



## Biomass production of different grass species available at irrigated lowland of Dassench Woreda in South Western Ethiopia

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### Abstract

On farm adaptability test of different grass species was conducted on pastoral area of Keelewe peasant association in Dassench Woreda of South Omo Zone in 2016 under irrigated condition with the objective to identify high biomass yielding grass species. The field experiment was laid out in a Randomized Complete Block Design with four replicates per tested species. The tested grass species were *Chloris gayana*, *Cenchrus ciliaris* and *Panicum coloratum*. The result indicated that there was a significant difference ( $p > 0.05$ ) among the tested grass species. *Panicum coloratum* yields the highest (18.08 t/ha) than the *Chloris gayana* (15.21 t/ha) whereas, *Cenchrus ciliaris* had yielded the lowest dry matter yield (11.20t/ha) than *Chloris gayana* and *Panicum coloratum*. The *Panicum coloratum* was one with maximum dry matter yield being recommended for irrigated conditions in the study area. However, further testing is required on feeding value, dry matter yield under different fertilizer dose, stem height, leaf to stem ratio, irrigation requirements and chemical composition of tested grass species.

**Key words:** dry matter yield, *Chloris gayana*, *Cenchrus ciliaris* and *Panicum coloratum*

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### Introduction

Duguma *et al.* (2012) and Tolera (2007) stated that low quality and quantity of livestock feed is one of impediments for low productivity of livestock in Ethiopia. Similarly, in pastoral area in which this study was made livestock nutrition is entirely depend on feed from natural pasture (Admasu *et al.*, 2010) which is characterized by high structural cell wall constituents, low crude protein and metabolisable energy. This has been resulted in a slow growth rate, loss of body condition and increased susceptibility to diseases and parasites. On the other hand the research facts that reported by Hunegnaw and Brehan (2016) and Mekonnen *et al.* (2016) from the Ethiopia also demonstrated that feed intake, digestibility and growth performance of livestock could be improved when the livestock supplemented with quality forages to poor quality roughages. Among the potential grass forage species *Cenchrus ciliaris* is a one of pasture grass in the tropics has been yielded up to 24 t/ha DM under good management (Ecocrop, 2010; Osman *et al.*, 2008). Furthermore, *Chloris gayana* is also one of grass family which identified as drought resistant and highly productive with average DM yield which ranged from 10-16 t DM/ha (Hidosa, 2015; Ecocrop, 2014).

However, in the lowland pastoral areas, recurrent drought and climatic variability limit availability and use of feed resources (Assefa *et al.*, 2013). Therefore, introduction of drought tolerant exotic grass species which have a significant role in improving feed availability in dry areas. Availability of irrigation in the lowland areas of South Omo Zone presents an opportunity to mitigate production risk from drought. However, the dry matter production potential of these grasses has not been tested in to irrigated lowland. In this context, this study was aimed to identify grass species for their dry matter production potential in irrigated conditions of pastoral area.

### Materials and Methods

#### Deception of study area

The study was conducted in pastoral area of South Omo Zone in South Western Ethiopia which is located astronomically by 50°14'N latitude, 36°44'E longitude with altitude ranges from 350-900m above sea level (SRFED, 2007). The temperature of the study area have been ranged between 25-40°C and whereas, the rainfall is has ranged from 350-600 with bimodal and erratic rainfall distribution patterns. The soils are

shallow, coarse textured with moderate to high fertility status as dominating by silt alluvial soil type which is suitable for irrigation from the Omo River (SRFED, 2007).

**Selection of trial participants**

The Keelewe kebele was identified from the Dassench pastoral communities for this study with aid of both experts and developmental agents. The three energetic trial pastoralists' from the pastoral communities were selected based on their experience in irrigation and willingness in donation of trial plots without restrain.

**Experimental design and treatment**

The *Chloris gayana*, *Cenchrus ciliaris* and *Panicum colaratum* were used in this study. Each grass species was planted in area 3cmx4cm = 12cm<sup>2</sup> and arranged in Completely Randomized Block Design with four times replicated per species. The fully irrigation was applied equally in all the plots during the critical stages of grass species growth to ensure the minimum amount of water requirement for optimal forage yield.

**Experimental site management and data collection**

The planted grass species were managed by hoeing and weeding and all the trial plots had been continually monitored. The biomass data such as fresh biomass and dry matter yield was collected from the each grass species after three month planting when grass species at 50% heading stages. Four samples per species randomly harvested from the area of 50cm x 50 cm = 2500cm<sup>2</sup> by using sickle and then cut it in to small pieces and pooled over. The pooled samples were allowed oven dried at 105°C for 24hrs at Feed and Nutrition Laboratory which located at Jinka Agricultural Research Center. The

total dry matter yield (t/ha) will be calculated by (total fresh/ha\*%DM)/100 and whereas %DM = ODW/ (SFW\*100).

