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Research Paper

Yield Dynamics and Nutrient Quality of Napier Grass (*Pennisetum purpureum*) Varieties under Consecutive Harvests

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Abstract

Negative feed balance in terms of dry matter and forage quality has been affecting animal production in Ethiopian livestock system. Yield dynamics and forage quality assessment of ten Napier grass (*Pennisetum purpureum Schumach*.) genotypes to assess the yield and nutritional quality of the grass was conducted in the field of Chano Mille Research substation from September 2018 to November 2019. The experiment was laid out in randomized complete block design with three replications. All growth parameters showed significant (P<0.01) variation among genotypes that were contributing either to yield or quality. Depending on the weather condition of growing months, dry matter yield was varied among genotypes and harvesting months significantly (P<0.01). Dry matter yield varied from 4.87 to 17.35 t/ha for weather variation in growing months and from 9.57 to 18.4 t/ha for genotype variation. Leaf to stem ratio was not varied significantly among genotypes. Stem and leaf quality variation among genotypes for calcium, phosphorus and crude protein was significant while not for neutral and acid detergent fibers. Zehone_02 and ILRI_16835 genotypes could be of optimum dry matter yield and quality to be used as a feed option in a study area and similar agro-ecological zones. Assessing silage and hay quality and animal preference warranted with the production of the crop under irrigated condition.

1. Introduction

Napier grass (*Pennisetum purpureum Schumach*.) is a fast-growing perennial grass native to Sub-Saharan Africa that is widely growing across the tropical and subtropical regions of the world (Alemayehu Teressa et al., 2017). Its high production, ease of establishment and regeneration, persistence, and enhanced water use efficiency make Napier grass the primary forage of choice in the regions of Eastern and Central Africa, where smallholder dairy farmers and pastoralists suffer from intermittent droughts and possess limited irrigation infrastructure (Nyambati et al., 2010). Napier grass is recommended for smallholder crop-livestock farming systems especially in dairy and feedlot production systems (Halim et al., 2013).

Most smallholder livestock producers predominantly own small and fragmented pieces of land, therefore, Napier grass offer a best-fit alternative to other feed options, as these are high yielding forages which require a minimum amount of inputs and land (Alemayehu Teressa et al., 2017). Different cultivars of Napier grass produced as higher dry matter yield as 60 tons per hectare per year (Rengsirikul et al., 2013) whereas the yield may be more depending on the cultivar in use, the environment and management options. The tallest or normal Napier grass varieties produce higher dry matter yield than the shortest or dwarf ones (Williams and Hanna, 1995) where in tropical and subtropical regions with annual moisture of 750 to 2500 mm in an altitude

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ranging from sea level to 2100 meter above sea level (Nyambati et al., 2010). Therefore, the objective of this study was to evaluate the agronomic performance, yield dynamics and nutritive quality of ten varieties of Napier grass in 15 months growing period and subsequently identify superior varieties based on those criteria.

2. Materials and Methods

Evaluation of yield dynamics and nutrient quality of ten Napier grass varieties were conducted starting from September 2018 to November 2019 at the Arba Minch Agricultural Research Center substation (6°03'43.7''N, 37°33'41.5''E; 1,220 meter above sea level) (Figure 1). The mean annual rainfall of the location is 938.55 mm with average minimum and maximum temperatures of 17.3 and 30.3°C, respectively. Weather data including mean monthly rainfall and maximum and minimum temperatures during the course of the trial are presented in Figure 2. Planting year 2018 (809.26 mm) was characterized with 13.8% below and production year 2019 (1171.6 mm) was characterized with 23.35% above the normal precipitation of 10 years average value (938.55 mm). The bimodal character of rainfall showed that January, February, March, July, August and December have the lowest precipitation while April, May, June, September, October and November characterized as better precipitation in the year with the

