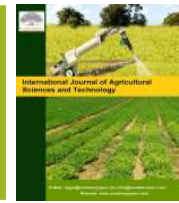




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## Registration of Elephant Grass (*Pennisetum purpureum*) Variety 'Hararghe'

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### Abstract

Elephant grass could play an important role in providing a considerable amount of quality forage for mixed farming system. It can provide a continual supply of green forage throughout the year and is best fit for intensive small-scale farming systems with appropriate management practices for cut and carry feeding systems in East Hararghe Zone. Thus, the study aimed to identify and register high herbage biomass yield, high quality, disease and pest tolerant elephant grass variety. One candidate variety, Hararghe (ILRI-16803) of elephant grass (*Pennisetum purpureum*) was evaluated with two standard checks (Zehone-02 and Bako-01) at six locations under rain fed conditions. All agronomic practices recommended were applied uniformly. Data were collected on morphological, agronomic and yield traits. Out of the tested varieties, Hararghe (ILRI-16803) variety had higher herbage dry matter yield, tiller number, leaf to stem ratio, stable performance and tolerance to major elephant grass diseases. The new variety is also characterized by medium plant height and less hairiness which are associated with preference for high in take by animals. The variety had high herbage dry matter yield with average yield of 45.24 t/ha and showing yield advantage of 31.17% over standard checks. The study also showed that Hararghe (ILRI-16803) had high nutritional quality when compared to standard check varieties. Generally, it was found to be the most stable and high-yielding, high nutritional quality and tolerance to major elephant grass diseases and pests. Based such merits, the Ethiopian Variety Release Standing Committee has officially approved the release of the new variety (ILRI-16803) with the breeder name "Hararghe" for wider production in East Hararghe zone and similar agro-ecologies of the country.

**Keywords:** Diseases, Herbage dry matter yield, Elephant grass, Hararghe, Pests, Variety

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### 1. Introduction

Forage plays an important role in providing ruminants with a source of fiber, carbohydrates, protein, minerals, vitamins and other nutrients that are beneficial for their survival. One of the forages that have good potential is elephant grass (Rusdy, 2016). Elephant grass is a perennial C4 grass species that is native to Sub-Saharan Africa from where it is believed to have been distributed to other tropical and subtropical regions around the world (Kandel et al., 2016). Elephant grass originates from Sub-Saharan tropical Africa and has been introduced in most tropical and subtropical

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regions worldwide as forage (Clayton *et al.*, 2013). Elephant grass also known as Napier grass is the most promising high-yielding fodder, giving dry matter yield that surpass most other tropical grasses (Ansah *et al.*, 2010). Napier grass is a perennial forage crop with high growth rate, high productivity and good nutritive value and mostly used for cut and carry system over the tropical and sub-tropical area of the world (Cook *et al.*, 2005). It is propagated vegetative by using stem cuttings, root splits or shoot tips and usually vary across agro-ecologies (Tessema, 2008; Gezahagn *et al.*, 2016).

Characteristically, elephant grass is vigorous and highly productive forage, which can withstand long periods of drought (Tessema, 2005). Although little or no growth takes place during the dry periods, it rapidly recovers with the onset of rains and can survive in drought for more than five years (Mwendia *et al.*, 2006; Wijitphan *et al.*, 2009b). It is superior to other tropical grasses in terms of dry season growth and forage quality (Wijitphan *et al.*, 2009b) and can support large tropical livestock units per hectare (Muia *et al.*, 2001). Elephant grass performs well in low, mid, and highland areas of Ethiopia (Tessema, 2008). It can provide a continual supply of green forage throughout the year and is best fit for intensive small-scale farming systems with appropriate management practices for cut and carry feeding systems in Ethiopia (Tessema and Alemayehu, 2010). Some elephant grass varieties released and registered in Ethiopia is decreasing from time to time in dry matter yield and nutritional quality due to climatic change and agro-ecology of the study. Lack of stable and high yielding varieties with diseases and pests tolerant is a major problem constraining the widely cultivation and use of elephant grass in Eastern Oromia. Therefore, the objective of the study was to release and register elephant grass variety that is high-yielding and stable for forage yields, nutritional qualities, and performance for major agronomic traits.

## 2. Materials and Methods

### 2.1. Description of the Study Areas

The variety verification trial was done at on-station and sub-station of Fedis agricultural research center, and on-farm during cropping season of 2023/24. The study was conducted at three districts namely; Fedis (Boko research station and on-farm), Babile (Erer sub-station and on-farm) and Sofi (on farm). The brief descriptions of the study sites are presented in Table 1.

Sites	Longitude	Latitude	Altitude (m.s.a)	Annual rainfall (mm)	Min-Max T <sup>0</sup>
Fedis	42°04'24.3"E	9°07'51.611"N	1050-2100	500-900	13-29°C
Babile	42°19'25"E	9°13'09"N	950-2000	450-850	15-38°C
Sofi	42°15'0"E	9°9'3"N	800-1800	600-870	10-28°C

**Note:** m.s.l. = meter above sea level; Min T<sup>0</sup>= Minimum temperature; Max T<sup>0</sup>=maximum temperature.

### 2.2. Experimental design and Treatments

The treatments were planted at six locations namely; Belina Arba, Umar kule, Kile, Erer guda, Boko station and Erer sub-station. One candidate variety (ILRI-16803) was selected from RVT study and planted with two standard check varieties (Bako-01 and Zehone-02). The experiment was planted on a plot area of 10 m x 10 m in single plot each using stem cuttings. The space between rows and plants was 1 m and 0.5 m, respectively. Also the space between plots and blocks was 1 m and 1.5 m, respectively. 100 kg of Urea per hectare was applied.

