>Silage</td>
<td>37.1</td>
<td>10.2</td>
<td>25.3</td>
<td>4.90</td>
<td>13.1</td>
<td>46.5</td>
<td>54.0</td>
<td>39.6</td>
<td>11.2</td>
<td>28.4</td>
</tr>
<tr>
<td>Silage 1 (S1)</td>
<td>53.6</td>
<td>8.81</td>
<td>27.5</td>
<td>4.45</td>
<td>2.12</td>
<td>38.0</td>
<td>51.2</td>
<td>29.1</td>
<td>8.25</td>
<td>20.8</td>
</tr>
<tr>
<td>Silage 2 (S2)</td>
<td>56.4</td>
<td>11.9</td>
<td>24.1</td>
<td>5.18</td>
<td>24.5</td>
<td>35.2</td>
<td>46.8</td>
<td>32.9</td>
<td>6.46</td>
<td>26.4</td>
</tr>
</tbody>
</table>

S1 = 90% of A. nummularia + Acacia saligna mixture + 10% molasses and S2 = 70% of A. nummularia + Acacia saligna mixture + 10% molasses + 20% broiler litter fed to desert mature male goats.

The CP content of A. saligna appeared to be reasonable and enough to cover the maintenance requirements of protein for ruminants (El Shaer, 1996). The higher ash contents in S1 and S2 could be attributed to inclusion of A. nummularia in the ensiled materials. The higher fiber constituents (NDF, ADF, ADL, etc.) in all A. saligna forms could constraint and limit feed intake and digestibility (Kandil et al., 1996).

Table (3) summarizes data on voluntary intake, apparent digestibility of some nutrients, nutritive values of A. saligna fed to sheep and goats (Abou El Nasr et al., 1996 and Kandil et al., 1996). Although the intake of the fresh Acacia was higher than that of the dried Acacia, the ensiling process improved the consumption which was the highest for sheep fed Acacia silage and goats given S1 and S2, in terms of DM, CP, and TDN. The higher ADL content (16.8%) in Acacia hay could be the limiting factor for lower intake. However, such intake values are higher than that reported by Degen, et al., (1997); may be due to the age of shrubs and fiber contents. It seems that sheep and goats tended to utilize Acacia silage and the S1 and S2 much better than the fresh and dried Acacia since animals fed the ensiled materials showed the greatest DM, CP, NDF and ADF digestibilities. It was also reflected on the nutritive values where the maximum TDN and DCP values were recorded for Acacia silages. Neither fresh nor air-dried Acacia could be used as a sole diet for sheep and goats because of low CP digestibility and slightly low intake since sheep lost 73 and 182 g/day on fresh and dried Acacia, respectively. Similar results were obtained by Degen, et al., (1997). This appears to be mainly due to the impact of anti-nutritional factors in Acacia. The condensed tannins in Acacia depress rumen digestion of carbohydrates, voluntary intake (Ash, 1990) and CP digestibility (Ramirez and Ledezma-Torres, 1997).

Ensiling process of Acacia could eliminate the concentrations of such anti-nutritional substances since nutrient utilization was improved and goats fed S1 and S2 gained noticeable body weight (35.5 and 53.3g/day, respectively). The effect of such processing methods (ensiling and air-drying, etc.) on some anti-nutritional compounds need to be studied.
Table 3: Intake, digestibility and nutritive values of A. saligna by sheep and goats.

<table>
<thead>
<tr>
<th>Acacia forms*</th>
<th>Intake , g/Kg**</th>
<th>Digestibilitys, %</th>
<th>Nutritive value, %</th>
<th>BWC, g/day**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DM</td>
<td>CP</td>
<td>TDN</td>
<td>DM</td>
</tr>
<tr>
<td>Fresh</td>
<td>51.4</td>
<td>5.54</td>
<td>23.6</td>
<td>54.2</td>
</tr>
<tr>
<td>Hay</td>
<td>47.8</td>
<td>5.02</td>
<td>21.9</td>
<td>60.8</td>
</tr>
<tr>
<td>Silage</td>
<td>55.0</td>
<td>5.73</td>
<td>28.1</td>
<td>63.4</td>
</tr>
<tr>
<td>S1</td>
<td>85.7</td>
<td>7.75</td>
<td>40.5</td>
<td>64.2</td>
</tr>
<tr>
<td>S2</td>
<td>87.2</td>
<td>9.59</td>
<td>47.1</td>
<td>64.9</td>
</tr>
</tbody>
</table>

* Fresh, hay and silage were fed to mature sheep, whereas S1 and S2 were consumed by male goats.
** BWC: body weight changes, g/day

However, improving nutrients utilization and reducing the concentrations of some anti-nutritional compounds in Acacia should be prime of both plant breeding and animal nutrition objectives that need further investigations.

References


