Evaluation of Desho (*Pennisetum pedicellatum*) Grass Varieties for Dry Matter Yield and Chemical Composition under Irrigation in two Districts of South Omo Zone, Southwestern Ethiopia

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Abstract

Background: Productivity and reproductive performances of livestock in Ethiopia is low mainly due to scarcity and quality of feed. The Desho grass is indigenous to Ethiopia and belongs to the family Poaceae and has high biomass production potential that could be used to tackle the problem of scarcity and quality of feed.

Objectives: This study was initiated to evaluate dry matter yield and chemical composition of four Desho grass varieties grown in irrigated lowland of Dassench and Hamer districts of South Omo Zone in southwestern Ethiopia.

Material and Methods: The Sermemiret Kebele from Dassench District and Eribore Kebele from Hamer district were selected for a participatory on-farm experimental trial with active involvements of district pastoral office experts and Kebele development agents. Four Desho grass varieties, namely, Areka-DZF#590, Kulumisa-DZF#590, Kindokisha-DZF#591 and Areka local were evaluated in a randomized complete block design with three replications per variety. Data on dry matter yield (DMY), cutting height, number of tillers per plant (NTPP) and leaf to stem ratio (LTSR) were analyzed using the Generalized Linear Model (GLM) procedures of SAS.

Results: The highest ($P < 0.05$) dry matter yield (35.09 t ha^{-1}) and Crude protein (CP) (129.50g kg^{-1}, DM) were recorded for Areka-DZF#590 whereas the lowest dry matter yield (16.96 t ha^{-1}) and CP (90.60g kg^{-1}, DM) were obtained from Areka local check.

Conclusion and Implication: We conclude that Areka-DZF#590 Desho grass variety was found to be the highest in dry matter and crude protein production. Pastoralists, agro-pastoralists, and farmers in the area could enhance feed availability for increased livestock production.

Keywords: Acid detergent fiber; Crude protein; Cutting height; Neutral detergent fiber; Number of tillers per plant

1. Introduction

Ethiopia has the largest livestock population in Africa possessing 61 million cattle, 33.02 million sheep, 38.96 million goats, 1.93 million horses, 9.66 million donkeys, 0.37 million mules, camels 1.76 million and 59.42 million poultry population (CSA, 2018/19). However, the overall production and productivity of livestock in Ethiopia are generally very low due to many factors (FAO, 2018). The poor feed quality and inadequate feed supply especially during the dry season are the top urgent factors that seriously reduce livestock production (FAO, 2018). Likewise, in the study districts, the livestock feeding system is extensively based on natural pasture (Denbela Hidosa *et al.,* 2017; Berhanu Tekelyohannes *et al.,* 2017).

It is obvious that the natural pasture-based livestock feeding system is greatly influenced by feed supply and nutritional dynamics of range forages (Hidosa and Tesfaye, 2018). Moreover, these feed resources could not satisfy the nutritional requirement of animals particularly in the dry seasons with the supply being inconsistently distributed over the seasons in the study districts. Furthermore, feeds from natural pasture are characterized by high fiber (>55%) and low crude protein (CP) (< 7%) (Diriba Geleti *et al.,* 2014). As a result, the total dry matter intakes are limited and barely satisfy even the maintenance requirements of animals. This triggers high mortality, longer calving intervals and substantial weight loss of livestock (Denbela Hidosa *et al.,* 2017; Berhanu Tekelyohannes *et al.,* 2017; Hidosa and Tesfaye, 2018; Admasu Teferi *et al.,* 2010). Therefore, testing and identifying adaptable forage species to improve natural pasture-based feeding system is the only way out to overcome the problem of feed shortage in the study districts (Denbela Hidosa *et al.,* 2017; Shapiro *et al.,* 2015). Desho *(Pennisetum pedicellatum)* grass is an indigenous perennial grass of Ethiopia belonging to the family Poaceae. It has an extensive root system that well anchors the soil with high biomass production potential (Leta Gerba *et al.,* 2013). The previously reported dry matter yields results for different varieties of this grass under irrigation were found to be 28.35, 26.52, 23.37 and 21.95 tons/hectare for Areka-DZF#590, Kulumisa-DZF#592, KindoKisha-