## 3. Results and Discussion

### 3.1. Origin and Varietal Evaluation

Hararghe variety (ILRI-16803) together with other genotypes, was formerly introduced from International Livestock Research Institute (ILRI) and developed through selection breeding method. A total of 11 selected genotypes were evaluated at multi-location regional variety trial with the standard checks (Zehone-02) during 2019/20-2021/22 main cropping season at Fedis and Babile districts. One variety, 'Hararghe' (ILRI-16803) gave 31.17% yield advantage over the standard check and had preferable overall performances over the standard check, Zehone-02. In 2024 main cropping season the variety 'Hararghe' was planted with two standard check varieties, Zehone-02 and Bako-01 at multi-location

on behalf of finally evaluation for variety verification trial breeding stage at six locations with a plot area of 10 m x 10 m for each variety.

### 3.2. Morphological and Agronomic Characters

The newly released variety, ‘Hararghe’ has erected and high leaf yielder and an average plant height of 112.9 cm at first harvesting (90 days) and 77.44 cm at second harvesting (60 days). It has higher tiller number than standard check and other evaluated genotypes. Also, the variety has higher leaf to stem ratio during the first and second harvesting than the standard check varieties, Bako-01 and Zehone-02. The newly released variety leaf and stem has less hairy than the standard check (Bako-01 and Zehone-02) and the stem of the released variety is moderately soft while the stem of both standard check is moderately hard at stage of harvesting for animal feeding. This characteristics make our newly released variety more differentiate and show us its specific merits.

### 3.3. Yield Performances and Reaction to Major Diseases

In a multi-location evaluation trial, the average dry matter yield of ‘Hararghe’ variety (ILRI-16803) was 45.24 tons ha<sup>-1</sup>, showing a yield advantage of 31.17% as compared to the standard check, Zehone-02. Under variety verification trial breeding stage ‘Hararghe variety’ gives dry matter yield of 44.76 tons ha<sup>-1</sup> and has 17.34% and 31.83% yield advantage over Bako-01 and Zehone-02 variety, respectively. Under research field, the variety ‘Hararghe’ gave dry matter yield ranging from 43.96-47.90 tons ha<sup>-1</sup> while on farmers’ field, its yield ranged from 42.62-45.07 tons ha<sup>-1</sup> (Table 2). ‘Hararghe’ variety (ILRI-16803) and the standard check varieties, Bako-01 and Zehone-02 are tolerant to major elephant grass diseases.

<b>Table 2: Summary of the Description of Agronomic and Morphological Characteristics of the Newly Released Variety</b>	
Crop: Elephant grass ( <i>Pennisetum purpureum</i> )	
Variety name: ‘ <b>Hararghe</b> ’ (ILRI-16803)	
Adaptation area:	Lowland to midland areas of East Hararghe zone and similar agro-ecologies
Altitude (m.a.s.l):	1300-2000
Rainfall (mm):	450-1000
Soil type:	Vertisol and Luvisol
Seed rate (cuttings/ha) :	30,000
Spacing (cm)	
Between plants:	50
Between rows:	100
Planting date:	Mid-June to Early July
Fertilizer rate (kg/ha)	
NPS:	50
Urea	100
Days to first harvesting (days):	90
Days to second harvesting (days):	60
Plant height at first harvesting (cm):	112.9
Plant height at second harvesting (cm):	77.44
Growth habit	Erected and very leafy

<b>Table 2 (Cont.)</b>	
Yield (t/ha):	
Research field:	43.96- 47.90
Farmers' field:	42.62-45.07
Tiller number per plant:	14.12-33.25
Leaf to stem ratio (LSR):	2.18-3.13
Disease reaction	Tolerant to most important elephant grass diseases
Utilization	Cut and carry system
Forage quality:	
CP (%)	14.73
Ash (%)	6.46
NDF (%)	69.81
ADF	36.51
ADL	4.17
IVDMD (%)	66.15
IVOMD (%)	57.81
Year of release	2024
Breeder and Maintainer	Fedis Agricultural Research Center

#### 4. Conclusion

Generally, the newly released variety was found to be a high yielder, moderate protein content, stable, higher *in-vitro* dry matter digestibility and tolerant to elephant grass diseases and pests. Considering such merits, the Ethiopian Variety Release Standing Committee had officially released the candidate variety ILRI-16803 with the breeder name 'Hararghe' for wider cultivation and use in lowland to midland of East Hararghe Zone and similar agro-ecologies of Ethiopia. This variety will be maintained and distributed to users by Fedis Agricultural Research Center. This variety can provide higher dry matter yield as compared to other varieties due to its high leaf yielder and has less hairy on leaf and stem hence leads to higher feed intake by animals. 'Hararghe' variety can play significant role in increasing production and productivity of livestock thereby increasing the income and livelihood of smallholders.

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#### Conflicts of Interest

The authors declared that there is no conflicts of interest.

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