Yield and Chemical Composition and in Vitro Digestibility of Dry Matter of Tabar Plant (Ipomaea kordofana Choisy; Convolvulaceae) in Gezira State, Sudan

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Abstract – This experiment was conducted in Greater Wad Medani and South Gezira localities in Gezira state, Sudan. The objective of the experiment was to investigate - and estimate the percent botanical composition of Tabar plant (ton/ha) in pasture in Gezira state and to evaluate the chemical composition of Tabar plant using the proximate analysis techniques for crude protein, crude fiber, dry matter and ash content. Also the in vitro digestibility of the plant was determined through a standardized in vitro technique. Before stating the field experiment, 50 questionnaires to investigate the effect of grazing on Tabar on animal health and milk characteristic were distributed to each of the two localities. Tabar the yield was estimated randomly by selecting different number of square meters by throwing the rope (14 times) each week and making the square meter by the rope itself. Chemical composition of Tabar and components were obtained. Proximate analysis of Tabar plant using the procedures of [11]. The statistical design used, was complete randomized design (CRD). The results revealed significant differences in opinion of respondent on Tabar as toddies, yield (ton/ha) from Tabar plant. While the chemical composition and in vitro digestibility was not significantly different in the two localities. It could be concluded that grazing on Tabar was Convincing in DM yield (ton/ha), chemical composition and in vitro digestibility

Keywords – Tabar plants (Ipomaea kordofana), Chemical Composition, Protein, Fiber Content, Proximate Analysis Techniques, Pasture, Vitro.

I. INTRODUCTION

Sudan has second largest livestock inventories in Africa. Natural pasture covered almost 24 million hectare [1]. Sudan ranks first in cattle population in Africa [2]. Total Sudan cattle population in 2001 was 38.325 million heads. About 29.7% of Sudan cattle population is in Southern Darfur and Kordofan. The middle region (comprising the central clay plain) is the home of 27% of Sudan’s cattle. Eastern and Northern regions of the Sudan accommodate 3.6% and 3% of Sudanese cattle, respectively [3] Sudan [4]. According to [5] the major production system may be described as: follows Nomadic, transhumant and sedentary. Other systems: include ranching, feedlot operations and per urban backyard livestock production. Sudanese Plant naming: Sudanese people are well known for their significantly descriptive local plant names. They name plants with names either derived from the local environment. [6, 7, 8].

[9] Reviewed the Effect of Some Management Practices on Decertified rangelands at Sinnar State, Sudan. The authors concluded that, the Tabar Plant density 0.02%, Composition 0.02% and frequency evaluation 2.08% after one month for the first season. While the Tabar Plant density 0.04%, Composition 0.04% and frequency evaluation 2.08% after one month for the second season. However the Tabar Plant density 0.03%, Composition 0.03% and frequency evaluation 1.04% at harvest for the second season.

[10] Studies the chemical composition, forage production and succession of the range plants in Um Elgura area, Sudan. The authors concluded that, the crude protein percentages ranged from 3.0% to 18.7% in Ipomoea cordofana (Tabar). Tabar showed the highest crude fibre content (54.7%). The total Tabar weight was higher in season 2000 (with a range of 2450-5691 kg/ha) than that of 2001 (with a range of 84-2553 kg/ha).

The total number of plants/ha at Elmegaid (season 2000) ranged from 334000 to 406000 and from 82000 to 203000 in season 2001. In Elbuwadia, the range of the plant density was 217000-407000 plants/ha in 2000 and 99000-195000 plants/ha in 2001. Elmegaid range was dominated mainly by Tabar, Um Kewiat and Kurmoshaiba (Chloris virgala) but the time of their domination was different.

Tabar plant is usually utilized as a valuable autumn feed source in Gezira. This feed source holds animal for 1.5 – 2 months. However the Tabar plant, the composition, yield and digestibility is not known.

Therefore this research was conducted with three objectives, namely:- 1) to estimate and botanical composition of Tabar plant (ton/ha); 2) to evaluate the chemical composition of Tabar plant using the proximate analysis techniques for crude protein, crude fiber, dry
milk and Ash content; 3) to quantify the digestibility of Tabar plant through a standardized in vitro technique, since the digestibility is one of the important measures for the evaluation of Tabar plant for feed purposes.