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DZF#589 and KindoKisha-DZF591 respectively (Tekalegn Yirgu *et al.,* 2017). Moreover, Gadisa Birmaduma *et al. (*2019) reported dry matter yields of 28.74, 26.14 and 23.59 ton/hectare for Areka-DZF#590, Kulumisa-DZF#592 and KindoKisha-DZF#591 varieties, respectively under rain fed condition. In addition, Desho grass is currently being utilized as a means of soil conservation practices, rehabilitation of degraded land, as animal feeds as well as provision of a small business opportunity for the people in the country (FOA, 2010; Shiferaw Abebe *et al.,* 2011; Leta Gerba *et al.,* 2013; Yakob Getahun *et al.* 2015; Bimrew Asmare *et al,* 2016; Worku Bedeka *et al.,* 2017).

Pertaining to the feeding value of Desho grass used as a basal diet, an increasing proportion of the hay from 0 to 100% for Washera lambs supplemented with a concentrate mixture showed improvement in total dry matter intake, nutrient digestibility and average daily weight gain performances as compared to sheep fed on pasture hay as basal diet (Bimrew Asmare *et al.,* 2016). However, different Desho grass varieties have not been evaluated for forage dry matter yield and their chemical composition in irrigated lowland areas in South Omo Zone. Therefore, the current study was initiated with the objectives of evaluating dry matter yield and chemical composition of four Desho grass varieties grown under irrigation in Dassench and Hamer districts in South Omo Zone.

2. Material and Methods

2.1. Description of Study Area

This study was conducted in agro-pastoral areas of the Hamer and Dassench districts of South Omo Zone. Dassench district is situated at a geographical location of 5^{0}14' "0"N Latitude, 36^{0}44' 01"E Longitude with an elevation range of 350 to 900m above sea level and an average temperatures ranging from 25 to 40^o$_C$. The annual rainfall of the district ranged from 350 to 600mm having a bimodal rainfall with erratic distribution and soil type is silty alluvial. According to the population projections for 2016/17 based on the population and housing census conducted in 2007 (Central Statistical Agency, 2008), the Dassench district has a total human population of 70, 133 and whereas, the population of livestock are estimated to be 1, 014, 403 cattle, 753, 568 sheep, 1, 013971 goats, 23, 412 Poultry and 17, 228 donkeys. According to the estimate of CSA (2010), the total population of Hamer district is 79, 419 and the population is composed of three ethnic groups. These are Hamer, Erborie and Kara with a population of 54,583 (81.4 %), 10,333 (15.4%) and 2,129 (3.2%), respectively. Annual rainfall is an average of 764 mm per annum. The climate of the district is a mix of Dry Woyina Dega (8%), Dry Kola (54%), Semi Dry Kola (37.5%) and Desert (0.5%). The highest temperature in the district ranges between 32 ^{o}C to 38 ^{o}C and while the lowest temperature ranges between 29^{0}c to 31^{0}c. Livestock production is the main stay of the majority of the Hamer district and there are about 324,000 cattle, 714,000 goats and 332,000 sheep (SOFEDB, 2014).

2.2. Experimental Site Selection and Preparation

Based on availability and accessibility of irrigation schemes, the Sermemiret Kebele (lowest administrative Sub-unit) from Dassench and Eribore Kebele from Hamer district were selected for On-farm experimental trials after communication with Livestock and Fisher Resource Development Offices of the two districts. The land ploughed, disked, harrowed and ridges by using tractor and corrected by labors.