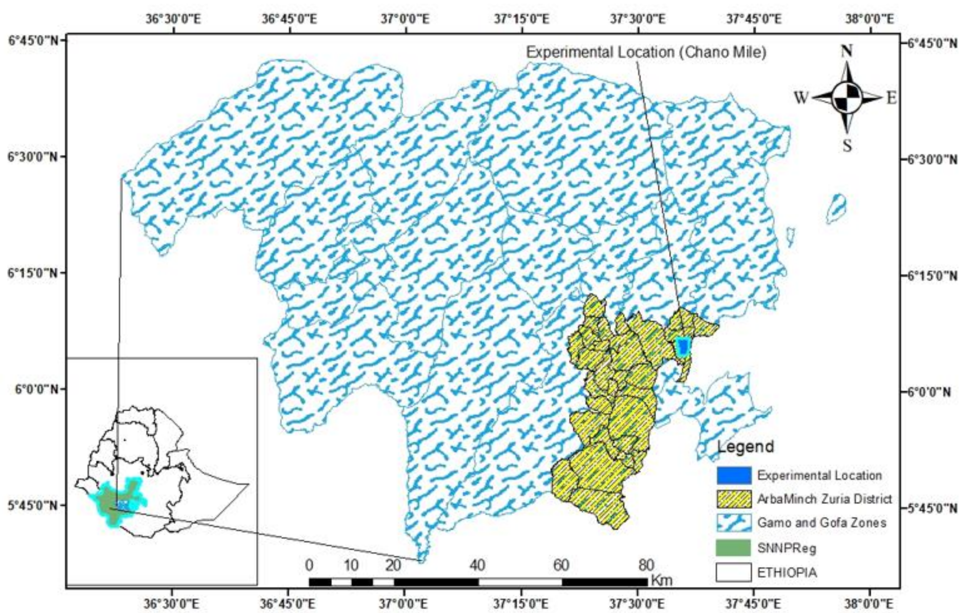

Figure 1: Location Map of the study area

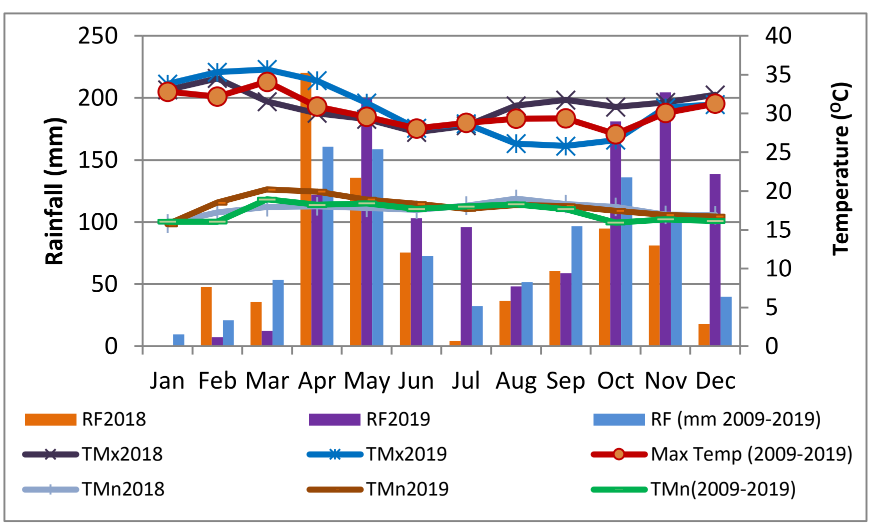

Figure 2: Rainfall (RF), maximum temperature (TMn) and minimum temperatures (TMx)

peak in April and May. No irrigation supplemented in the low moisture seasons for the trial. The soil is a sandy loam (sand 64%, clay 15%, silt 21%), with pH 6.2, available phosphorus 14.5 mg/kg, total nitrogen 0.29%, organic carbon 1.19%, organic matter 1.63% and potassium 1.12 cmolc/kg. The experimental soil is in the range of moderately acidic (ATA, 2016), low available phosphorus, optimum amount of total nitrogen, low organic carbon and organic matter and high potassium concentration (Landon, 1991).

Field experiment of nine Napier grass accessions (ILRI_14982, ILRI_16782, ILRI_16783, ILRI_16784, ILRI_16800, ILRI_16817, ILRI_16821, ILRI_16835, and ILRI_16837) with one standard check (zehone_02 released in 2017) (Gezahegn Kebede et al., 2019) was laid out in randomized complete block design with three replications. Stem cuttings with three nodes were planted to 16 holes with a depth of 15-20 cm at 45° in 3 x 2 m^2 plots (four rows per plot) with plant to plant spacing of 50 cm, between row 75 cm, which could have 26666 plants per hectare. The distance between plots and blocks were 100 cm and 200 cm, respectively. Nitrogen, Phosphorus, Sulfur (19% N: 37% P_2O_5:7% S) 100 kg/ha blended fertilizer was applied at planting and no additional fertilizer was added after frequent harvesting.

