Yield and Quality of Ten Forage Sorghum \textit{(Sorghum bicolor (L.) Moench)} Genotypes Grown under Rain-fed in North Kordofan State

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Authors' contributions

This work was carried out in collaboration among all authors. Author SEEA designed the trials and prepared the samples for nutritional analysis and wrote the first draft and final draft of the manuscript. Author AAJ collected the primary data and performed the statistical analysis. Author EEBMA managed the literature review. All authors read and approved the final manuscript.

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ABSTRACT

Availability of forage in North Kordofan during rainy season as result of mismanagement of pasture, over-grazing plays an important role in yield and quality. A field experiment was conducted for two consecutive rainy seasons (2014/15- 2015/2016). The treatments were arranged in a randomized complete block design (RCBD) with three replications. The results indicated that, the genotypes had significant effects on most studied characters. Pioneer and Nabig genotypes had the highest plant height, leaf area index and green forage yield (ton/ha) compared to other genotypes. The genotypes Pioneer and Taqqa9A were superior and performed better in forage quality, scored higher crude protein and lesser crude fiber, therefore recommended to the areas facing shortage of forage during rainfall in north kordofan state.

Keywords: Yield; forage sorghum; genotypes; rain-fed.

1. INTRODUCTION

Sorghum \textit{(Sorghum bicolor (L.) Moench)} is a cereal plant member of the family of Poaceae [1]. It is the fifth important cereal in the world after maize, rice, wheat and barley [2]. It can be grown as important dual purpose crop for grain and forage yields in many arid and semi-arid regions of the world, due to its advantages over. These advantages include, high water use efficiency and could be a good alternative to maize under limited water in the semi-arid conditions [3]. The crop thrives well in a wide range of temperature (16-40°C). In Sudan, is grown in nearly 92% of the total area devoted to whole crops [4]. Crop adaptability to soil is also wide; it grows in

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sandy soil “Goz” to heavy black cracking clays [5].

According to a recent survey conducted by [6], the annual forage crops produced in Sudan were estimated at 971 thousand tons of dry matter, which was produced from cultivated area of 121 thousand hectares. In Sudan, sorghum forage production is primarily concentrated in the central and eastern states. Its production system is mainly under irrigation [7]. Locally in North Kordofan State the latest estimates of the livestock population of Kordofan [8] indicated that, there are now 31 million heads, composed of 8, 12.5, 8, and 3 million of cattle’s, sheep’s, goats and camels respectively, totaling about 13 million animal units. And the diminishing amount of fodder produced in naturally due to the expansion of rain-fed agriculture on the expensive of range land. In the country, forage sorghum was not reach its required amount of production both quality and quantity wise [9].

In North Kordofan state, there was no form of fodder production practiced and conservation, except collection of browse fodder and hay residues after crop harvest. No effort has been done with respect to improve the existing forage crop in Sandy soil of North Kordofan State in term of selection new forage crops or even evaluation the existing forage sorghum. Hence, useful fodder determination and their nutritive values evaluation could be of great importance to support and improved live stock production in the area. Therefore the aim of this study was to evaluate the performance of different sorghum forage genotypes under rain-fed condition and their quality.

2. MATERIALS AND METHODS

2.1 Experimental Site

This study was out at the experimental farm of crop Sciences department, faculty of natural resources and environmental studies, university of Kordofan, Sudan, latitude (11-15) and (16-30) N and longitude (27-32)E. The climate of the area is arid and semi arid with sandy soil, annual rain fall ranges between 350 –450 mm [10]. Average maximum daily temperature ranges between 30-40°C throughout the year.

2.2 Experimental Design, Field Layout and Plant Material

A field experiment was conducted for two consecutive rainy seasons during (2014/2015 and 2015/2016) on 10 of July. The ten genotypes were arranged in a randomized complete block design (RCBD) with three replications. The seeds were equally distributed manually on lines 70 cm apart with seed rate of 30 kg/fed, the plot size was (3×3) m² consisted of five rows. Manual weeding was practiced twice during both seasons. Six local tested sorghum genotypes were selected from “Zinnari” were used, include: Taqqat.7B, Taqqat. 9A. Taqqat.5A, Gasabi, Geshaish and Nabig these were early maturing genotypes which were collected from Khor-Taqqat area, and three genotypes which were cultivated in the irrigated area include: Pioneer(introduced hybrid), Abu70-Ailab from Hudeiba (ARC) and Piper (Grawia) obtained from Sudanese Arabic seed company (ASSCO), were represent the improved sorghum fodder genotypes, and aish-Baladi collected from Merowi area.