2.3. Experimental Design and Treatments

In the current study, a Randomized Completed Block Design in factorial arrangement having two locations and four varieties level with three replications per variety was used to evaluate the Desho grass varieties. A total of 12 plots were used in the experiment with three replications in which each of the plots having an area of a 4m x 3m = (12 m^2). Each plot had 4 rows with the spacing between rows and plants within a row being 1meter and 0.5 m, respectively (Denbela Hidosa *et al.,* 2020). The spacing between plots was 1 meter and the total area of the experimental site was 13 x 16 m (208 m^2). The three Desho grass varieties; Areka-DZF#590, Kulumisa-DZF#590 and Kindokisha-DZF#591 were collected from Debre Zeit Agricultural Research Center, whereas one Areka local variety obtained from Jinka Agricultural Research Center. The planting materials were the root splits which were planted without fertilizer application neither at planting nor in the growing period. Furrow irrigation method was used with all plots being irrigated uniformly after a three-day interval.

2.4. Data Collection and Measurement

The agronomic data such as cutting height above ground, leaf to stem ratio (LTSR) and number of tillers per plant were recorded at the age of 65 days after planting by harvesting the two middle rows using sickle. Fresh samples were recorded in the field immediately after harvest using spring balance. Five-hundred-gram sample per plot was brought to Jinka Agricultural Research Center. Samples were chopped into pieces and 300-gram sub-sample was taken to be dried in an oven set at a temperature of 105°$_C$ for 24 hours. Dry matter yield was determined using the following formula described by James *et al.* (2008).

$$\text{Dry Matter Yield (t/ha)} = \text{TFW X} \left(\frac{\text{DWss}}{\text{HA}} \text{X FWss}\right) \text{X 100;}$$

Where, TFW = total fresh weight kg/plot; DWss = dry weight of sub-sample in grams; FWss = fresh weight of sub-sample in grams, HA = Harvest plot area in square meters and 10 is a constant for conversion of yields in kg/m^2 to t/ha.

Cutting height above ground was measured from the ground level to the tip of five randomly selected plants per plot using a steel tape. To determine the fresh weight of leaf to stem ratios, samples were categorized into leaf and stem first and then the weights of each component was measured separately. The samples were oven dried for 24 hours at a temperature of 105°C and separately weighed to estimate the proportions of these parts. Accordingly, the Leaf to Stem Ratio (LTSR) was estimated based on the dry matter of each component.

2.5. Chemical Analysis

The laboratory analysis was done at Debre Birhan Agricultural Research Center, Ethiopia. Three forage sample of each variety was allowed to be oven dried set at a temperature of 65°C for 48 hours and ground to pass through a 1mm sieve size for chemical analysis (AOAC, 1990). Dry mater yield (DMY), Crude protein (CP) and ash were analyzed according to the procedures of (AOAC, 1990). The Neutral Detergent Fiber (NDF) values were calculated using the procedure of Van Soest *et al.* (1991) and whereas the Acid Detergent Fiber (ADF) value was analyzed using the procedures described by Van Soest and Robert (1985).

3.2. Data Analysis

The data such as cutting height, number of tillers per plant, dry matter yield and nutritional parameters were subjected to analysis of variances (ANOVA) using the Generalized Linear Model (GLM) procedure of Statistical Analysis System software (SAS, 2002). The significant differences among the means of varieties were declared significant at P ≤ 0.05 and means were separated using Least Significant Difference (LSD). The model employed was,

$$Y_{ijk} = \mu + R_i + V_j + L_k + (VL)_{jk} + e_{ijk}$$

Where, yijk = is the dependent variables; μ = overall mean; R = replication; Vi = the effect of variety; Lj = the effect of Locations; ViLj = the interaction effects of variety by location and eijk = random error.

3. Results and Discussion

3.1. Dry Matter Yield, Cutting Height, Number of Tillers per Plant and Leaf to Stem Ratio

The dry matter yield, cutting height, number of tillers per plant and Leaf to stem ratio **(**LTSR) of Desho grass varieties under irrigation in the lowland of Dassench and Hamer districts are presented in Table1. The result of the current study revealed that Areka-DZF#590 variety gave the higher (P<0.05) dry matter yield than KindoKisha-DZF#591 and Areka local check varieties but it was comparable to Kulimisa-DZF#590 variety. However, the dry matter yield was insignificant (P>0.05) among the Kulimisa-DZF#590, KindoKisha-DZF#591 and Areka local varieties. The cutting height above ground obtained from this study was not significantly (P>0.05) varied among the varieties but Kindo Kisha-DZF#590 gave taller cutting height above ground and whereas, Areka local gave shortest cutting height above ground. Moreover, Areka-DZF#590 variety produced significantly (P < 0.05) higher branches per plant than Kulimisa-DZF#590, KindoKisha-DZF#591 and Areka local but it was insignificant (P>0.05) among the Kulimisa-DZF#590, KindoKisha-DZF#591 and Areka local varieties.

