

Performance Evaluation of Teff (*Eragrostis Tef* (Zucc.) Varieties At Bedele District, Buno Bedele Zone Southwestern, Ethiopia

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Abstract:

Access of improved teff variety is highly limited in different parts of Ethiopia due to inaccessibility of different production factors. Bedele zone is one of such areas where the technologies are not widely addressed and adopted so far. The current trial was carried out during 2017 cropping seasons by Bedele Agricultural Research center. Three Teff varieties (Guduru, Quncho and Kenna) including local check were tested with the objective of selecting adaptable and best performing teff variety under farmers management. The trial was laid out in a randomized complete block design with seven replications along farmers. Plot size of experiment was 10m×10m (100m²). Data on various characters, such as plant height, panicle length, Lodging Index, Biomass Yield and grain yield. Data was subjected to analysis of variance and there was highly significant difference ($p<0.001$) among the varieties for grain yield and some of agronomic traits. The mean grain yields of Guduru and Quncho varieties were 11.28 and 8.28 kuntal /ha while the yield of kena (7.20 kuntal/ha) was less than the local variety (7.67). Based on their selection criteria in the districts farmers were preferred first Guduru among the tested Teff varieties due to its high grain yields and resistant logging than other. Secondly, Quncho was preferred by the farmers due to it is very white seeded color and high market demand. However, Quncho variety highly affected by logging the same as local variety. Therefore, based agronomic traits (grain yield, days to maturity, plant height, panicle length, days to heading and farmers' preference (grain yield, seed color, Straw Biomass, Market Demand, shattering tolerance and Lodging Tolerance) Guduru Teff variety was preferred by the target community and it is recommended to be pilot scaled up.

Keywords: Grain yield, Biomass yield, Teff Varieties

INTRODUCTION

Teff (*Eragrostis tef*) is ancient and an important cereal crop in Ethiopia, where domestication took place before the birth of Christ (MOARD, 2010). Teff has got both cultural and economic value for Ethiopian farmers with more than six million households' life depending on the production of Teff (Tareke et al., 2011). It is a daily staple food for about 57.20 million people of Ethiopia, and this accounts for more than 64% of the total population of the country (ATA, 2013). Ethiopia is not only the origin of teff, but also the center of diversity where it plays great role towards sustaining food security (Assefa et al., 2011).

Currently, in Ethiopia teff is cultivated on area of about 3.02 million hectares. Teff and maize taking up about 24% and 17% of the total grain crop area, respectively (CSA, 2018). This makes teff the first among cereals in the country in area coverage. However, out of the total cereal grain produced, maize and teff accounted for 27% (8.39 million tons) and 17% (5.28 million tons), respectively (CSA, 2018), and the average national yield of teff is only 1.74 tons ha⁻¹ in 2017/18 cropping season (CSA, 2018) which is very low as compared with teff yield produced at research

station 2.53 to 3.2 tons ha⁻¹ and its yield potential (Solomon et al., 2017). 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 Buno Bedele Zone of Oromia most probably due 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 Buno Bedele Zone.

MATERIALS AND METHODS

Experimental material and location

A field experiment was conducted on Famer field at Bedele district During 2017 main cropping season using three Tef varieties (Kena (23-tafi-adi-72), Guduru (DZ-01-1880) and kunchu with one local check on farmers field with their full participation. The test material for adaptation was introduced from Bako Agricultural Research Center. Their adaptability with full participation of farmers in the study areas. The spacing between plots and rows were 1.m and 0.2m respectively. Each experimental plot had 10m x10m (100 m²). Planting was done in row by drilling at seed rate of 5 kg/ha. NPS was applied at the rate of 100kg/ha at sowing. UREA was also applied at the rate of 50 kg/hectare. Half was applied at the time of planting while the remaining the second half was applied at the time of tillering.

Data Collection and Analysis

Data were collected on parameters like Plant Height (cm), panicle length (cm), lodging index, Biomass Yield and grain yield kungal/ha. The recorded data were analysed using SAS Software (Version 9.0). Mean separation was carried out using Least Significant Difference (LSD) at 5 percent levels of significance.

RESULTS AND DISCUSSION

Table 1. Combined mean yield and agronomic traits for tested tef varieties Bedele district.