II. MATERIALS AND METHODS

A. Location of the Experiment

Gezira State is located south-west of Khartoum state. The state lies between latitude 32°13’ and 30°15’N and longitudes 22°32’ and 20°43’ E. It covers an area of about 27545 km² of which around 90% can be utilized for agriculture. It has a virtually flat relief, with slight tilt of the ground sloping gently from south to the north, which made possible the construction of a gravity-based irrigation system that covers all of the Gezira scheme. Gezira scheme which is a part of the state was mainly constructed for cotton production. Rainfall is characterized by high degree of spatial and temporal variability of wet and dry decades from season to season as well as within the same season. The state is divided into eight localities. The experiment was conducted in two localities of Gezira state where Tabar plant was found. This included, South Gezira locality which lies south of Greater Wad Medani locality. Greater part of this locality found in Gezira irrigated scheme. From this locality cattle herd composed of 58 animal units (AU) in Al-Shkaba was selected (selections based on animal owner cooperation). This herd grazed on Tabar plant which designated in this study as Tabar plant. Another herd of 65 AU also in South locality was selected from Ganib Al-Asad area where animals grazed on Tabar plant. The second locality was Greater Wad Medani locality. From this locality a herd of 69 AU in Al-Nshashiba area was selected for Tabar plant grazing and a herd of 62 AU in Atra area for Tabar plant grazing. The lactating cows in Al-Shkaba and Al-Shkaba was 46%. While it was 49% and 53% in Ganib Al-Asad and Atra respectively. Each herd was of mix breeds (local and crosses between local and Friesian cows).

B. Questionnaire

A questionnaire was designed to investigate of Tabar on ruminants. It included the following questions:

i. Grazing of Tabar plant on:
   i. Feeding of ruminants on Tabar plant.
   ii. Effect on milk production.

III. If yes: what is the effect on:
   i. Milk production.
   ii. Color of milk.
   iii. Taste of milk.
   iv. Milk coagulation time.

IV. Impact on animal health.

V. Is there any case of diarrhea.

C. Estimation of Tabar plant

Tabar yield was estimated by selecting different number of square meter by throwing a rope for fourteen times and making the square meter by the rope itself. From each square meter Tabar plant were cut by sickle at 10 cm above the ground level. The components of the Tabar were separated in to leaves and tender branches and then weighed freshly and again after drying in an oven at 105°C for 24 hours using digital scale.

A. Methods of Proximate Analysis

Proximate analysis of Tabar plant using the procedures of [11].

B. Determination of In Vitro Digestibility

The technique for determination of conventional in vitro digestibility complied with the [12] modification of the [13] two-stage procedure was used.

C. Statistical Analysis

The statistical design used, was complete randomized design (CRD). Means and differences between means of Estimation of Tabar plant, Proximate analysis of Tabar plant (Crude protein (CP), Ash, Dry Matter, Crude fiber, Tanning), in vitro digestibility of Dry Matter were performed using SPSS.

III. RESULTS AND DISCUSSION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effect of feeding Tabar plant</th>
<th>No effect of feeding Tabar plant</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in milk production</td>
<td>91</td>
<td>9</td>
<td>0.003</td>
</tr>
<tr>
<td>Effect on the color of milk</td>
<td>9</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Effect of the taste of milk</td>
<td>11</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>There is an impact on animal health</td>
<td>13</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>Symptoms of feeding on Tabar plant</td>
<td>18</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>Quick coagulation of milk</td>
<td>6</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>Presence of diarrhea</td>
<td>11</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>Presence of different animal types</td>
<td>18</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

Table (1) Significant number (P ≤ 0.001) respondents agreed that, feeding Tabar increase milk production, had no effect on color of milk and the taste of milk, There is an impact on animal health, symptoms of feeding on Tabar plant, quick coagulation of milk, presence of diarrhea and increased frequency of affected animals by Tabar plant grazing. It was found that, Tabar plant grazing had significantly different. It is clear that no effect on the animals grazed on it almost all of the respondents agreed that Tabar plant grazing had some no effects on animals compared to effects. However [14] found on increase in milk and no effect of symptoms of feeding on Tabar plant and no effect of animal health and no effect of diarrhea. While, [15] Results also indicated that plant Tabar is

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number one suspected plants that caused incidence of phytobezoars. The animals on the open range are selective in what they eat not only needs to be specified in terms of plants or different parts of plants in different stages of growth. It also needs to be looked at separately for each species of animals. In spite of their general anatomical and physiological similarities, different species of ruminants do not eat the same things, if, like it is the case on the open range, they have the choice. They have different motor habits and food preferences. Here we see goats browsing a higher layer of the vegetation than sheep.

### Table (2) DM yield (ton/ha) from Tabar plant

<table>
<thead>
<tr>
<th>Locality</th>
<th>Area</th>
<th>Leaves</th>
<th>Tender branches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Sig</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>South Gezira</td>
<td>Al-Shkaba</td>
<td>3.10  ± 0.214</td>
<td>0.193</td>
</tr>
<tr>
<td></td>
<td>Ganib Al-Asad</td>
<td>2.810 ± 0.173</td>
<td></td>
</tr>
<tr>
<td>Greater Wad Madani</td>
<td>Al-Nhashiba</td>
<td>2.730 ± 0.122</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atra</td>
<td>3.200 ± 0.183</td>
<td></td>
</tr>
</tbody>
</table>

Amount of total Tabar plant as was presented in the result of this study (Table 2) was significantly different between South Gezira and Greater Wad Madani Locality. The total yield of Tabar from Greater Wad Madani was higher than that of South Gezira. However, this yield of plant in both localities fell within the range of 2.450 – 5.691 t/ha reported by [10].