On the other hand, Kulimisa-DZF#590 had higher (P<0.05) LTSR than Areka-DZF#590 and Areka local varieties but it was comparable (P>0.05) to the Kindo Kisha-DZF#591 variety. Conversely, Areka-DZF#590 Desho grass variety gave significantly (P<0.05) higher number of tillers per plant than Kulimisa-DZF#590, Kindokisha-DZF#591 and Areka local Desho grass varieties but it was insignificant(P>0.05) among the latter of three grass varieties. The higher dry matter yield for Areka-DZF#590 variety from this study is due to the higher genetic potential of the variety to adapt to the tested environment than the other varieties.

Table 1. Dry matter yield, cutting height, number of tillers per plant and leaf to stem ratio of Desho grass variety grown in irrigated lowland of Dassench and Hamer districts in South Omo in 2019 year.

Tested variety	Dry Matter Yield ($t\ ha^{-1}$)	Cutting Height (cm)	Number of tillers per plant	LTSR
Kulumisa-DZF#591	25.42^{ab}	123.83	51.83^{b}	0.97^{a}
Kindo Kisha-DZF#592	22.86^{b}	124.33	49.17^{b}	0.90^{ab}
Areka-DZF#590	35.09^{a}	115	69.83^{a}	0.72^{b}
Areka Local	16.79^{b}	98.77	48.00^{b}	0.68^{b}
SEM	5.77	21.41	7.82	0.10
LSD	12.13	45.92	16.77	0.22

Note*: Means with the same letter(s) are not significantly different at P>0.05. SEM = Standard error of mean and LSD = Least Significance difference.*

The previous studies reported by different scholars were demonstrated that the wider range of dry matter yield difference between Desho grass varieties could be attributed due to differences in genetic potential of varieties (Tekalegn Yirgu *et al.,* 2017; Gadisa Birmaduma *et al.,* 2019; Bimrew Asmare *et al,* 2016; Denbela Hidosa *et al.,* 2020). The result obtained on dry matter yield from this study for Areka-DZ#F590 variety is higher than previously reported values of 27.99, 28.35 and 28.74t ha^{-1} by Denbela Hidosa *et al.* (2020), Tekalegn Yirgu *et al.* (2017) and Gadisa Birmaduma *et al.* (2019), respectively. However, the dry matter yield obtained from this study for Kulumsa-DZF#590 and KindoKisha-DZF#591 was higher than reported value of (20.77 and 15 t ha^{-1}) by Denbela Hidosa *et al.*

(2020), respectively under rain fed condition but relatively similar to previously reported values of (26.52 and 23.37 t ha^{-1}) by Tekalegn Yirgu *et al.* (2017) and 26.14 and 23.59t/ha by (Gadisa Birmaduma *et al.* (2019). Furthermore, finding from our study for cutting height above ground was higher for Areka-DZ#F590, Kulimsa-DZF#591 and KindoKisha-DZF#591 varieties to previously reported values which ranged from 71.27 - 96.30cm by Gadisa Birmaduma *et al.* (2019) and Tekalegn Yirgu *et al.* (2017), respectively. The difference in number of tillers produced per plant among the varieties of *Desho* grass from our study could be attributed due to varietal differences. The variation in number of tillers per plant in different varieties of Desho grass was also reported in Ethiopia under different agro-ecologies due to varietal genetic makeup (Denbela Hidosa *et al.,* 2020; Tekalegn Yirgu *et al.,* 2017; Bimrew Asmare *et al.,* 2016).

