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

**H.M. El Shaer**
Animal and Poultry Production Division, Desert Research Center, Mataria, Cairo, Egypt

**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 siute 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 reangelands .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

***Résumé*** *- La réhabilitation des terrains de parcours par introduction d'arbustes tolérant la salinité et la sécheresse est une bonne alternative pour réduire la pression de pâturage.* Acacia saligna *est la principale espèce introduite à cet effet sur la côte nord de l'Egypte. La plupart du million de plants produits ont été installés sur des sols marginaux irrigués avec des eaux salines. La production maximale est atteinte au printemps mais ne fournit pas une ressource alimentaire suffisante pour maintenir en état les animaux bien qu'elle ait une bonne teneur en MAT (12,5% en moyenne). Si* A. saligna *est ensilée, l'appétence et l'ingestion est meilleure que s'il est distribué frais ou séché. L'utilisation de l'ensilage d'*A. saligna *associé avec d'autres arbustes fourragers comme les Atriplex peut donc jouer un rôle déterminant dans l'amélioration des zones semi-arides d'Egypte. L'amélioration de l'utilisation et la réduction de la teneur en phytoconstituants secondaires sont donc les objectifs prioritaires pour de futures recherches.*

***Mots-clés:*** *arbuste fourrager, valeur nutritive, légumineuse, appétibilité*

## 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 (Tackhlom, 1974). It is a tree or a big perennial shrub; has many branches . The shrub is glabrous with hooked yellow prickles after forming impenetrable thorny thickets; flowers with purple clay and white stamens ; legume thin flate, 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 agroforestary 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 1: Fresh and nutrient yield (Kg/fed) of *A. saligna* shrubs during the four season.

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

However, dry foliage yield was insignificantly affected by different ages of *Acacia* shrubs during all seasons ( Abd Alla, 1999). The total boimas 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 biomas 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.

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

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 .

| *Acacia* forms* | Intake , g/Kg$^{0.75}$ | | | Digestibilities,% | | | | Nutritive value,% | | BWC, g/day** |
|---|---|---|---|---|---|---|---|---|---|---|
| | DM | CP | TDN | DM | CP | NDF | ADF | TDN | DCP | |
| Fresh | 51.4 | 5.54 | 23.6 | 54.2 | 44.4 | 53.4 | 57.2 | 45.9 | 4.67 | -73 |
| Hay | 47.8 | 5.02 | 21.9 | 60.8 | 40.6 | 46.3 | 53.1 | 45.8 | 4.12 | -182 |
| Silage | 55.0 | 5.73 | 28.1 | 63.4 | 52.6 | 64.2 | 60.3 | 51.1 | 5.36 | 8.9 |
| S1 | 85.7 | 7.75 | 40.5 | 64.2 | 51.8 | 66.8 | 60.4 | 46.1 | 4.33 | 35.5 |
| S2 | 87.2 | 9.59 | 47.1 | 64.9 | 56.6 | 69.1 | 64.3 | 52.1 | 5.92 | 53.3 |

* 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.

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