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Adaptability Study of Tef Varieties at Mid Land Agro-ecologies of Guji Zone, Southern Oromia

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Abstract
Access of improved tef variety is highly limited in different parts of Ethiopia due to inaccessibility of different production factors. Guji Zone is one of such areas where the technologies are not widely addressed and adopted so far. The current study was conducted by Bore agricultural research center to address the objective of selecting and recommending adaptable high yielding, early maturing ,diseases resistant improved tef varieties for mid land agro-ecologies of Guji zone. The experiment was done at three locations Adola on station and two farmers field (Bilu and Kiltu Sorsa). Thirteen (13) improved tef varieties with one local check were used. RCBD experimental design with three (3) replications was used on plot size of 1mx1m. collected data were subjected to analysis using SAS soft ware. Combined data analysis was used to test the performance of the varieties across the testing locations. The result of the study shows that, all varieties revealed significant difference for the selected characters across the locations. Based on the obtained result, two improved tef varieties namely; Boset and Tsedey shows early maturity, up to 10% yield increment than local variety .Therefore, these varieties were selected and recommended for the study area and similar agro-ecologies of Guji Zone.
Keywords: tef, cereal crop, adaptability

Introduction

Tef *(Eragrostis tef (zucc.)Trotter*) is ancient and an important cereal crop in Ethiopia, where domestication took place before the birth of Christ (MOARD,2010). Out of 10.14 million hectares of land occupied by cereals, tef the single dominant cereal took up 3.01 hectares annually and the production is about 47.5 million quintals (CSA,2014).

Ethiopia is not only the origin of tef, but also the center of diversity where it plays great role towards sustaining food security (Assefa *et al*.,2011). Outside Ethiopia there is a growing interest in using tef. For example, small scale commercial production of tef has begun in a few areas of the wheat belts of the USA, Canada and Australia (MOARD, 2010). The grain is ground to flour, which is mainly used for making popular pancake- like local bread called injera and sometimes for making porridge and the grain is also used to make local alcoholic drinks, called Tela and Katikala (MOARD, 2010). Tef straw, besides being the most appreciated feed for cattle, is also used to reinforce mud and plaster the walls of tukuls and local grain storage facilities called gotera (MOARD, 2010). Tef grain, owing to its high mineral content, has started to be used in mixtures with Soybean, Chickpea and other grains in the baby food industry (MOARD, 2010). It is the most adapted cereal crop to diverse agro-ecologies due to its elasticity to both drought and water logging(Assefa *et al*., 2010)

Even though Tef is most important growing cereal in Ethiopia and is adapted to a wide range of ecological conditions, the access of this technology is highly limited in Guji Zone of Oromia most probably due to the remoteness from the centre and inaccessibility of the area.

The potential of Tef is not exploited in this part of the region due to lack of improved varieties, poor management practice, biotic factors (weeds, disease, insects & pests especially birds).

So far the national & regional research institutions in the country have released many varieties adaptable to a wide range of environment for commercial production. However, these technologies did not reach the smallholder farmers living in such inaccessible areas due to lack of testing sites and other production constraints. Therefore, the present study was conducted to address the above problem through evaluating and selecting adaptable, high yielding, early maturing and diseases resistant improved tef varieties for mid land agro-ecologies of Guji Zone.

Materials and Methods

Thirteen (13) improved tef varieties that were brought from Debrezeit Agricultural research center and local check were evaluated at Adola on station and two farmers field(Bilu and Kiltu Sorsa PA's) to select and recommend adaptable, high yielding, disease resistance, and early maturing varieties. RCBD experimental design with three (3) replications was used on plot size of 1mx1m. Spacing of 1m and 1.5m between plot and block respectively was used. Nationally recommended seed and fertilizer rate of 25kg/hec and 100kg DAP/hec was used. Other agronomic practices recommended for tef production were also followed.

Data collection and analysis

Data were collected on parameters like days to emergency, days to heading, Plant Height (cm), punicle length

(cm), lodging index, fertile tillers per plant, days to maturity , thousand seed weight(kg), and grain yield(kg)/hec. The recorded data were subjected to analysis of variance (ANOVA)as suggested by Gomez and Gomez (1984) using SAS Software (Version 9.0). Mean separation was carried out using Least Significant Difference (LSD) at 5 percent levels of significance.

Result and discussion

The result of combined analysis of variance was done for showed the presence of significant difference among the tested varieties for phenological, growth, yield and yield related character(Table 1).

Date of heading: There is a significance differences between varieties for the character date of heading. Early heading was recorded by variety Tseday followed by simada. However, variety Dukem exerts late heading followed by Enatit. while selecting varieties for early maturing, considering early heading varieties could be imperative. Fentie *et al*.,(2012) and Plaza-Wuthrich *et al*.,(2014)also reported significant difference among the tested varieties for date of heading.