### Table (3) Percent chemical composition of Tabar plant

<table>
<thead>
<tr>
<th>Locality</th>
<th>Area</th>
<th>DM</th>
<th>CP</th>
<th>EE</th>
<th>Ash</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>SD</td>
<td>Sig</td>
<td>Mean ± SD</td>
<td>SD</td>
<td>Sig</td>
</tr>
<tr>
<td>South Gezira</td>
<td>Al-Shkaba</td>
<td>95.30</td>
<td>10.32</td>
<td>0.64</td>
<td>7.80</td>
<td>40.90</td>
</tr>
<tr>
<td></td>
<td>Ganib Al-Asad</td>
<td>95.21</td>
<td>10.28</td>
<td>0.63</td>
<td>7.90</td>
<td>41.10</td>
</tr>
<tr>
<td>Greater Wad Madani</td>
<td>Al-Nhashiba</td>
<td>95.40</td>
<td>10.38</td>
<td>0.64</td>
<td>7.80</td>
<td>41.20</td>
</tr>
<tr>
<td></td>
<td>Atra</td>
<td>95.25</td>
<td>10.35</td>
<td>0.64</td>
<td>7.70</td>
<td>41.20</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>0.421</td>
<td>0.224</td>
<td>0.092</td>
<td>0.113</td>
<td>0.895</td>
</tr>
</tbody>
</table>

Table (3) showed the chemical composition of Tabar plant from Greater Wad Madani Locality and South Gezira locality were not significantly different in all Parameter. Few reports on chemical composition of Tabar plant were found. In this study the DM from Al-Shkaba, Ganib Al-Asad, Al-Nhashiba and Atra was 95.30, 95.21, 95.40 and 95.20 % respectively. This higher DM is mainly attributed to that, the Tabar were collected from Tabar plant about 1 month after water withdrawal. While [15] found a DM of 95.92% in Tabar plant. The ash of Tabar plant was not significantly different. Furthermore, this result of % 7.80 in Al-Shkaba, 7.90% in Ganib Al-Asad, 7.80% in Al-Nhashiba and 7.70% in Atra in this study was in the range of % 7.20 – 7.90 reported by [15] and [16], [17]. Stated that, phytobezoars are commonly seen in cattle grazing large amounts of fibrous weeds. For instance, [18] stated that likely reason for the incidence might be plant composition change that is brought about by overgrazing, that resulted from removal of palatable species and were replaced by less palatable and in some cases harmful to the animals dependent on it. While the Crude Protein (CP) in Tabar plant was not significantly different. However, This result of % 10.32 in Al-Shkaba, 10.28% in Ganib Al-Asad, 10.38% in Al-Nhashiba and 10.38% in Atra in this study was in the range of % 10.20 – 10.60 reported by [16, 19, 17, 10]. The ether extract in Tabar plant was not significantly different. The percentages of ether extract on an average of 0.64% in all area were similar to [16, 19, 17]. The percentage of the cellulose, hemicelluloses and lignin was not significantly different. However, the percentages of cellulose, hemicelluloses and lignin on an average of 41%, 12.5% and 13.2% respectively in all area, were similar to [16, 19, 17, 10]. Other study about tannin was reported by [20] who stated that it is important to point out that intoxications caused by tannins, which only occur when animals are obliged to eat tannin-rich feed because of the lack of alternative plant resources.

### Table (4) Percent in vitro digestibility of leaves and tender branches from grazing on Tabar plant:

<table>
<thead>
<tr>
<th>Locality</th>
<th>Area</th>
<th>Mean ± SD</th>
<th>Sig</th>
<th>Mean ± SD</th>
<th>Sig</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leaves</td>
<td>Tender branches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Gezira</td>
<td>Al-Shkaba</td>
<td>65</td>
<td>1.112</td>
<td>0.24</td>
<td>5</td>
<td>0.256</td>
</tr>
<tr>
<td></td>
<td>Ganib Al-Asad</td>
<td>63</td>
<td>1.032</td>
<td>0.087</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>Greater Wad Madani</td>
<td>Al-Nhashiba</td>
<td>66</td>
<td>0.998</td>
<td>0.098</td>
<td>0.093</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atra</td>
<td>64</td>
<td>1.080</td>
<td>0.101</td>
<td>1.010</td>
<td></td>
</tr>
</tbody>
</table>

The in vitro dry matter (DM) digestibility from Tabar plant in all area was not significantly different (Table 4). When the digestibility of Tender branches in the present study was compared with 54% of sorghum straw (common roughage in Sudan) reported by [21], it is clear that the digestibility of Tabar branches was equal or higher than that of [21].

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IV. CONCLUSIONS

It could be concluded that grazing on Tabar was Convincing in DM yield (ton/ha), chemical composition and in vitro digestibility

RECOMMENDATIONS

It is recommended that, further studies are required for recommending of the optimum level of inclusion of Tabar plant in ruminant diets. Some studies on:
1. Meat produced form animals fed on Tabar plant and by-products
2. Designed research experiments on Tabar plant as animal feed.

We recommend scattering plant Tabar in the pasture to increase the nutritional value of pastures.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES
