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## Research Article

# Performance Evaluation of Napier Grass (*Penisetum Purpuruem* (L.) Schumach) accessions under rain fed and Irrigation System at Wondo Genet

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## Abstract

Six Napier grass accessions (*Penisetum purpuruem*) that have been tested and identified for their better agronomic and yield performance at different national and regional research centers were collected and tested at Wondo genet Agricultural Research center under two sets (under irrigation and rain fed) conditions. The experiment was conducted in randomized complete block design with three replications. Under supplementary irrigation there was no significant difference ( $P>0.05$ ) of mean yield and yield components observed among accessions both under fertilizer application and without fertilizer application with fresh biomass yield (t/ha) ranged from 43.73 to 70.24 and that of dry biomass yield (t/ha) ranged 11.54 to 20.32. Under rainfed condition the combined mean analysis for tiller number per plant, plant height, node number per plant and internodes length per plant did show significant ( $P<0.05$ ) while fresh biomass yield and dry matter yield didn't show significant ( $P>0.05$ ) difference. Fresh biomass yield (59.11 t/ha) and dry matter yield (16.17 t/ha) for fertilizer application is significantly higher ( $p<0.05$ ) than fresh biomass and dry matter yield of 40.51 t/ha and 10.51 t/ha respectively for non-fertilizer applied Napier accessions under rain fed condition. Both under supplementary irrigation and rainfed conditions, Napier accessions 14983, 15743 and 16788 responds better mean fresh and dry biomass yield. Hence, among tested genotypes 14983, 15743 and 16788 Napier grass accessions will be encouraged in the study area and similar environment.

## Introduction

Livestock production is an integral part of the subsistence crop-livestock mixed farming systems of Ethiopia. The major constraint that influences the productivity of livestock is shortage of feed both in quantity and quality [1]. The major feed resources for livestock come from natural pasture and crop residue (Alemu and Lemma 1991). However, they are poor in quality and provide inadequate protein, energy, vitamins and minerals [2].

Nevertheless, the feed supply to animals can be improved by cultivation of tropically adapted forage species, which give reasonable yield under drought and unstable climatic conditions. Among the promising forage species introduced to

Ethiopia, Napier grass (*Pennisetum purpureum*) is reported to be a popular fodder crop in the Ethiopian highlands where it has shown considerable potential to alleviate the severe shortage of high-quality fodder [3]. It is a tall perennial grass, also known as elephant grass, was originated from sub-Saharan tropical Africa and well adapted to the altitude up to 2500m and rainfall 600-1000mm [4] and occurs naturally throughout tropical Africa and particularly in East Africa [5]. It is the forage of choice not only in the tropics but also worldwide due to its desirable traits such as tolerance to drought and adaptability to a wide range of soil conditions and high photosynthetic and water-use efficiency [6]. Its leafy nature, considerable plant height, high tiller and re-growth ability made it a high productive feed crop per unit area of land as compared to other grass species [7].



Napier grass become ready for harvesting within 3-4 months after planting and harvesting can continue at an interval of 6-8 weeks for more than five years where there is no moisture stress and fertility problem. Napier grass could play an important role in providing a significant amount of biomass yield of 20 to 30 t DM/ha/year with good agronomic and management practices (Farrell et al., 2002). Napier grass is palatable and could be fed fresh, as silage or directly grazed on the field [8,9]. A yield of 85.4 t/ha without fertilizer application and a record high yield of 130 t/ha with 1320 kg/ha of nitrogen fertilizer application have been recorded [10]. Napier grass could be categorized as high-quality forage [11] and extremely palatable when young and leafy [12].

Practices, including fertilization, irrigation and pest control were reported agronomic practices required for production of high yield and quality fodder from Napier grass crops, [13]. Hence the objective of this study was to evaluate the biomass yield and desirable agronomic parameters of selected six Napier grass accessions at Wondo genet Agricultural Research Center under irrigation and rain fed conditions.

## Materials and methods

### Descriptions of the test environments

Under irrigation system the study was conducted at Wondo Genet agricultural Research Center which is one of the centers of Ethiopian institute of agricultural research and is found in Sidama Regional state, Wondo Genet woreda. It is situated about 268km south of Addis Ababa and 14 km south east of Shashemene. Its geographical location and altitude ranges from 38° 37'13"-38° 38'20" East and 7° 5'23"-7° 5'52" North and 1760-1920 m.a.s.l respectively [14]. The area receives mean annual rain fall of 1128 mm with minimum and maximum temperature of 11 and 26°C, respectively [15].

Set II experiment (under rain fed condition) was conducted at Awada Agriculture Research Sub-center. Awada Agricultural Research Sub-center is situated in the Tepid to cool semi-arid mid highland agroecology. It is located at about 315 km south of Addis Ababa at 603' N of latitude and 380 E of longitude at an altitude of about 1740m a.s.l. nearby Yirgalem town. The area has a semi-bimodal rainfall distribution characterized by double wet and dry seasons with an average precipitation of 1342 mm per annum [16].

### Experimental design, layout and treatments

Available accessions of the listed forage grass (*Penisetum purpurum*) that have been tested and identified for their better yield and desirable agronomic performance at different national and regional research centers were collected and tested at Wondo genet Agricultural Research center under two sets (under irrigation and rain fed) conditions. The experiment was conducted under field situations for three years during the main cropping seasons of 2010 to 2012 E.C. A 6X2 factorial in a Randomized Completely Block Design (RCBD) was used in performance evaluation of Napier grass accessions study. There were three replicate plots for each treatment with a total of 36 plots each measuring 10.5m<sup>2</sup> (3.5m\*3m). In this trial,

Napier grass accessions (14983, 14984, 16808, 16788, 15743, 16819) were designated as one main factor while fertilizer application (with and without fertilizer application) was designed as another factor. Spacing of 0.5 m distance between plots and a 1m distance between replications was used. Each plot was divided into two equal parts to test the performance of tested grass varieties with and without fertilizer application. Fertilizer was applied at the rate 100kg per hectare DAP (46 % P205 and 18 % N) at planting. Plots were hand weeded during the establishment phase.

### Harvesting procedure and data collection

The first harvest was at the age of 5 months after planting and then harvested on average of 4.5 months during experimental period. Measurements taken before and after each harvest were number of tillers per plants, node number per plant, Internode's length per plant, plant height and forage DM yield. Plant height was based on five culms taken randomly in each plot, measured using a steel tape from the ground level to the highest leaf. For determination of biomass yield, accessions were harvested at forage harvesting stage from two rows next to the guard rows of 5 to 10 cm above the ground level. Weight of the total fresh biomass yield was recorded from each plot in the field and the estimated 300 g sample was taken from each plot to the laboratory. The sample taken from each plot was weighed to know their sample fresh weight and then oven dried for 24 h at a temperature of 105°C to determine dry matter yield.

### Statistical analysis

Differences among accessions were tested using analysis of variance (ANOVA) procedures of SAS General Linear Model (GLM) to compare treatment means [17]. The difference in mean was compared using the Standard Error of the Mean (SEM).

## Results and discussion

The mean yield and yield components (Tillering performance, Plant height, Node number per plant, Internode's length per plant, Forage fresh and dry matter yield) for different Napier grass accessions and fertilizers under supplementary irrigation and rainfed was presented in Table 1 and Table 2 respectively. Under supplementary irrigation there was no significant difference ( $P>0.05$ ) of mean yield and yield components observed among accessions both under fertilizer application and without fertilizer application.

The combined mean number of tillers per plant of each treatment indicated that all Napier grass accessions were not significance difference ( $P>0.05$ ) among them under rainfed condition with similar effects of fertilizer application (Table 3). There was also no statistically difference ( $P>0.05$ ) for plant height, node number per plant, fresh biomass yield and dry biomass yield under rainfed condition among Napier grass accessions (Table 3). But statistically difference ( $P<0.05$ ) internodes length per plant was recorded among Napier grass accessions with least internodes length per plant of accession 15743 (12.9 cm) followed by 16819 (14.94cm) (Table 3).



Combined analysis of fresh biomass yield (t/ha) ranged from 43.73 to 70.24 and that of dry biomass yield (t/ha) ranged 11.54 to 20.32 (Table 3) under supplementary irrigation condition with no statistically no difference ( $P>0.05$ ) among Napier accession. The current results for fresh biomass yield and dry biomass yield were higher than the results (22.2 to 57.3 t/ha) and (3.9 to 10.5 t/ha) for fresh biomass and dry biomass yield respectively reported by Habtie et al. [18]. Even though there was no statistically difference ( $p>0.05$ ) on dry matter

yield among Napier grass accessions, the combined dry matter yield for accession 16819 (11.54 t/ha) was in agreement with the result (11.72 t/ha) reported by Kebede, et al. [19] at Debrezeit Location but lower than the results reported by the same author at Hawassa (13.30) and Adamitulu (18.30 t/ha) locations. Yields of the grass vary depending on genotype (Cuomo et al., 1996), edaphic and climatic factors and management practices [20]. The overall combined mean (ranged 13.95 to 21.97 t/ha) dry matter yield of the studied accessions (14983, 14984, 16808,

**Table 1:** Two years growing season mean yield and yield component for different Napier grass accessions and fertilizers at Wondo genet Agricultural research center under supplementary irrigation.

| Fertilizers    | Parameters                       | Accessions         |                     |                     |                     |                     |                     | P-value | SE    |
|----------------|----------------------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------|-------|
|                |                                  | 14983              | 14984               | 16808               | 16788               | 15743               | 16819               |         |       |
| F <sub>1</sub> | Number of tiller/plants          | 19.96              | 18.07               | 17.12               | 14.73               | 12.63               | 17.16               | .55     | 2.93  |
|                | Plant height (m)                 | 3.07 <sup>a</sup>  | 2.85 <sup>a</sup>   | 2.75 <sup>ab</sup>  | 2.91 <sup>a</sup>   | 2.81 <sup>ab</sup>  | 2.29 <sup>b</sup>   | .072    | 0.18  |
|                | Node number per plant            | 11.4 <sup>ab</sup> | 11.58 <sup>ab</sup> | 10.43 <sup>ab</sup> | 11.9 <sup>a</sup>   | 9.7 <sup>ab</sup>   | 9.17 <sup>b</sup>   | .114    | 0.81  |
|                | Internodes length per plant (cm) | 17.16 <sup>a</sup> | 14.01 <sup>b</sup>  | 15.20 <sup>ab</sup> | 14.06 <sup>b</sup>  | 14.20 <sup>b</sup>  | 14.71 <sup>ab</sup> | .108    | 0.87  |
|                | Fresh biomass yield (t/ha)       | 69 <sup>ab</sup>   | 65.6 <sup>ab</sup>  | 61.87 <sup>ab</sup> | 86.31 <sup>a</sup>  | 62.12 <sup>ab</sup> | 42.67 <sup>b</sup>  | .102    | 10.12 |
|                | Dry matter yield (t/ha)          | 25.23              | 16.96               | 17.24               | 25.59               | 19.98               | 11.28               | .213    | 4.51  |
| F <sub>0</sub> | Number of tiller/plants          | 20.18 <sup>a</sup> | 15.69 <sup>ab</sup> | 18.82 <sup>ab</sup> | 13.16 <sup>b</sup>  | 14.68 <sup>ab</sup> | 17.17 <sup>ab</sup> | .15     | 2.02  |
|                | Plant height (cm)                | 2.93               | 2.73                | 2.60                | 2.65                | 2.49                | 2.38                | .34     | 0.18  |
|                | Node number per plant            | 11.42              | 11.17               | 10.2                | 10.85               | 9.35                | 9.28                | .30     | 0.82  |
|                | Internodes length per plant (cm) | 16.29 <sup>a</sup> | 13.54 <sup>b</sup>  | 14.07 <sup>ab</sup> | 14.19 <sup>ab</sup> | 11.6 <sup>c</sup>   | 15.18 <sup>ab</sup> | .002    | 0.75  |
|                | Fresh biomass yield (t/ha)       | 64.14              | 44.82               | 51.66               | 54.16               | 68.42               | 44.80               | .24     | 8.22  |
|                | Dry matter yield (t/ha)          | 18.71              | 10.93               | 15.11               | 14.45               | 20.67               | 11.79               | .19     | 3.04  |

**Table 2:** Two years growing season mean yield and yield component for Napier grass accessions and fertilizers under rain fed of Wondo genet Agricultural research center (Awada sub center).

| Accessions     | Parameters              |                    |                       |                                  |                            |                         |
|----------------|-------------------------|--------------------|-----------------------|----------------------------------|----------------------------|-------------------------|
|                | Number of tiller/plants | Plant height (m)   | Node number per plant | Internodes length per plant (cm) | Fresh biomass yield (t/ha) | Dry matter yield (t/ha) |
| 14983          | 23.76 <sup>a</sup>      | 2.40 <sup>ab</sup> | 9.06 <sup>bc</sup>    | 17.47 <sup>a</sup>               | 60.28                      | 16.89 <sup>a</sup>      |
| 14984          | 15.98 <sup>b</sup>      | 2.35 <sup>b</sup>  | 9.47 <sup>b</sup>     | 14.73 <sup>b</sup>               | 48.14                      | 13.16 <sup>ab</sup>     |
| 16808          | 14.81 <sup>bc</sup>     | 2.36 <sup>b</sup>  | 10.05 <sup>ab</sup>   | 15.41 <sup>b</sup>               | 41.00                      | 11.74 <sup>ab</sup>     |
| 16788          | 14.50 <sup>bc</sup>     | 2.66 <sup>a</sup>  | 11.65 <sup>a</sup>    | 15.52 <sup>b</sup>               | 54.34                      | 14.64 <sup>ab</sup>     |
| 15743          | 11.51 <sup>c</sup>      | 2.46 <sup>ab</sup> | 10.33 <sup>ab</sup>   | 12.95 <sup>c</sup>               | 55.80                      | 14.20 <sup>ab</sup>     |
| 16819          | 16.15 <sup>b</sup>      | 2.00 <sup>c</sup>  | 7.38 <sup>c</sup>     | 15.65 <sup>b</sup>               | 39.31                      | 9.61 <sup>b</sup>       |
| P-value        | <0001                   | .0003              | .0002                 | <0001                            | .043                       | .047                    |
| SE             | 1.13                    | 0.10               | 0.62                  | 0.61                             | 6.72                       | 2.07                    |
| Fertilizer     |                         |                    |                       |                                  |                            |                         |
| F <sub>1</sub> | 18.51 <sup>a</sup>      | 2.45               | 10.09                 | 15.52                            | 59.11 <sup>a</sup>         | 16.17 <sup>a</sup>      |
| F <sub>0</sub> | 13.72 <sup>b</sup>      | 2.29               | 9.22                  | 15.06                            | 40.51 <sup>b</sup>         | 10.58 <sup>b</sup>      |
| P-value        | <0001                   | .05                | .09                   | .36                              | .0009                      | .0012                   |
| SE             | 0.65                    | 0.06               | 0.36                  | 0.35                             | 3.88                       | 1.20                    |

**Table 3:** Two years growing season mean yield and yield component for Napier grass accessions and fertilizers under supplementary irrigation of Wondo genet Agricultural research center.

| Accessions     | Parameters              |                    |                       |                                  |                            |                         |
|----------------|-------------------------|--------------------|-----------------------|----------------------------------|----------------------------|-------------------------|
|                | Number of tiller/plants | Plant height (m)   | Node number per plant | Internodes length per plant (cm) | Fresh biomass yield (t/ha) | Dry matter yield (t/ha) |
| 14983          | 20.07 <sup>a</sup>      | 3.00 <sup>a</sup>  | 11.41 <sup>a</sup>    | 16.73 <sup>a</sup>               | 66.57 <sup>a</sup>         | 21.97 <sup>a</sup>      |
| 14984          | 16.88 <sup>ab</sup>     | 2.79 <sup>a</sup>  | 11.38 <sup>a</sup>    | 13.77 <sup>bc</sup>              | 55.21 <sup>ab</sup>        | 13.95 <sup>ab</sup>     |
| 16808          | 17.97 <sup>ab</sup>     | 2.68 <sup>ab</sup> | 10.32 <sup>ab</sup>   | 14.63 <sup>bc</sup>              | 56.77 <sup>ab</sup>        | 16.17 <sup>ab</sup>     |
| 16788          | 13.76 <sup>b</sup>      | 2.78 <sup>a</sup>  | 11.38 <sup>a</sup>    | 14.13 <sup>bc</sup>              | 70.24 <sup>a</sup>         | 20.02 <sup>a</sup>      |
| 15743          | 13.66 <sup>b</sup>      | 2.65 <sup>ab</sup> | 9.52 <sup>b</sup>     | 12.9 <sup>c</sup>                | 65.27 <sup>a</sup>         | 20.32 <sup>a</sup>      |
| 16819          | 17.16 <sup>ab</sup>     | 2.34 <sup>b</sup>  | 9.23 <sup>b</sup>     | 14.94 <sup>b</sup>               | 43.73 <sup>b</sup>         | 11.54 <sup>b</sup>      |
| P-value        | .09                     | .013               | .015                  | .0003                            | .06                        | .05                     |
| SE             | 1.78                    | 0.13               | 0.58                  | 0.58                             | 6.52                       | 2.72                    |
| Fertilizer     |                         |                    |                       |                                  |                            |                         |
| F <sub>1</sub> | 16.55                   | 2.78               | 10.70                 | 14.89                            | 64.60                      | 19.38                   |
| F <sub>0</sub> | 16.62                   | 2.63               | 10.38                 | 14.14                            | 54.67                      | 15.28                   |
| P-value        | 0.96                    | .15                | .50                   | .115                             | .07                        | .07                     |
| SE             | 1.03                    | 0.07               | 0.33                  | 0.33                             | 3.77                       | 1.57                    |



16788, 15743) under supplementary irrigation condition at Wondo genet was higher than the combined mean dry matter yield (ranged 7.97 to 12.54 t/ha) results reported by Kebede, et al. 2016 [19] for accessions (15743, 16783, 16791, 16792, 16794, 16813, 16815, 16817) at Holetta, Debre Zeit, Adamitulu and Areka locations.

Under rainfed condition the combined mean analysis for tiller number per plant, plant height, node number per plant and internodes length per plant did show significant ( $P < 0.05$ ) while fresh biomass yield and dry matter yield didn't show significant ( $P > 0.05$ ) difference (Table 4). Fresh biomass yield and dry matter yield (t/ha) is significantly higher ( $p < 0.05$ ) for fertilizer application than for non-fertilizer applied Napier accessions under rain fed condition (Table 4). In current study under rainfed condition the higher plant population was recorded for accession 14983 (23.76) followed by 16819 (16.15), 14984 (15.98), 16808 (14.81), 15743 (14.51) and 16788 (14.50). Even though there was no statistically difference ( $P > 0.05$ ) the higher fresh biomass yield (60.28 t/ha) and dry matter yield (16.89 t/ha) was recorded for accession 14983 with higher tiller number per plant under rain fed condition which could be due to the contribution to increase photosynthetic activity and hence higher DM production. The development of new shoots bearing on each plant result in greater number of tillers and increased yield for grasses as the plant matured and increased in tiller density [3]. Tillers number is an important characteristic of grasses as it increases the chances of survival and amount of available forage [21,22].