The results on number of tillers per plant for all tested Desho grass from our study is lower than previously reported value of 78 by Demeke *et al.* (2017) and however, it was higher than reported value of 50 by Asmare Bimrew *et al.* (2017) for Kulimisa-DZF#592 and Areka-DZF#590 but lower Kindokisha-DZF#591 and Areka local Desho grass varieties. The leaf fraction is associated with high nutritive value of the forage because leaf is generally of higher nutritive value (Fekede Feyissa *et al.,* 2005). The result for leaf to stem fraction for tested Desho grass varieties from our study was higher than reported values for Kulumisa-DZF#592 and Kindokisha-DZF#592 varieties (Tekalegn Yirgu *et al.,* 2017) and (Gadisa *et al.,* 2019), but it was comparable to results reported by same authors for Areka-DZF#590 variety.

Generally, inconsistency in dry matter yield, cutting height, number of tillers per plant and leaf to stem ratio from our study as compared to previously reported studies by different scholars for tested Desho varieties might be due to difference in soil parameters, harvesting age, irrigation effect, management and agro ecological differences where this was conducted.

3.2. Effect of Location on Dry Matter Yield, Cutting Height, Number of tillers per Plant and Leaf to Steam Ratio

The effects of location on dry matter yield, cutting height above ground, number of tillers per plant and leaf to stem ratio are shown in Table2. The results from this study demonstrated that the dry matter yield and cutting height above ground were not significantly ($P>0.05$) affected by tested locations. However, better dry matter and longer cutting height above ground obtained from Dassench location than Hamer location. Conversely, significantly higher ($P<0.05$) number of tillers per plant and leaf to stem ratio were obtained from Dassench location than Hamer location. The higher dry matter yield, cutting height above ground, number of tillers per plant and leaf to stem ratio from Dassench location than Hamer is might be due to suitability of temperature and favorable soil parameters for plant which make faster plant growth and triggering more leaves per plats which are responsible for more dry matter yield, longer cutting height and number of tillers per plant.

Moreover, the highly significant environment effect and its high variance component could be attributed to the large differences between the two test location in altitude, physic-chemical properties of the soil, temperature, differences in both amount and distribution of annual rainfall, and other agro-climatic factors. In supports to the findings from our study the previous study reported by different scholars had confirmed that dry matter yield of forage species greatly influenced by weather conditions such as rainfall, temperature and precipitations (Eshetie Alemu *et al.,* 2018; Usman Semman *et al.,* 2018). Moreover, the previously reported studies from Ethiopia had demonstrated that the higher yield of forage could also be attributed to the favorable rainfall, temperature and available nutrient in the soil (Denbela Hidosa *et al.,* 2020; Asmare Bimrew *et al.,* 2017; Gezahagn Kebede *et al.,* 2016; Kebede Gezahagn *et al.,* 2016; Yasin Muhammad *et al.,* 2003).

Table 2. The effects of location on dry matter yield, cutting height, number of tillers per plant and LTSR in irrigated lowland of Dassench and Hamer districts in South Omo in 2019 cropping year.

Parameter measured	Tested locations				
	Dassench	Hamer	Mean	SEM	LSD
DMY(t ha^{-1})	27.42	22.66	25.04	4.39	9.42
Cutting height (cm)	124.80	106.17	11.48	15.14	32.47
Tillers per plant	61.00[a]	48.42[b]	54.70	5.53	11.86
LTSR	1.12[a]	0.52[b]	0.82	0.07	0.15

Note*: Means with the same letter across row for dry matter yield, cutting height, tillers per plant and LTSR at 65 days are not significantly different at P>0.05. SEM = Standard error of mean and LSD = Least Significance difference.*

3.3. Effect of Location by Variety on Dry Matter Yield, Cutting Height, Number of tillers per Plant and Leaf to Stem Ration

The effect of location by variety on dry matter yield, cutting height, number of tillers per plant and leaf to stem ratio are presented in Table3. The result for effect of location and variety revealed higher (P>0.05) dry matter yield was observed in Dassench location than Hamer for all tested Desho grass varieties. Likewise, significantly taller (P<0.05) cutting height above ground was obtained from Dassench location than Hamer for KindoKisha-DZF#592 when compared to Areka-DZF#590 and Areka local check but it was comparable (P>0.05) to Kulumisa-DZF#591 variety. Moreover, significantly (P>0.05) more number of tillers per plant were observed at Dassench location than Hamer location for all varieties except Areka-DZF#590 variety which gave higher (P<0.05) number of tillers per plant but it was insignificant to other varieties for both locations.