The plants in experimental plots were allowed to establish for a period of four months before the first data was taken in January 2019. There were a total of seven harvests over a period of 12 months starting the first data at January 2019 to the last at November 2019 with the harvesting interval of -/+7 weeks depending on the weather condition of the season and growth rate of the grass.

Growth measurements were undertaken for plant height (PH), leaf number per plant (LNPP), leaf length (LL), leaf width (LW), tiller number per plant (TNPP) and circumference (CF) before harvesting of the grass for fresh matter yield and dry matter yield in each harvest from randomly selected central net rows of the plot of five plants. PH was measured using tape meter from ground to base of top leaf. LNPP was counted for five plants from central rows and recorded to calculate the average number of leaves. From randomly selected five plants there were five central leaves marked to measure LL by using tape meter from attachment with the stem to leaf tip. LW was also measured in centimeter form five leaves using graduated caliper. The number of tillers was counted from five plants from each plot. The diameter circumference was measured by using tape meter from randomly selected five plant holes to calculate the average measurement for a plant culm diameter.

Grasses on the plot were cut close to the ground level (5 cm above ground) using manual sickle. The cut pieces were collected from five plants to make composite sample of 300 gram for leaf and stem independently to compute leaf to stem ratio (LSR). The plot green forage yield was measured by spring balance to figure fresh matter yield per hectare. The sample was taken to laboratory and exposed to oven at 65°C for 24 h to get constant dry weight and calculate dry matter yield (DMY (t/ha)). The dry matter yield was determined for seven harvests by using the formula:

$$\mathrm{DM\%} = \frac{\mathrm{ODW}}{\mathrm{FW}} * 100$$

where, DM% is dry matter percent, ODW is oven dry weight, FW is fresh weight

$$\mathrm{DMY\,(t/ha)} = \mathrm{FMY(t/ha)} * \mathrm{DM\%}$$

where, DMY is dry matter yield, and FMY is fresh matter yield

The dried samples were then ground to pass 1 mm sieve tube and used for forage quality analysis. Crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL), available phosphorus (P %DM) and calcium (Ca %DM) for leaf and stem samples detected in separate way. CP, NDF, ADF and ADL were assessed in the laboratory according to the procedures of National Forage Testing Associations (Undersander, 2014). Phosphorous and calcium content of the forage was determined by extraction with 0.5 M $NaHCO_3$ (Olsen et al., 1954).

Collected data were analyzed using the analysis of variance procedure and least significance difference ($LSD_{0.05}$) of Genstat statistical sofware Version 18, VSN International Ltd, UK (Payne et al., 2015).

3. Results and discussion

3.1.Results

Mean square values for growth parameters such as PH in cm, LNPP, LL in cm, and LW, TNPP, CF and LSR; DMY in t/ha and forage nutritional quality for stem and leaf such as crude protein (SCP%, LCP%), acid detergent fiber (SADF%, LADF%), neutral detergent fiber (SNDF%, LNDF%), calcium concentration (SCa, LCa) and available phosphorus (SAvP, LAvP) data was presented in Table 1. Growth and yield parameters were shown significant variation among genotypes and harvesting period through the growing period except for leaf to stem ratio. Interaction effect of genotypes with harvesting period was significantly affected the dry matter yield and plant height in this study.

Growth parameters

Mean plant height was in a range between 63.91 and 85.72 cm (Table 2). Plant height was significantly (*P*<0.01) varied among genotypes and the highest height was recorded for genotype ILRI_16821 (85.72 cm) followed by ILRI_16835 (83.77 cm) in the test whereas the shortest one was ILRI_16817 with the height of 63.91 cm. Plant height contributes a lot to the dry matter production of forage crops. Leaf number per plant mean varied significantly (P<0.05) among Napier genotypes

Table 1: Analysis of Variances presenting 10 Napier grass genotypes evaluation during 2018-2019

