Registration of "Dursi" Newly Released Tef (*Eragrostis tef* (Zucc.) Trotter) Variety

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Abstract

The name **Dursi** *was given to tef [***Eragrostis tef** *(Zucc.) Trotter] variety with the pedigree of Acc 236952 primarily collected by the Ethiopian Biodiversity Institute from Arsi zone, Dodota Sire district.* **Dursi** *was evaluated against standard check (***Kena***), eight other pipeline varieties and a local check at Shambu, Gedo and Arjo sub sites during 2016 and 2017 main cropping season. Yield stability analyses using Genotype and Genotype by Environment interaction (GGE) biplot, revealed that Dursi is stable and high yielding (2285 kg ha^{-1}) with 26% yield advantage over the standard check and stable performance in western Oromia. Therefore, Dursi was fully released in 2018 for wider production in the highlands of Western Oromia and similar agro-ecologies.*

Keywords: *Eragrostis tef*, Genotype and Genotype by environment interaction (GGE), Stability

Introduction

Eragrostis tef (Zucc.) Trotter, is a self-pollinated warm season annual grass with the advantage of C4 photosynthetic pathway (Seyfu, 1997). Tef is among the major Ethiopian cereal crops grown on more than 3 million hectares annually (CSA, 2017), and serving as staple food grain for over 70 million people. Tef has an attractive nutritional profile, being high in dietary fiber, iron, calcium and carbohydrate (Hager *et al*., 2012). Besides, it has high level of phosphorus, copper, aluminum, barium, thiamine and excellent composition of amino acids essential for humans (Abebe *et al*., 2007). The straw (*chid*) is an important source of feed for livestock. Tef is also a resilient crop adapted to diverse agro-ecologies with reasonable tolerance to both low (especially terminal drought) and high (water logging) moisture stresses. Tef, therefore, is useful as a low-risk crop to farmers due to its high potential of adaptation to climate change and fluctuating environmental conditions (Balsamo *et al.*, 2005). Nevertheless, tef was considered as "orphan" crop: the one receiving no international attention for research and other technologies applicable to smallholder farmers (Seyfu, 1997). Because of its gluten-free proteins and slow release carbohydrate constituents,

tef is advocated and promoted as health crop at global level (Spaenij-Dekking *et al*., 2005). Inadequate research investment to improvement of the crop is one among the major tef productivity constraints. Therefore, the objective of this activity was to evaluate and release high yielding, lodging and diseases tolerant tef variety for tef growing areas of western parts of the country.

Variety origin and evaluation

Dursi (Acc. 236952) was formerly collected by the Ethiopian Biodiversity Institute (EBI) from Arsi zone, Dodota Sire district. It was primarily selected from the 81 tef landraces evaluated for MSc thesis research (Dagnachew *et al*., 2008) and promoted to the succeeding breeding steps through single plant selection method. A total of nine pipeline tef genotypes were evaluated at Shambu, Gedo and Arjo research sub sites against standard (*Kena*) and local check for two consecutive years (2016 and 2017). Dursi was selected and verified in 2018 for its high grain yield and stable performance across locations and years.

Morphological and Agronomic characteristics

Dursi has medium plant height, good tillering capacity and tolerant to lodging. Detail description of the variety is presented in Table 1 and Table 2. Combined analysis of variance revealed highly significant ($p<0.01$) difference among genotypes for plant height, panicle length, shoot biomass, lodging % and grain yield (Table 1).

Table 1. Mean grain yield (kg ha^{-1}) per location across years

Genotype	Shambu		Gedo		Arjo		Mean	% yield
	2015/16	2016/17	2015/16	2016/17	2015/16	2016/17		advantage
Acc.236952	2507	2120	2256	2330	2134	2363	2285	26
Acc.55253	2187	2302	2195	2181	2012	2181	2176	19.29
DZ-01-1001	1916	2061	1703	1858	1675	1887	1850	
DZ-01-1004B	1931	2042	1653	1677	1672	1652	1771	
DZ-01-102	2180	2030	1900	2010	2074	1969	2027	11.13
DZ-01-385	2044	1882	1871	2102	1477	2081	1910	
DZ-01-739	1922	1997	1943	1848	1755	1841	1884	
DZ-01-778	2065	1902	2002	1800	1853	1883	1918	
DZ-01-821	2018	1894	1938	1851	1831	1914	1908	
Kena	2009	2043	1830	1637	1783	1644	1824	
Local	1691	1798	1748	1806	1706	1777	1754	
Mean	2025	2043	1918	1927	1816	1927	1937	
CV	8.9	6.3	6.6	6.1	11.3	4.3		
F-Value	<0.005	<0.002	<0.001	<0.001	<0.028	<0.001		