Furthermore, the result on LTSR for location by variety interaction effect revealed the higher (P<0.05) LTSR obtained from the Hamer location than Dassench for Kulumisa-DZF#591variety except Areka-DZF#590 variety which is gave higher LTSR at Dassench location but is similar (P > 0.05) to Kindokisha-DZF#592 variety. The differences for tested parameters over location for tested varieties are might be due to variability in climatic and soil condition which indicated that the genetic make-up of tested Desho grass varieties were influenced by environmental factors which shows to us different varieties have differential response to different planting locations. The previous study showed that variety by environment interaction is the result of changes in cultivar's relative performance across environments due to differential responses of the genotypes to various edaphic, climatic and biotic factors and this is help to identifying suitable genotype for specific location (Yasin Muhammad *et al.*, 2003).

Table 3. Effect of Location by variety on dry matter yield, cutting height, number of tillers per plant and LTSR grown in irrigated lowland of Dassench and Hamer districts in South Omo in 2019 cropping year.

Tested variety	Location	Parameter measured			
		DMY (t ha^{-1})	Cutting height (cm)	NTPP	LTSR
Kulumsa-DZF#591	Dassench	27.80^{ab}	126.33^{ab}	48.67^{b}	0.56^{bc}
	Hamer	23.03^{ab}	121.33^{ab}	49.67^{b}	1.39^{a}
Kindokisha-DZF#592	Dassench	22.93^{ab}	168.00^{a}	49.00^{b}	0.85^{bc}
	Hamer	22.78^{ab}	116.67^{ab}	43.00^{b}	1.30^{a}
Areka-DZF#590	Dassench	38.82^{a}	101.00^{b}	96.67^{a}	0.93^{b}
	Hamer	31.35^{ab}	113.33^{ab}	47.00^{b}	0.51^{d}
Areka Local	Dassench	20.1^{c}	96.53^{b}	49.67^{b}	0.52^{d}
	Hamer	13.51^{c}	80.67^{b}	54.00^{b}	0.50^{d}
SEM		4.39	30.28	11.06	0.15
LSD		9.42	64.95	23.72	0.31

Note*: Means with the same letter(s) across column for forage dry matter yield, cutting height, tillers per plant and LTSR at 65 days are not significantly different at P>0.05. SEM = Standard error of mean and LSD = Least Significance difference.*

3.4. Chemical Composition of Desho Grass Varieties

The chemical compositions of tested Desho grass varieties grown in irrigated lowland of Dassench and Hamer districts are presented in Table4. The findings from this study for DM%, Ash, CP, NDF and ADF were not significantly (P>0.05) varied for all tested varieties. However, the Areka-DZF590 variety had higher (P>0.05) CP content as compared to Areka local variety used as local check. The variety used as local check had higher (P<0.05) NDF than Areka-DZF#590 and Kulumisa-DZF#590 varieties but it was comparable (P>0.05) to the Kindo-KishaDZF#591 variety. On the other hand, Areka-DZF#590, Kulumisa-DZF#590 and KindoKisha-DZF#591 varieties had similar (P>0.05) NDF contents. The similarity in crude protein, ash and ADF for all tested Desho grass varieties is due to similarity in genetic make-up of varieties to accumulate similar nitrogen contents in a given environment. The result obtained from our study for CP value for all tested Desho grass varieties were higher than previously reported values by different authors. Accordingly, the CP values which ranges from 6.93-9.38% under different spacing and harvesting stages (Asmare Bimrew *et al.,* 2017); the reported CP values was also ranges from 7.86- 8.84% and 3.97-7.81% under different agro-ecologies respectively by Bimrew Asmare *et al.* (2018) and Genet Tilahun *et al.* (2017), respectively. Generally, the previously reported studies by Leng (1990) and Smith(1993) indicated that crude protein content of about 60-70 g/kg, DM is required for maintenance of ruminant livestock and whereas, the CP content of 80-130g/kg, DM is required for moderate milk production (10-15kg/cow/day) for dairy cows reported by ARC (1984) and Humphreys (1991). Therefore, the CP content obtained from our study for all tested Desho grass varieties is above the maintenance requirement for ruminant livestock and enough to satisfy protein requirement for dairy Cow to produce 10-15kg milk/ cow/day.