Source of variation	d.f.	DMY (t/ha)	PH (cm)	LNPP	TNPP	LSR	LW (cm)	LL (cm)	CF (cm)
Replication	2	116.9	514	8.75	315.2	0.34	1.05	76.13	921.6
Genotype	9	197.7***	457.*	2.08***	1227.2***	0.41	1.31***	136.47*	1177.6*
Harvesting period	6	2002.4***	71213***	82.5***	14140.3***	15.9***	14.9***	1780.34***	14095.4 ***
Genotype harvesting period	54	53***	340*	0.84	259.5	0.12	0.14	38.47	467.1
Residual	138	10.7	199	0.58	257.6	0.17	0.15	81.34	607.5

Source of variation	d.f.	SCa	SAvP	SCP	SNDF	SADF	LCa	LAvP	LCP	LNDF	LADF
Replication	2	1.48	12.9	0.18	119.5*	98.4	56.6	3.7	7.6*	14.5	14.8
Genotype	9	38.21***	277***	0.68**	14.2	31.6	58.5	287.5***	3.3	15.9	137
Residual	18	10.72	6.58	0.13	20.4	79.2	40.5	5.95	1.37	14.8	101.2

*Significant at *P*<0.05 ** *significant at P<0.01* *** *significant at P<0.001*

Table 2: Mean values of plant height (PH, cm), Leaf number (LNPP), leaf length (LL, cm), leaf width (LW, cm), tiller number (TNPP), circumference (CF, cm) and leaf to stem ratio of napier grass genotypes, during 2018-2019

Genotype	PH (cm)	LNPP	LL (cm)	LW (cm)	TNPP	CF (cm)	LSR
Zehone_02(SC)	74.39^{bc}	9.35^{bc}	74.97^{de}	2.86^{b}	54.14^{b}	180.07^{a}	1.83
ILRI_14982	70.34^{cd}	10.14^{a}	85.32^{a}	2.47^{c}	64.06^{a}	174.39^{abc}	2.06
ILRI_16782	66.66^{cd}	8.77^{de}	78.13^{bcde}	2.72^{bc}	42.31^{cde}	145.41^{de}	1.89
ILRI_16783	69.32^{cd}	9.30^{bcd}	74.20^{e}	2.69^{bc}	47.73^{bc}	158.44^{bcd}	2.17
ILRI_16784	65.37^{cd}	9.23^{bcde}	82.02^{ab}	3.02^{ab}	46.18^{bcd}	176.63^{ab}	1.69
ILRI_16800	67.42^{cd}	8.95^{cde}	76.56^{cde}	3.29^{a}	36.90^{de}	139.52^{e}	2.28
ILRI_16817	63.91^{d}	9.51^{b}	77.79^{bcde}	2.67^{bc}	50.91^{bc}	176.99^{a}	2.62
ILRI_16821	85.72^{a}	9.69^{ab}	81.54^{abc}	2.78^{bc}	35.56^{e}	167.64^{abc}	1.67
ILRI_16835	83.77^{ab}	9.46^{bc}	80.18^{abcd}	2.94^{ab}	32.63^{e}	157.22^{cde}	1.71
ILRI_16837	64.74^{cd}	8.75^{e}	76.68^{bcde}	2.84^{b}	33.94^{e}	163.70^{abcd}	2.15
$LSD_{0.05}$	9.87	0.54	5.43	0.36	9.81	18.52	NS
CV%	21.06	8.82	10.47	19.26	33.54	17.15	46.79

Common letters in the column not statistically significant in the test was in the range between 8.75 and 10.14. ILRI_14982 genotype observed to have highest leaf number than other genotypes in the experiment. Leafy plants could have lower lignifications and preferred as better animal feed. Longer leaf and highest number of tillers per plant was observed for ILRI_14982 while wider leaf was for ILRI_16800 when comparing to standard check. Circumference of the plant was wider for standard check (zehone_02) which was at par with ILRI_16817.