**Data analysis**

The yield such as fresh and dry matter were subjected to Analysis of variances (ANOVA) and followed by GLM procedure of SAS (SAS, 2009). Effect of tested species was considered significantly if (P ≤ 0.01). The least means squares were separated by using Duncan's least significant difference (LSD) test by using model  $Y_{ij} = A + \beta_i + t_j + e_{ij}$ ; where:  $Y_{ij}$  = biomass yield recored, A = General mean,  $\beta_i$  = block effects,  $t_j$  = treatment effects and  $e_{ij}$  = Random error

**Results and Discussion**

**Fresh biomass yield**

The fresh biomass yield of grass species tested in irrigated lowland of Dassench Woreda was summarized in Table1. The fresh biomass yield recorded from this study revealed that *Panicum coloratum* had produced highest (P < 0.05) fresh biomass than *Chloris gayana* and *Cenchrus ciliaris*. However, *Cenchrus ciliaris* was produced relatively the lowest fresh biomass yield than *Panicum coloratum* and *Chloris gayana*. The fresh biomass yield (t/ha) obtained from the current study for *Panicum coloratum* and *Cenchrus ciliaris* is higher than previously reported values (40.8t/ha) and (33t/ha) by Hidosa (2015) respectively in rain fed condition at Jinka Agricultural Research Center on station trial. The higher, fresh biomass yield from this study from the Hidosa (2015) reported values might be due to effect of agro ecologies and irrigation, Soil fertility and management differences.

**Table1.** The fresh biomass yield tons /ha of grass species affected by irrigation in Dassench Woreda in 2016

Tested grass species	Yield parameters						
	FBY( g/plot)	FBY t/ha	CV	LSD	F-value	P-value	SEM
<i>Chloris gayana</i>	1339 <sup>b</sup>	53.56	18.00	215.54	4.52	0.065	**
<i>Cenchrus ciliaris</i>	998 <sup>a</sup>	39.92	18.00	215.54	4.52	0.065	**
<i>Panicum colaratum</i>	1587 <sup>c</sup>	63.48	18.00	215.54	4.52	0.065	**

Mean values in a column having different superscripts differ significantly each other; FMY = Fresh biomass yield; g = gram; CV = Coefficient of variance; LSD = Least significance difference; SEM = Standard error of mean; \*\* = (P<0.01); ha , Hactre.

**Table2.** The dry matter yield t/ha of grass species affected by irrigation in Dassench Woreda in 2016

Tested legume species	Yield parameters measured						
	DM( g/plot)	DM/ha	CV	LSD	F-value	P- value	SEM
<i>Chloris gayana</i>	380.20 <sup>A</sup>	15.21	5.20	65.04	1.74	0.254	*
<i>Cenchrus ciliaris</i>	279.88 <sup>B</sup>	11.20	5.20	65.04	1.74	0.254	*
<i>Panicum coloratum</i>	451.98 <sup>C</sup>	18.08	5.20	65.04	1.74	0.254	*

Mean values in a row having different superscripts differ significantly each other; DMY = Dry matter yield; g = gram; CV = Coefficient of variance; LSD = Least significance difference; SEM = Standard error of mean; \* = (P<0.05); ha = hectare.

Adane (2003) reported that the biomass yield production potential of forage species differed each other due to difference in cultivars, agro ecological effect and management practices which is corresponds to the current study. However, the fresh biomass yield of *Chloris gayana* obtained from the current study is in line with the fresh biomass yield reported by Tewdros and Messert (2013) from the Southern Ethiopia which had been ranging from 31.9-98.0 t/ha.

#### Dry matter yield

Pertaining to dry matter production potential of grass species recorded from this study was summarized in Table2. The result obtained on dry matter (t/ha) in fully irrigated condition from this study indicated that similar trends as fresh biomass yield among the three grass species. The significantly highest (P<0.05) dry matter yield obtained from *Panicum coloratum* than *Chloris gayana* and *Cenchrus ciliaris*. However, significantly the lowest dry matter yield obtained from *Cenchrus ciliaris* than *Panicum coloratum* and *Chloris gayana*. Dry matter is important parameters in order to evaluate forage species for livestock production. Generally, the dry matter yields for the tested grass species show doubled increment than reported value by Hidosa(2015) from On-station research at Jinka Agricultural Research Center. However, the dry matter yield recorded for *Chloris gayana* from this study is corresponds to what Tessema (2008) reported value f of 14 t/ha in rain fed conditions from the Ethiopia. Pertaining to dry matter value recorded from this study for *Panicum colorutum* is higher than values reported by Diriba (2000) which ranging from 9.48 - 15.39 t ha<sup>-1</sup> in rain fed condition. Furthermore, the dry matter yield obtained in the current study for the *Cenchrus ciliaris* is higher than value (6.68 t/ha) reported by Hidosa (2015). Generally, result had obtained

from this study for three grass species indicated that there is relatively two fold increase in dry matter yield in irrigated condition than rain fed condition even though Ayana and Oba (2010) reported comparable forage dry matter values which ranged between 10-16 t/ha under rain fed condition from the Southern Ethiopia for *Cenchrus ciliaris* and *Chloris gayana*.

#### Conclusion and Recommendation

The current study had shown that *Panicum coloratum* produced higher fresh and dry matter yield than *Chloris gayana* and *Cenchrus ciliaris* under fully irrigated condition when compared to yield obtained from rain fed conditions. Based on the current result it could be concluded that better improvement was observed in fresh and dry matter yield of grass species in irrigated condition than non-irrigated condition especially in lowland areas of South Omo Zone which is characterized by high coefficient of variability in rainfall distribution patterns. However, further testing is required to put the recommendation on a strong basis since the current study data is from one cropping season. Moreover, the tested grass species were not evaluated as to their disease and pest resistance, seed production potential, nutritive and feeding values under different fertilizer rate and irrigation requirements.

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