The NDF and ADF are frequently used as standard for forage quality testing. The NDF approximates the total cell wall constituents and is used to predict intake potential in livestock and whereas, ADF primarily represents cellulose and lignin, and is often used to calculate digestibility of feeds (Van Soest, 1994). The value obtained from our study for NDF is lower than previously reported value which ranged 72.78-77.68% by Asmare Bimrew *et al.* (2017). But it was relatively comparable to values which ranged from 58.82-63% reported by Bimrew Asmare *et al.* (2018). Moreover, the ADF value obtained from out study was higher than the previous reported values which ranged from 45.06-54.27% and 16.63-36.14% respectively by Asmare Bimrew *et al.* (2017) and Genet Tilahun *et al.* (2017). Generally, the feeds containing NDF values of less than 45% could be classified as high quality, those with values ranging from 45% to 65% as medium and those with values higher than 65% as low quality (Singh and Oosting, 1992). Based on this classification all tested Desho grass varieties except Areka local which used as check variety can be classified as medium quality forages class.

Table 4. The chemical compositions of Desho grass variety grown in irrigated lowland of Dassench and Hamer districts in South Omo in 2019 cropping year.

Tested variety	DM (%)	Ash ($g\ kg^{-1}$)	CP ($g\ kg^{-1}$)	NDF ($g\ kg^{-1}$)	ADF ($g,\ kg^{-1}$)
Kulumisa-DZF#592	90	108.70	115.50	615.20^{b}	448.40
Areka-DZF#590	90	101.70	129.50	609.40^{b}	479.80
Kindo Kisha-DZF#591	90	97.20	101.10	656.70^{ab}	497.20
Areka Local	89	91.80	90.60	691.50^{a}	505.20
SEM	1.82	1.31	3.74	3.02	2.54
LSD	4.46	3.20	9.14	7.39	6.22

Note*: Means with the same letter(s) across column for DM, Ash, CP, NDF and ADF at 50% flowering stage are not significantly different at P>0.05. DM = dry matter; CP = Crude protein; Ash = Ash percentage; NDF = Neutral detergent fiber; ADF = Acid detergent fiber; SEM = Standard error of mean and LSD = Least Significance difference.*

4. Conclusion

The Areka-DZF#590 variety gave higher (P < 0.05) dry matter yield and whereas, the Areka local which used as check gave lowest dry matter yield. However, the Kulimisa-DZF#591 and KindoKisha-DZF#592 had higher (P<0.05) leaf to stem ratio and whereas, Areka local Desho grass variety used as check gave lower leaf to stem ratio. Pertaining to testing location, higher (P<0.05) dry matter yield, cutting height, number of tillers per plant and leaf to stem ratio obtained from Dassench location than Hamer for all tested Desho grass varieties. The DM%, Ash, CP and NDF were not significantly (P > 0.05) varied for all tested varieties and however, Areka-DZF590 variety had higher (P > 0.05) CP content as compared to Areka local variety. Based on results from this study we concluded that pastoralists and agro-pastoralists communities could be planted Areka-DZF#590 Desho grass variety followed by Kulumisa-DZF#591 for higher dry matter yield and CP content. The future research should focus on the effect of planting space and cutting interval on forage dry matter yield and chemical compositions and feeding effect of superior candidates on livestock production.

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