Dry matter yield

Dry matter yield obtained from a total of seven harvests (January 2019 – November 2019) per year in the current study was varying from 66.98 t/ha to 128.89 t/ha among genotypes with mean of 92.34 t/ha. Zehone_02 variety yields better than other varieties in the test followed by ILRI_16835. The dynamics of herbage dry matter yield during the growing period was presented in Table 2. The mean dry matter yield at first harvest in January 2019, after 120 days of planting, was 15.35 t/ha. The trend was decreasing to 8.18 t/ha at March 2019, increased to 13.18 t/ha in May and 17.35 t/ha in June 2019 and then consistently dropping to the last harvest in November. Dry matter yield improved (Table 3) with wet season and residual moisture as higher as 17.35 t/ha in June while dry season decreased yield of the grass as lower as 4.87 t/ha.

Forage nutritional quality

Stem and leaf quality of Napier grass genotypes evaluated in terms of calcium (Ca), phosphorus (P), crude protein (CP), acid detergent fiber (ADF) and neutral detergent fiber (NDF) is presented in Table 4. Stem calcium, phosphorus and crude protein content of the grasses were significantly (*P<0.001)* varied among genotypes through the production period while no significant variation was observed for neutral detergent fiber and acid detergent fiber. The mean value for stem Ca, P and CP were ranging from 0.14- 0.25, 0.20-0.52, and 1.01-2.50 %DM, respectively. ILRI_16837 genotype has shown better content of stem calcium followed by zehone_02. Phosphorus content was higher for zehone_02 genotypes in the experiment. Content of leaf phosphorus was varied (*P<0.01*) from 0.18 to 0.47 %DM and crude protein 3.8 to 7.33% among genotypes in the test while no significant variation was recorded in terms of calcium, ADF and NDF content. Significantly (*P<0.01*) higher leaf phosphorus was recorded for ILRI_16837 followed by ILRI_16800 and ILRI_16817 than other genotypes in the test and standard check was shown much lower leaf P content. Leaf crude protein was lower (*P<0.05*) for ILRI_14982 and ILRI_16782 than others in the test.

Table 3: Dry matter yield (DMY t/ha) from Jan 2019 through Nov 2019 by month of harvesting and genotype

Genotype	January	March	May	June	July	Sept	Nov	Mean	Total
Zehone_02(SC)	21.34	14.31	17.09	21.20	14.13	12.18	8.54	18.4^{a}	128.79
ILRI_14982	15.3	7.85	12.32	17.00	10.55	6.09	4.25	12.73^{de}	89.12
ILRI_16782	13.66	5.33	11.27	14.65	9.07	5.53	3.31	11.18^{ef}	78.26
ILRI_16783	32.44	9.91	14.39	14.74	10.14	8.03	2.96	$16b^{c}$	111.97
ILRI_16784	9.25	6.03	10.34	14.98	10.86	7.19	3.25	9.61^{f}	67.26
ILRI_16800	13.11	7.83	10.16	13.08	8.80	5.01	3.63	11.34^{ef}	79.38
ILRI_16817	7.89	7.90	10.38	13.79	9.40	4.67	2.79	9.57^{f}	66.98
ILRI_16821	9.91	9.30	15.71	20.23	13.13	11.10	8.45	14.25^{cd}	99.75
ILRI_16835	16.6	8.57	17.72	26.58	16.6	12.56	7.02	16.86^{ab}	118.05
ILRI_16837	14.04	4.73	12.4	17.24	10.22	9.29	4.5	11.98^{e}	83.86
Mean	15.35^{b}	8.18^{e}	13.18^{c}	17.35^{a}	11.29^{d}	8.17^{e}	4.87^{f}	13.19	92.342

$LSD_{0.05:}$ Genotype (G) =1.998, Months (M) =1.672, $LSD_{0.05}$ of Genotype by months interaction (GxM) =5.29; coefficient of variation (CV) = 24.8%