Days to maturity: As the study result indicates, significant difference is observed among the tested variety for date of maturity across the location. similar result was also reported by Fentie *et al*.,(2012).

considering this character for variety selection is very critical in order to select early maturing varieties for different agro ecologies. Accordingly, variety simada followed by Tseday and Boset were early maturing as compared to local check and other varieties.

Plant height: Among the tested varieties, Dukem shows the longest height followed by Quncho where as variety Simada and Boset exerted the shortest height. Considering this character for variety evaluation is very crucial as it help for selecting varieties that can able to withstand lodging problems. But, this study result is in contrast to Fentie *et al*.,(2012) finding.

Panicle length: From the study result, significant difference was observed among the tested varieties for panicle length across the study locations which was ranged from **29.56** to 41.18. Accordingly, variety Dukem shows maximum panicle length whereas variety Boset followed by Simada shows minimum panicle length.

Lodging index(LI): A significant difference was depicted among the varieties across the locations for the character LI which was ranged from 1.22 to 3.67 . Maximum LI was exerted by variety Simada followed by Boset. Low LI was revealed by variety Enatit and key Tena.

Number of fertile tillers/plant(NFTPP): It was observed that varieties shows significant difference for the character number of fertile tillers per plant. maximum number of fertile tillers were scored for Key Tena whereas minimum for simada and Genet(Table 1).

Grain yield(GY): significant variability was observed among the tested varieties across the testing locations for grain yield qt/ha, which was ranged from 10.36 to 15.82 qt/ha with the mean value of 13.25qt/ha and coefficient of variation 21.93%. The highest grain yield (15.82) and (15.61 qt/ha) was recorded for Tseday and Boset variety respectively. But, low yield of 10.36 qt/ha was obtained from variety Genet(table 1).

Table 1: combined data analysis of tef trial at multi-locations(2013/14 cropping season)

No	Treatments	DH	DM	PH	PL	LI	stnd	NTP	NFTP	GY(Qt)
1	Boset	38.89	73.78	55.39	29.56	3.22	97.89	3.44	3.22	15.61
2	Tsedey	37.11	73.78	56.02	31.26	2.89	96.89	3.11	2.89	15.82
3	Quncho	44.00	75.00	61.94	40.29	2.56	98.00	3.78	3.11	15.22
4	Simada	37.33	73.11	48.38	29.72	3.67	97.67	3.56	3.11	14.41
5	Ziquala	41.22	77.00	60.27	39.21	1.78	96.56	3.33	3.33	14.11
6	Gemechis	39.44	74.67	60.84	36.69	2.78	97.67	3.44	3.11	13.95
7	Gibe	40.67	77.56	58.87	38.13	1.33	95.00	3.67	3.22	13.04
8	Dukem	43.89	76.00	63.76	41.18	1.78	98.00	3.67	3.22	12.66
9	Zobil	39.44	76.22	58.44	36.09	2.89	96.78	3.11	3.00	12.52
10	Enatit	42.22	77.44	56.64	39.81	1.22	97.22	3.56	3.11	11.61
11	Magna	40.67	74.67	60.31	35.24	2.67	97.22	3.22	3.22	11.53
12	KeyTena	41.67	77.67	58.80	36.78	1.22	96.78	3.56	3.11	10.75
13	Genete	40.33	75.67	55.60	36.36	2.56	97.11	3.44	3.11	10.36
14	L.Check	37.89	75.67	56.24	35.09	2.67	97.33	3.33	3.33	13.97
Means		40.34	75.59	57.97	36.1	2.47	97.15	3.47	3.15	13.25
CV (5%)		3.02	1.35	6.90	8.19	34.61	1.43	15.60	18.77	21.93
LSD (5%)		1.27	0.97	3.61	2.76	0.80	1.29	0.51	0.56	2.71

Keys:trt= treatments,DH=days to heading, PH=Plant Height (cm),PL=Panicle length (cm),LI=lodging index,stnd=stand(%),NTP=number of tillers/plant,NFTP=number of fertile tillers/plant, GY= grain yield(kg)/hac.

Conclusion and Recommendation

The tef adaptation trial was conducted at three locations representing mid- land agro-ecologies of Guji Zone, Southern Oromia during 2013/14 cropping season to evaluate and select adaptable, high yielding, early maturing ,diseases resistant varieties. Even if different characters are determinant for selecting and recommending certain technologies, main concern should be given for the major objective of the activity under taken. From this work, it was observed that each of the tested variety shows different performance for different characters . Grain yield is an important character to be considered for variety selection to address the objective of the conducted activity. For this reason, two improved varieties i.e tseday and Boset, showed better performance for most of the studied characters including grain yield. Therefore, these two varieties were selected and recommended for the study area and similar ecologies of Guji Zone.

Finally, in order to avail the accessibility of improved tef varieties to the area these varieties need to be demonstrated to users along with their improved production packages for their further extension.

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