The plant height in current study under rainfed condition ranged from 2m to 2.66m is higher than the result (ranged 1.07m to 1.26m) reported by Kebede, et al. 2016 [19] at Holeta, Debrezeit, Adamitulu, Hawassa and Areka locations which could be due to different in age at harvesting time. Increments in plant height at later harvest stages could be due to massive root development and efficient nutrient uptake, letting the plant to bear to increase in height as mentioned by Melkie [23]. Growth characteristics and productivity [24] and fodder yield of Napier grass in Kenya [25] is affected by height at cutting. Amongst the major agronomic practices required, harvesting of Napier grass at appropriate cutting height and defoliation frequencies are very important to improve DM yield and nutritive values of this plant. A higher cutting height of Napier grass may result

in underutilization and the quality of forage is reduced by a higher cutting height [26].

Significant ( $P < 0.05$ ) variation was observed among the tested Napier grass accessions under rain fed condition for number of nodes per plant and internodes length per plant (Table 4). In combined analysis under rain fed condition, the number of nodes per plant ranged from 7.38 to 11.65. The mean length of internodes per plant ranged from 12.95 to 17.47. The highest number of nodes per plant was recorded for 16808 (11.65) accession while accession 16819 (7.38) produced the lowest. The highest mean internodes length per plant was recorded for accession 14983 (17.47cm) and the lowest accession was produced by accession 15743 (12.95cm). Generally, as other agronomic traits, stem elongation also influenced by variation in soil type, temperature, amount and distribution of rainfall, genotypes and genotype by year interaction effects [27,28].

Combined mean of forage fresh biomass and dry matter yield showed significant ( $p < 0.05$ ) variation among the tested Napier grass accessions under rainfed condition (Table 2). The fresh biomass yield (t/ha) ranged from 39.31 to 60.28 with a mean of 49.81. The highest fresh biomass was recorded in 14983 followed by 15743, 16788, 14984 and 16819 (standard check). The higher fresh biomass enables for cut and carry system for using the herbage yield [18].

In combined analysis under rainfed condition, the forage DM yield (t/ha) ranged from 9.61 to 16.89 with a mean of 13.37 t/ha. The current result is slightly higher than Gezahagn, et al. (2016) who reported the mean forage DM yield (t/ha) of different accession of Napier grass 15743(7.4), 16791(10.51), 16794(6.9), 16813(5.49), 16815(4.57) 16817(6.17) at Holetta and slightly agreed with who reported at D/zeyit, Adamitulu, Areka and Hawassa. The result of the DM yield of the current study under rainfed condition is also higher than Tesfaye (2018) who reported the mean forage DM yield (t/ha) of different Napier accessions 15743(5.3), 16783(3.7), 16791(7.4), 16792(3.2), 16794(3.1), 16813(4.1), 16815(2.8), 16819(1.7) and Check (6.2).

Under rainfed condition, the mean yield and yield component for Napier grass accessions with fertilizer application is significantly ( $p < 0.05$ ) higher than those accessions not applied with fertilizer (Table 2). This could be due to Napier grass is

**Table 4:** Two years growing season mean yield and yield component for different Napier grass accessions and fertilizers at Wondo genet agricultural research center under rain fed condition.