2.3 Studied Characters

2.3.1 Growth attributes

Vegetative growth attributes were carried on sample size of ten plants chosen randomly from the inner rows when plants reached 50% flowering in each plot. Plant height(cm) was measured in (cm) from the base to the tip and then average was calculated. Days to 50% flowering were recorded as the number of days from the effective sowing date to the day on which 50% of the plants in a plot reached anthesis at least halfway down the panicle. Leaf area index was determined using the following formula:

\[
\text{Leaf area} = \text{maximum leaf length} \times \text{maximum leaf width} \times (0.75)
\]  

(1)

Maximum leaf length was measured from the base of leaf blade up to its tip while maximum leaf width was estimated from the middle of the leaf blade. These calculations were taken from upper (flag), middle, and the lower leaf and average was estimated, and then the average was multiplied by the number of leaves per plant, according to [11]. And leaf area index (L.A.I) was determined as following:

\[
\text{Leaf area index (L.A.I)} = \frac{\text{Leaf area per plant}}{\text{Plant ground area}}
\]  

(2)

2.3.2 Yield attributes

Green forage yield (ton/ha), was calculated by harvesting one meter a long from central rows,
cut was practiced at 15 cm above soil surface in each plot, and then weighed immediately in the field by using spring balance and finally fresh weight expressed in ton/ha. The green forage cut of one meter was sun dried for three weeks and weighed by spring balance again to get the dry forage yield (ton / ha).

2.3.3 Quality attributes

Quality parameters like, crude protein and crude fiber were determined from random dry composite samples collected from harvested plants at 50% flowering stage and analyzed for proximate composition according by [12].

2.4 Statistical Analysis

The recorded data for growth, yield traits, and quality parameters were subjected to the analysis of variance according to [13], using MSTATC software to evaluate the significant differences among the tested genotypes. Duncan’s multiple range tests was used to separate the differences between the treatments means.

3. RESULTS AND DISCUSSION

Generally, all genotypes revealed significant effect in plant height (cm), L.A.I, number of days to 50% flowering, Green forage yield, dry and forage yield. As it's like in quality parameters.

3.1 Plant Height (cm)

Statistical analysis expressed high differences in plant height during both seasons (Table 1). Plant height was ranged from a maximum of 159.9 cm in cultivar Pioneer to a minimum of 92.0 cm in genotype Taqqat.9A during rainy season (2014/2015). Compared to the recorded results during rainy season (2015/2016), in this respect, maximum and minimum values was recorded in both genotypes 172.5 cm and 100.1 for Pioneer and Taqqat.9A respectively. This variation in plant height might be due to inherited genetic make-up. These results are in accordance with the findings of [14,15].

3.2 L.A.I

Leaf area is the measure of size of assimilatory system of plant and is product of leaf length and width. Statistical analysis of the data revealed that, differences in the average of leaf area index was significant (Table 1). Maximum average leaf area index of 2.6 and 2.5 was recorded for local genotypes Nabig and Taqqat.7B respectively during season (2014/2015), whereas cultivar Pioneer and genotype Taqqat.7B recorded the highest values of 2.0 and 1.9 during rainy season (2015/2016) the minimum leaf area index of 1.2 and 0.9 was recorded for Local genotype Gassabi in both seasons. High leaf area index might be to high number of leaves per plant and minimum leaf area index might be due to less number of leaves per plant of these genotypes and their adaptation to different environment. [16] also perceived difference in leaf area index of various pearl millet forage cultivars.

3.3 Days to 50% Flowering

Results indicated significant differences among genotypes in number of days to 50% flowering during the two seasons (Table 1). The genotypes Grawia, Taqqat.5A, Abu70(Aliab), Taqqat.7B and Pioneer recorded later days to reach 50% flowering stage (76,76,71,76 and 75 days) respectively during both seasons, While genotypes Gashaish and aish-Baladi were earliest, recorded between (50- 54 day) during both seasons. This variation in number of days to 50% flowering also was attributed to genetic make-up of these genotypes. These results are in line with the findings previously reported by [17,18], also confirmed that, there were highly significant differences among Sudanese sorghum accessions in days to flowering.

3.4 Green Forage Yield (ton/ha)

The fresh weight per plant is important factor for determining the total green forage yield. Statistical analysis of the data showed that, differences in fresh fodder yield of the different genotypes were significant (Table 2). Hybrid Pioneer ranked first with maximum green forage yield of 26.5 (ton/ha), Booth local genotypes Gassabi (5.1 ton/ha) and Taqqat.9A (7.1 ton/ha) produced the minimum green during first rainy season. While cultivar Pioneer produced the highest 21.3 (ton/ha) green forage yield by the second rainy season, whereas the lower yield genotypes produce 10.4 and 10.8 (ton/ha) in genotypes Gassabi and Gashaish respectively. The overall mean of rainy season (2014/2015) was greater than rainy season (2015/2016). Genotypes had greater plant height, more number of leaves plant, higher leaf area index and high tillering ability produced maximum green forage yield. These results are in accordance with those of [19,20]. [21] reported a significant variation in fresh yield per plant and between sorghum forage genotypes.
Table 1. Effect of genotypes on plant height (cm), leaf area index, crude protein, crude of fodder sorghum (*Sorghum bicolor* L. Moench) grown during rainy season (2014/2015-2015/2016)

<table>
<thead>
<tr>
<th>Treatment (Genotypes)</th>
<th>Rainy season (2014/2015)</th>
<th>Plant height (cm)</th>
<th>L.A.I</th>
<th>C.P%</th>
<th>C.F%</th>
<th>Rainy season (2015/2016)</th>
<th>Plant height (cm)</th>
<th>L.A.I</th>
<th>C.P%</th>
<th>C.F%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taqqat.9A</td>
<td></td>
<td>92.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.9&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.0&lt;sup&gt;e&lt;/sup&gt;</td>
<td>35.0&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>100.1&lt;sup&gt;e&lt;/sup&gt;</td>
<td>1.2&lt;sup&gt;cd&lt;/sup&gt;</td>
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<td>31.67&lt;sup&gt;f&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
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<td>9.4&lt;sup&gt;cd&lt;/sup&gt;</td>
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<td>9.3&lt;sup&gt;cd&lt;/sup&gt;</td>
<td>35.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>128.7&lt;sup&gt;bcd&lt;/sup&gt;</td>
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<td>30.33&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
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<tr>
<td>Aish –Baladi</td>
<td></td>
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<td>1.1&lt;sup&gt;d&lt;/sup&gt;</td>
<td>6.5&lt;sup&gt;d&lt;/sup&gt;</td>
<td>35.5&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>105.7&lt;sup&gt;e&lt;/sup&gt;</td>
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<td></td>
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<tr>
<td>Abu70(Alaab)</td>
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<td>2.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7.2&lt;sup&gt;f&lt;/sup&gt;</td>
<td>45.0&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>1.5&lt;sup&gt;abc&lt;/sup&gt;</td>
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<td>8.3&lt;sup&gt;e&lt;/sup&gt;</td>
<td>33.5&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>116.0&lt;sup&gt;de&lt;/sup&gt;</td>
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<td>36.37&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
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<tr>
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<td></td>
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<td>2.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>10.0&lt;sup&gt;bc&lt;/sup&gt;</td>
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<td>36.33&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
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<tr>
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<td>2.0&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>10.1&lt;sup&gt;bc&lt;/sup&gt;</td>
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<td>35.33&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
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<tr>
<td>Gassabi</td>
<td></td>
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<td>1.2&lt;sup&gt;d&lt;/sup&gt;</td>
<td>10.4&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>32.0&lt;sup&gt;c&lt;/sup&gt;</td>
<td>113.0&lt;sup&gt;de&lt;/sup&gt;</td>
<td>0.9&lt;sup&gt;d&lt;/sup&gt;</td>
<td>9.53&lt;sup&gt;c&lt;/sup&gt;</td>
<td>33.00&lt;sup&gt;f&lt;/sup&gt;</td>
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<tr>
<td>Grand mean</td>
<td></td>
<td><strong>116.79</strong></td>
<td><strong>2.1</strong></td>
<td><strong>9.2</strong></td>
<td><strong>35.6</strong></td>
<td><strong>130.53</strong></td>
<td><strong>1.4</strong></td>
<td><strong>8.56</strong></td>
<td><strong>33.8</strong></td>
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<tr>
<td>SE±</td>
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<td>2.03</td>
<td>0.07</td>
<td>0.02</td>
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<td>4.72</td>
<td>0.07</td>
<td>0.113</td>
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<tr>
<td>C.V%</td>
<td></td>
<td>5.45</td>
<td>11.28</td>
<td>4.39</td>
<td>7.13</td>
<td>11.43</td>
<td>20.66</td>
<td>4.18</td>
<td>8.15</td>
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</table>

*Values having the same letter are not significantly differing at 5% levels according to Duncan’s multiple range test (DMART)
Table 2. Effect of genotypes on green forage yield (ton/ha), dry forage yield (ton/ha) and number of days to 50% flowering of fodder sorghum (Sorghum bicolor L. Moench) grown during rainy seasons (2014/2015-2015/2016)

<table>
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<tr>
<td></td>
<td>G.F.Y (ton/ha)</td>
<td>D.F.Y (ton/ha)</td>
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<td>Taqqat.9A</td>
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<td>2.7&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Pioneer</td>
<td>26.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9.7&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Taqqat.7B</td>
<td>18.0&lt;sup&gt;c&lt;/sup&gt;</td>
<td>5.5&lt;sup&gt;cd&lt;/sup&gt;</td>
</tr>
<tr>
<td>aish -Baladi</td>
<td>12.7&lt;sup&gt;ef&lt;/sup&gt;</td>
<td>4.2&lt;sup&gt;de&lt;/sup&gt;</td>
</tr>
<tr>
<td>Abu70(Aliab)</td>
<td>17.3&lt;sup&gt;cd&lt;/sup&gt;</td>
<td>6.4&lt;sup&gt;bc&lt;/sup&gt;</td>
</tr>
<tr>
<td>Taqqat.5A</td>
<td>20.4&lt;sup&gt;bc&lt;/sup&gt;</td>
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<td>23.3&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>5.4&lt;sup&gt;cd&lt;/sup&gt;</td>
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<td>Grawia</td>
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<td>4.8&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>Geshaish</td>
<td>13.2&lt;sup&gt;def&lt;/sup&gt;</td>
<td>3.1&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
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<td>Gassabi</td>
<td>10.4&lt;sup&gt;l&lt;/sup&gt;</td>
<td>2.9&lt;sup&gt;g&lt;/sup&gt;</td>
</tr>
<tr>
<td>Grand mean</td>
<td>11.9&lt;sup&gt;l&lt;/sup&gt;</td>
<td>5.2&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>SE±</td>
<td>0.76</td>
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<tr>
<td>C.V%</td>
<td>14.19</td>
<td>16.65</td>
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</tbody>
</table>

*Values having the same letter are not significantly differing at 5% levels according to Duncan’s multiple range test (DMART). G.Y.T and D.F.Y, denotes for green forage yield and dry forage yield respectively.

3.5 Dry Forage Yield (ton/ha)

Statistical analysis of the data showed that, differences in dry forage yield of the different genotypes were significant (Table 2). Maximum dry forage yield of 9.7 ton/ha was recorded by hybrid cultivar Pioneer, followed by genotype Taqqat.5A with 7.1 ton/ha. Minimum dry fodder yield of 2.7, 2.9, 3.4, and 4.8 was recorded for genotypes Taqqat.9A, Gassabi, Geshaish and Grawia respectively during rainy season (2014/2015). Genotypes during rainy season 2015/2016 was significantly differ with respect to dry fodder yield ton per hectare. Highest dry forage yield (9.5 and 8.3 ton/ha) was recorded by cultivar Pioneer and Taqqat.7B. In the overall situation genotypes varied from 4.7 - 5.5 ton/ha, while lesser values of 1.9 and 2.4 ton/ha were recorded for local genotypes Gassabi and Geshaish respectively during rainy season (2015/2016). Genotypes having taller plants, more number of leaves, higher fresh, and weight higher leaf area index might be produced maximum dry fodder yield weight. The significant variations among sorghum genotypes for dry matter production had already been reported in studies conducted by [22]. Dry fodder yield showed positive relationship with fresh forage yield. Similar results were reported by [23].

3.6 Forage quality attributes

3.6.1 Crude protein percentage

Fodder quality includes crude protein is of great importance as well as higher fodder yield. Statistical analysis of the data showed that, differences in crude protein among genotypes were statistically significant (Table 2). The data revealed that, local genotype Taqqat.9A produced the highest crude protein 12.9% and 13.18% during both rainy seasons successfully; it was followed by genotypes Gassabi and cultivar Pioneer respectively. While lesser values of (6.5%) and (6.9%) was recorded by local genotypes aish-Baladi and Geshaish respectively during both seasons. These differences in crude protein could be attributed to the differences in anatomy, morphology and chemical composition. Similar results were obtained by [24], also [25] had reported a significant difference among sorghum genotypes with respect to crude protein contents. Also [21], reported that, the differences among genotypes in protein might be due to relative contribution of leaves to total biomass and concentration of dry fodder.

3.6.2 Crude fiber percentage

Crude fiber is one of the most important traits influencing the quality of fodder crops. The data
pertaining to crude fiber percentage revealed that, the genotype Abu70 gave significantly higher crude fiber percentage of (45.0%) and (37.67%) respectively during both seasons than the other genotypes, followed by genotype Nabig. The minimum crude fiber percentage of (32.0%) was recorded in case of genotype Gassabi, during rainy season (2014/2015) with genotype Taqqat.5A which produced (33.0%) at rainy season (2015/2016). This variation in crude fiber among genotypes might be due to variation in genetic factors of cultivars, [19] reported the same findings as in our study, [26] also confirmed that, there was a significant difference among sorghum varieties regarding crude fiber, while [27], in other study reported that, crude fiber was slightly higher in Abu 70 compared to Sudan grass.

4. CONCLUSION AND RECOMMENDATION

The sorghum forage genotype Pioneer performed better than all tested genotypes in high yielding, in terms of green and dry forage yield (26.5 and 21.3 ton /ha), (9.7 and 9.5 ton /ha) respectively during both seasons. At 50% flowering stage, the fodder quality in terms of crude protein was commendably high by genotypes Pioneer and T.9A compared to other genotypes, also the crude fiber was slightly had lowest values in the same genotypes. It was advised to cultivate and harvest theses genotypes at 50% flowering stage rather than philological maturity under rain-fed to fill the gap of fodder shortage in the area.

COMPETING INTERESTS

Authors have declared that no competing interests exist. (We confirmed that).

REFERENCES

4. Fadelmula AA. Effect of sowing date on the incidence of sorghum midge, (Stenodiplosis sorghicola Coq.), (Cecidomyiidae: Diptera) in sorghum (Sorghum bicolor (L.). Moench) at Damazin rain- fed area, Sudan; 2009.
14. Amanullah Khan AA, Nawab K, Khan A, Islam B. Growth characters and fodder production potential of sorghum varieties under irrigated condition Department of
Ahmed et al.; ABAARJ, 2(1): 6-12, 2020; Article no.ABAARJ.198


27. Abd-Elbakheit AKE. The performance of Abu, Sabien (Sorghum bicolor L), and Sudan grass (Sorghum Sudanese) under different Levels of Phosphorus Fertilizer, MSc. Thesis in (Agric). University of Khartoum. Khartoum Sudan; 2007.

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