Table 4: Nutritional quality parameters of Napier grass, during 2019

Genotype	SCa (%DM)	SP (%DM)	SCP%	SADF%	SNDF%	LCa (%DM)	LP (%DM)	LCP%	LADF%	LNDF%
Zehone_02(SC)	0.23^{ab}	0.52^{a}	1.43^{bc}	55.13	75.40	0.38	0.18^{f}	7.33^{a}	50.47	73.73
ILRI_14982	0.17^{de}	0.30^{d}	1.90^{ab}	57.37	76.83	0.34	0.31^{d}	5.1^{bc}	50.33	71.57
ILRI_16782	0.21^{bc}	0.44^{b}	1.010^{c}	52.40	78.40	0.29	0.39^{bc}	3.80^{c}	45.07	71.9
ILRI_16783	0.22^{b}	0.32^{d}	2.50^{a}	60.70	73.47	0.39	0.21^{f}	6.90^{ab}	58.27	76.3
ILRI_16784	0.14^{f}	0.33^{d}	1.00^{c}	59.27	73.00	0.41	0.26^{e}	5.63^{abc}	34.3	70.23
ILRI_16800	0.19^{dc}	0.24^{e}	1.03^{c}	59.53	73.33	0.32	0.43^{a}	5.53^{abc}	52.9	76.53
ILRI_16817	0.15^{ef}	0.44^{b}	1.50^{bc}	58.73	78.63	0.37	0.41^{ab}	6.10^{ab}	43.8	71.6
ILRI_16821	0.16^{ef}	0.37^{c}	1.30^{bc}	63.63	77.50	0.42	0.37^{c}	6.73^{ab}	44.6	71.83
ILRI_16835	0.15^{ef}	0.20^{e}	1.03^{c}	62.00	74.33	0.41	0.36^{c}	6.90^{ab}	41.27	71.9
ILRI_16837	0.25^{a}	0.37^{c}	1.23^{c}	59.43	74.03	0.39	0.47^{a}	6.0^{ab}	43	69.77
LSD$_{0.05}$	0.025	0.044	0.61	NS	NS	NS	0.042	2.01	NS	NS
CV%	7.83	7.24	25.21	15.13	5.98	17.06	7.15	19.53	21.68	5.29

SCa= stem calcium content, SP=stem phosphorus content, SCP=stem crude protein, SADF=stem acid detergent fiber, SNDF=stem neutral detergent fiber, LCa=leaf calcium, LP=leaf phosphorus, LCP=leaf crude protein, LADF=leaf acid detergent fiber, LNDF=leaf neutral detergent fiber, SC=Standard check

3.2.Discussion

3.2.1. Dry matter yield

Variability of the weather across the forage harvesting months in 2019 helped to evaluate the productivity of the Napier genotypes under different growing conditions. This condition previously reported as the precipitation and temperature are the major factors affecting forage growth and development (Garay et al., 2017). Hence, the dry matter yield variation of genotypes for different harvesting interval in the present study was due to the differences in amount and distribution of rainfall received during the growth period. The moisture availability following the wetter season triggering development of root, tiller and shoot of Napier grass and then dramatically increases the yield. Yield variation due to seasonal weather variability was similarly presented by other scholars for different cool season and warm season forages (Ritz et al., 2020) and Napier grass genotypes (Abuye Tulu et al., 2021). In the farmers' field condition at trial location, there is no trend of producing forages in intensive management using agricultural inputs and this experiment could point the way how we can produce high yielding forages like Napier grass with minimum input in dry land agricultural system. Total average dry matter yield of present result was 92.34 t/ha/year which could sufficiently feed 51 animals with body weight of 200 kg for 365 days (Selk, 2020) with mean value of 13.9 t/ha/cut was by far better than other reports that for 10 accessions yielded 27.9 t/ha/year in 2016 and 39.7 t/ha/year in 2017 (Abuye Tulu et al., 2021), <10 t/ha for four accessions (Tessema Tesfaye et al., 2021) and 11.04 t/ha for ten varieties (Gezahegn Kebede et al., 2016) in Ethiopia and 3.4-5.8 t/ha/cut for four cultivars (Zailan et al., 2018) and 43.7-61.6 t/ha/year for nine varieties (Halim et al., 2013) foresees. Also in agreement with the yield report of 12.6-15.8 t/ha/cut (Maleko et al., 2019) for four varieties of Napier grass.