| Fertilizers    | Parameters                       | Accessions         |                     |                     |                      |                     |                     | P-value | SE    |
|----------------|----------------------------------|--------------------|---------------------|---------------------|----------------------|---------------------|---------------------|---------|-------|
|                |                                  | 14983              | 14984               | 16808               | 16788                | 15743               | 16819               |         |       |
| F <sub>1</sub> | Number of tiller/plants          | 26.18 <sup>a</sup> | 16.78 <sup>b</sup>  | 18.38 <sup>b</sup>  | 17.83 <sup>b</sup>   | 13.3 <sup>b</sup>   | 18.6 <sup>b</sup>   | .0003   | 1.80  |
|                | Plant height (m)                 | 2.38 <sup>ab</sup> | 2.42 <sup>ab</sup>  | 2.47 <sup>ab</sup>  | 2.76 <sup>a</sup>    | 2.57 <sup>a</sup>   | 2.10 <sup>b</sup>   | .02     | 0.13  |
|                | Node number per plant            | 8.87 <sup>bc</sup> | 9.78 <sup>bc</sup>  | 10.67 <sup>ab</sup> | 12.45 <sup>a</sup>   | 10.93 <sup>ab</sup> | 7.83 <sup>c</sup>   | .002    | 0.77  |
|                | Internodes length per plant (cm) | 17.68 <sup>a</sup> | 14.87 <sup>bc</sup> | 15.58 <sup>ab</sup> | 15.57 <sup>abc</sup> | 13.14 <sup>c</sup>  | 16.12 <sup>ab</sup> | .014    | 0.84  |
|                | Fresh biomass yield (t/ha)       | 64.86              | 56.40               | 47.90               | 67.49                | 70.53               | 47.48               | .42     | 10.02 |
|                | Dry matter yield (t/ha)          | 19.79              | 14.94               | 12.55               | 18.96                | 18.79               | 12.00               | .43     | 3.46  |
| F <sub>0</sub> | Number of tiller/plants          | 21.33 <sup>a</sup> | 15.18 <sup>b</sup>  | 11.23 <sup>bc</sup> | 11.15 <sup>bc</sup>  | 9.72 <sup>c</sup>   | 13.70 <sup>bc</sup> | <0001   | 1.35  |
|                | Plant height (cm)                | 2.42 <sup>a</sup>  | 2.82 <sup>ab</sup>  | 2.25 <sup>ab</sup>  | 2.56 <sup>a</sup>    | 2.36 <sup>a</sup>   | 1.90 <sup>b</sup>   | .04     | 0.14  |
|                | Node number per plant            | 9.25 <sup>ab</sup> | 9.15 <sup>ab</sup>  | 9.43 <sup>ab</sup>  | 10.85 <sup>a</sup>   | 9.72 <sup>ab</sup>  | 6.93 <sup>b</sup>   | .15     | 0.98  |
|                | Internodes length per plant (cm) | 17.25 <sup>a</sup> | 14.60 <sup>ab</sup> | 15.25 <sup>ab</sup> | 15.31 <sup>ab</sup>  | 12.76 <sup>b</sup>  | 15.18 <sup>ab</sup> | .03     | 0.89  |
|                | Fresh biomass yield (t/ha)       | 55.71              | 39.88               | 34.11               | 41.19                | 41.07               | 31.13               | .47     | 8.96  |
|                | Dry matter yield (t/ha)          | 13.98              | 11.37               | 10.94               | 10.32                | 9.62                | 7.22                | .46     | 2.28  |





highly sensitive to soil fertility condition and it responds well when manure, compost or nitrogen fertilizer is applied. But the result under supplementary irrigation is not significantly ( $p>0.05$ ) responded between accessions applied with nitrogen fertilizer and those not (Table 3). This could be attributed with the good soil fertility condition of the experimental site Table 4.

## Conclusions and recommendations

Under supplementary irrigation there was no significant difference ( $P>0.05$ ) of mean yield and yield components observed among accessions both under fertilizer application and without fertilizer application. Napier grass accessions respond differently for agronomic performance under rainfed condition due to differential responses of the genotypes to various edaphic, climatic and biotic factors. Both under supplementary irrigation and rainfed conditions, Napier accessions 14983, 15743 and 16788 responds better mean fresh and dry biomass yield. Hence, among tested genotypes 14983, 15743 and 16788 Napier grass accessions will be encouraged in the study area and similar environment.

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