Table 2: Mean Agronomic traits across years and locations

Genotype	GY (t ha^{-1})	LD%	LR	NFT	PH	PL	SBM (t ha^{-1})
Local check	1.75	60.56	1.00	16.34	40.19	24.67	66.21
DZ-01-1004B	1.77	56.67	3.42	17.97	43.03	29.53	79.79
Acc.236952	2.29	6.89	1.50	18.88	45.24	34.13	87.71
DZ-01-821	1.91	10.00	2.76	18.33	51.41	32.87	67.36
Acc.55253	2.18	13.61	1.60	20.91	49.02	33.07	89.56
Kena	1.82	79.44	2.00	18.38	45.58	29.67	82.54
DZ-01-739	1.88	6.89	1.41	21.24	56.07	27.47	87.75
DZ-01-1001	1.85	18.89	3.39	18.32	50.99	32.07	62.71
DZ-01-102	2.03	60.00	1.61	17.89	47.00	33.53	79.82
DZ-01-385	1.91	7.67	3.56	20.43	50.54	26.80	86.17
DZ-01-778	1.92	43.33	3.11	20.56	51.91	30.20	84.64
Mean	1.94	32.85	2.31	19.02	48.27	30.36	79.80
CV%	6.70	34.00	26.40	14.10	10.30	8.30	18.90
LSD	0.09	8.66	0.75	1.77	3.28	3.49	9.97
F-Value	**	**	**	**	**	**	**

Key: GY (t ha^{-1})=Grain yield ton per hectare, LD%=Lodging %, LR=leaf rust, NFT=Number effective tiller, PH=plant height, PL=Panicle Length, SBM (t ha^{-1})=Shoot Biomass ton per hectare

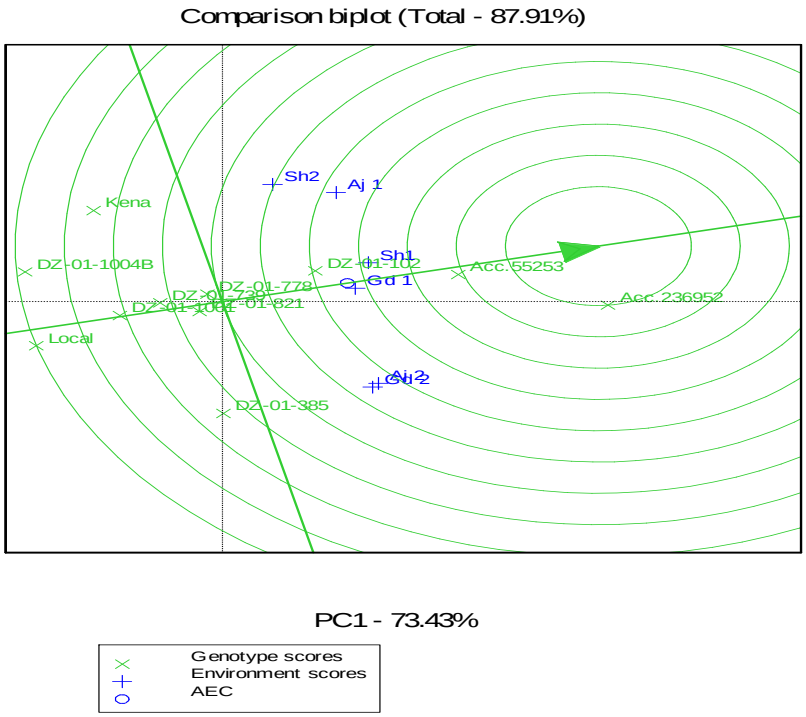
Yield potential, its Stability and Adaptability

The new variety *Dursi* showed higher mean grain yield (2285 kg ha^{-1}) and more stable performance with yield advantage of 26% over the standard check, *Kena* (1824 kg ha^{-1}.) and the local check (1754 kg ha^{-1}). Results from GGE biplot analysis also showed that *Dursi* (Acc 236952) fall in the central circle away from vertical mean line and closer to the origin, indicating its high yield potential and relative stability and wider adaptability compared to the other genotypes (Fig.1). *Dursi* was released for the highlands of Western Oromia and similar agro-ecologies receiving sufficient amount of rainfall (1800 mm-2000 mm) and altitude ranges of 1850-2500 m.a.s.l. The variety performs best with its full agronomic recommendations presented in Table 1.

Table 1. Agronomic & morphological characteristics of Dursi variety

Agronomic characters and descriptions of *Dursi*	
Variety name	*Dursi* (Acc. 236952)
Adaptation area	Shambu, Gedo, Arjo, and similar agro ecologies
•Altitude (masl)	1850-2500
•Rainfall (mm)	1800-2000
Seeding rate (kg ha^{-1})	10 and 15 (row planting and broad cast, respectively)
Spacing (cm):	20 cm between rows
Planting date:	Early to mid-July
Fertilizer rate (kg ha^{-1}):	•100 DAP at planting •50 UREA (half at planting & half after 25 days)
Days to heading:	70
Days to maturity:	132
1000 seed weight (g):	0.3
Plant height (cm):	115
Seed color:	cream White
Panicle color:	yellowish at maturity
Crop pest reaction*	
Grain yield (t ha^{-1}):	•On farmers field: 1.8-2.2 t ha^{-1}. •On-station: 2.0-2.4 t ha^{-1}.
Year of release:	2018
Breeder/ maintainer:	BARC/OARI

*=Tolerant to major Tef diseases (Head smudge and Rust)



Key: SH1 and SH2=Shambu year one and two, Gd1 and GD2= Gedo year one and two, Aj1 and Aj2=Arjo year one and two

Fig 1: GGE biplot analysis showing stability of genotypes and test environments

Conclusion

Dursi is stable in its grain yield and has good agronomic traits that make it suitable for production in the high highlands of western Oromia and similar agro-ecologies.

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