3.2.2. Forage growth parameters

Growth parameters such as PH, LNPP, LW and length, TNPP and CF determine the amount of DMY while LSR demonstrates forage quality. DMY is a function of growth parameters like PH (Maleko et al., 2019) in which forages possessing taller PH contributing higher cumulative DMY (Halim et al., 2013). Significant ($P<0.01$) mean PH variation for Napier grass genotypes which was ranging from 63.91 to 85.72 cm in the present study was reported by other scholars (Wangchuk et al., 2015). It was also recommended to feed napier grass to dairy cattle at the height of 60 to 100 cm (Muia, 2000) which most fits the present study result. Leafy plants could have lower lignification and preferred as better animal feed (Islam et al., 2003) especially for calves and lactating cows. Napier genotype ILRI_14982 was demonstrating higher number, longer leaves and the highest number of tillers per plant comparing to standard check and others in the test. Circumference of the plant was wider for standard check (zehone_02) as previously reported in Ethiopia (Gezahegn Kebede et al., 2019) and at par with ILRI_16817. Variation in tiller number (32.63-64.06 per plant) among genotypes in the present study was also previously reported for three cultivars that higher tiller could re-establish the lost photosynthetic area and maintaining basal area (Wangchuk et al., 2015).

3.2.3. Forage nutritional quality

Calcium and phosphorus mineral nutrition has significant economical and health importance on livestock production (Aioanei and Pop, 2013). Forages which contain less than 0.11% of phosphorus and 0.20% of calcium are considered to be deficient in respective nutrients (Gastler and Moxon, 1944). Calcium content of present study was ranging from 0.14 to 0.25% for stem and 0.29 to 0.42% for leaf while the stem phosphorus content significantly varied from 0.2 to 0.52% and leaf from 0.18 to 0.47% which better qualifies the requirement of nutrients. ILRI_16837 genotypes demonstrated better in stem calcium and leaf phosphorus content comparing to standard check and other genotypes in the experiment. Zehone_02 excels other genotypes in stem phosphorus content while lower in leaf phosphorus content. Calcium and phosphorus content of the present result concurs with the ten years average forage grasses hay calcium content 0.71% and phosphorus 0.36% (Peters and Kelling, 2001).The CP% and DM yield picture out in determining the overall nutritional value of forage crops (Abuye Tulu et al., 2021). The CP in forage determines the productivity of ruminant animals and greater quality grass hay should exceed 8% of DM to meet maintenance requirement of the animal (Uslu et al., 2018) while at below 6% possess lower quality (Selk, 2020) and to support milk production from cows fed on Napier grass with advanced maturity should be supplemented with 3% of protein (Muia, 2000). In our present report the Napier grass genotypes CP value was ranging from 3.8 to 7.33% for leaves with average of 6.02%. Stem CP value was also ranging from 1.00 to 2.5% which is noted for its low quality for supplement of ruminant protein maintenance. The mean of leaf CP value nearly similar with other scholars report ranging from 7.3 to 11.9% (Shinoda and Kawashima, 2000) and 5.4 to 8.3% (Abuye Tulu et al., 2021). Napier genotype ILRI_16782 noted for its lower CP value among 10 genotypes. Napier grass leaves for present study possess >6% CP which is intermediate CP quality for grass hay (Selk, 2020) and similar with the previous report of determining the composition and digestible nutrients of leaves of Napier grass harvested in a way to simulate grazing by cattle (Kidder, 1945). No significant variation recorded for both leaf and stem NDF and ADF contents. This was reported previously by other scholars for NDF (Abuye Tulu et al., 2021). Comparatively leaves of Napier grasses have lower NDF and ADF content than stem part at harvesting.

4. Conclusion

The result of the present study demonstrated that Zehone_02 variety produced better yield (8.54-21.34 t/ha average per cut 18.4) followed by ILRI_16835 (7.02-26.58 t/ha average per cut 16.86) in terms of forage dry matter production while ILRI_16817 the least (2.79-13.79 t/ha average per cut 9.57) from September 2018 through November 2019 under fluctuating weather (rainfall and temperature) condition in Arba Minch rift valley lowlands. Zehone-02 variety showed higher stem Ca and P and leaf CP while lower leaf Ca and P. ILRI_16835 genotype produced high dry matter yield with optimum stem and leaf nutrient composition. No statistically significant NDF and ADF variation recorded among genotypes for either stem or leaf production in this study. This shows Napier grass genotypes are expecting to produce similar fiber content for leaf or stem in the rift valley of Arba Minch. Silage making, hay quality and animal preference could be warranted for the genotypes/accessions in the test prior to be included in variety verification process. The production also has to be tested for irrigation. Farmers in the study area and in similar agro-ecology and weather condition could produce ILRI_16835 genotype with Zehone_02 variety for sustainable optimum dry matter and quality production of Napier grass.

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