Varieties	PH	PL	LT	NT	BMV	GY
Guduru	96.4 ^a	42.14 ^a	80.00 ^a	5.57 ^a	11.32 ^a	11.28 ^a
Qumcho	96.14 ^a	42.12 ^a	40.00 ^b	4.42 ^b	9.74 ^b	8.28 ^b
Kenna	86.04 ^b	37.33 ^b	41.42 ^b	4.00 ^b	7.95 ^c	7.20 ^c
Local	86.19 ^b	37.00 ^b	50.00 ^b	4.14 ^b	8.59 ^c	7.67 ^{cb}
Mean	91.2	39.65	52.86	4.53	9.4	8.61
LSD	1.43	1.92	15.43	0.67	1.11	0.82
CV	1.4	0.86	26	13.32	10.53	8.51

PH=plant Height, PL=Plant Length, LT=lodging toleranc, NT=Number of tiller, BMV=Biomass Yield and GY=grain Yield

The result showed that Guduru Tef variety with a plant height of 96.40cm is the tallest plant among the tested tef varieties followed by Quncho, local and kenna with the magnitude of 96.14,

86.19 and 86.04cm respectively. The statistical result at ($p < 0.01$) showed Guduru is significantly vary from kenna and the local; but it is almost the same (no significant difference) with Quncho. In case of number tillering per plant, Guduru Tef variety showed highest (5.57) whereas Kenna had the smallest than other varieties (4.14). Similarly, there was significant difference between Guduru and kenna variety in terms of plant height and also between Guduru and Local check. But there is no significant different difference between Guduru and qumcho. Panicle length ranges from 37.00 (kenna) to 47.38 (Guduru). The local variety had highest lodging percentage of 17%. Guduru variety had better yield than all tested varieties

Economic Analysis

Table2: - Partial budget of Adaptation trail onTeff

Criteria	Guduro	Qumcho	Kenna	Loca
Average yield (Qt/ha)	11.28	8.28	7.2	7.67
Adjusted yield (Qt/ha)	10.16	7.45	6.48	6.9
GFB(Birr/ha)	20320	16390	12960	13110
Field cost of seed (Birr/kg)	562.5	780	570	462.5
Total variable costs (Birr/ha)	562.5	780	570	462.5
Net benefit	19757.5	15610	12390	12647.5
MRR	35.12	-	-	-

The results of partial budget analysis data are shown in Table 2. Accordingly, the highest net benefit (19757.5 ETB) was obtained from Guduru treatment followed by Qumcho with a net benefit of 15610 ETB. Kenna Variety treatment had the least net benefit, which was even below the control. The highest marginal rate of return (3500%) was obtained from guduru variety.

Farmers Preference on the Varieties

Farmers have a broad knowledge base on their environments. Farmers' selection criteria were grain yield, seed color, Straw Biomass, Market Demand, Shattering tolerance and Lodging Tolerance. Based on their selection criteria in the districts farmers were preferred first Guduru among the tested tef varieties due to its high grain yields and logging tolerance than other. Secondly, Quncho was preferred by the farmers due to it is very white seeded color and high market demand.

Table 3. Farmers' varietal selection criteria and the average scores given by the farmers.

Criteria	Guduru	Quncho	Kenna	Local
Seed Color (10)	5.71	7.14	4.29	5.71
Straw Biomass (2)	1.43	0.86	0.57	0.86
Marketability (7)	5	5	3	3
Lodging Tolerance (3)	1.71	0.86	1.71	1.29
Grain Yield (12)	8.57	6.86	5.14	5.14
Shattering Tolerance (6)	3.43	4.29	4.29	4.29
Maturity date	0	0	0	0

Scores ranges (2-4), 2 for minimum value and 4 for maximum value

SUMMARY AND CONCLUSIONS

Three varieties (Guduru, Kenna and Quncho,) including local were evaluated with the objective of selecting adaptable and best performing tef variety with full participation of farmers. The analysis of variance showed higher yield of Guduru which is 11.28 kuntal per hectare whereas Quncho gave

8.28 kuntal from a hectare. On the other hand, kenna gave low yield of 7.2 kuntal per hectare while the local variety gave 7.67 kuntal hectares which is greater than the yield of kenna. Farmers' selection criteria were straw biomass, market demand, shattering tolerance, lodging tolerance, grain yield and seed color. Based on their selection criteria, farmers selected Guduru for grain yield and Quncho for yield plus white seeded color but highly attacked by logging. Since, Guduru varieties were preferred by the farmers, it is better if scaled up.

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