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Tef (*Eragrostis tef*) Variety Kora

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ጤፍ በኢትዮጵያ ሀገር በቀል የሆነና ሰፊ ተለያይነት ያለው ሰብል ሲሆን በሐገሪቱም ዋነኛ የምግብ ሰብል በመሆን ያለማላል። በኢትዮጵያ በየዓመቱ ከ 3.02 ሚሊዮን ሄክታር በላይ መሬት ለጤፍ ምርት ሲውል ይህም በሀገሪቱ ከሚመረቱት የብርዕና አገዳ ሰብሎች ከፍተኛውን የመሬት ሽፋን በመያዝ በአንደኛ ደረጃ ላይ ይገኛል። ይሁን እንጂ አማካይ የጤፍ ምርታማነት አነስተኛ ነው (1.6 ቶን/ሄክታር)። ለዚህም በከፊል እንደ ምክንያት የሚጠቀሱት አርሶ አደሩ ያልተሻሻሉ የአካባቢ ዝርያዎችን በመጠቀሙና፣ የተለያዩ የጤፍ ምርታማነትን የሚቀንሱ እንደ በሽታ፣ ተባይ፣ አረምና የሰብል መጋሸብ፣ የርጥበት ማነስና የመሳሰሉ ችግሮች ናቸው። የጥናቱም ዓላማ ከፍተኛ ምርት እና ጥራት ያለቸውን ለተለያዩ አካባቢዎች ተስማሚ የሆኑ ዝርያዎችን ማፍለቅ ነበር። ለዘህም 14 የተለያዩ የጤፍ ዝርያዎች (ሁለት ማወዳደሪያ ዝርያዎችን በማካተት) ለሁለት ዓመት (2012-2013) በስምንት የተለያዩ ወኪይ ቦታዎች ላይ ከተፈተሹ በኋላ ኮራ የተባለው ዝርያ ከማወዳደሪያ ዝርያዎች የተሻለ ውጤት በማሳየቱ በስፋት ለምርት አንዲውል ተመርጧል።

Abstract

Tef [Eragrostis tef (Zucc.) Trotter], is a staple food crop of Ethiopians that originated and diversified in Ethiopia. It has existed in Ethiopia throughout recorded history. Annually, it occupies 3.02 million hectares thereby ranking first among all cereals cultivated in the country. However, the national average yield of tef is low 1.6 t ha^{-1}. The use of unimproved local cultivars and biotic and abiotic stresses are partially attributed to the low yield of the crop. Thus, the experiment was designed to develop high yielding and desirable quality improved varieties of tef suitable for diverse agro-ecologies, farming systems and purposes. Fourteen tef genotypes including two checks were laid out in randomized complete block design using four replications for two years (2012 and 2013) at eight locations. The combined data analysis across locations and over the years indicated that candidate variety Kora (DZ-Cr-438 (RIL No. 133B) performed better than the two checks and other test genotypes. Consequently, Kora was identified and approved for large scale production.

Introduction

Tef, *Eragrostis tef* (Zucc.) Trotter, is an annual self-pollinated grass species of the family Poaceae, subfamily Chloridoideae. Within the genus Eragrostis, tef is the only species that is grown to produce grain (100 kernel weight = 0.18–0.38 mg) for human consumption, while the straw is fed to livestock. The crop is grown on a large scale in Ethiopia where it occupies 3.02 million hectares (CSA. 2015) thereby ranking first among all cereals cultivated in the country. Despite the high demand for tef in Ethiopia, as observed from the nearly tripling of the production area from 1.2 million ha in 1990 to 3.02 million ha in 2015, the yield of tef per unit area is low (national average about 1.6 t ha^{-1}) compared to other cereals. Current tef varieties can yield three times more than the country's average under experimental conditions without lodging (Yifru and Hailu, 2005).

Crop breeding activities largely depend on the available variability upon which selection can be applied. After the re-discovery of Mendelian genetics, intra-specific (or inter-varietal) crosses have been used to widen variability and thereby develop new varieties. Crops like tef with no germplasm or breeding materials stock to receive from other sources have no choice but to depend on the existing natural variation, or create variation with classical breeding methods.

The development of tef varieties through hybridization began following the discovery of tef flower opening time and thereby the artificial surgical hand emasculation and pollination by Tareke Berhe in 1974 (Tareke, 1975). Up to now, 36 improved tef varieties have been released by the Ethiopian Agricultural Research System (MOA, 2014). Through the years of tef breeding, genetic gain studies revealed that the average annual genetic gain was 0.8% under lodging controlled conditions from 1970 until 1995 (Yifru and Hailu, 2005) and 0.58% under lodging uncontrolled condition from 1970 until 2012 (Fano, 2013). The earlier workers also reported that from 1970 until 1995, grain yield increased from 3.4-4.6 t ha-1(i.e. 27 kg/ha/year), and varieties developed through hybridization showed a yield advantage of 9.5% over those developed through direct selection from farmers' cultivars.

Methodology

Hybridization or crossing between DZ-Cr-387 X Kaye Murri was made in 2006. The purpose was to develop stable, high yielding; and farmers and consumers preferred tef varieties for the high rainfall and optimum moisture (high potential) areas of the country. In other words, it was targeted at developing varieties with high yielding potential and better quality than the improved contemporary standard check variety ***Quncho***. DZ-Cr-387 (Quncho) was selected for its high yielding ability, farmer- and consumer-preferred very white caryopsis color, and wide adaptability. Kaye Murri was selected as a parent for its extra white seed color, thick culm and vigorous growth habit. Following a successful crossing rapid generation advancement up to two to three generations per year was made using off-season irrigation facilities. As a result, Kora was developed as a recombinant inbred line through an F_2 derived single-seed descent method; and following series of multi-environment yield tests in various major tef growing regions of the country.

Description of the variety Kora

DZ-Cr-438 (RIL No. 133B) is released as Ethiopian tef variety christened "Kora" in 2014 (MoA, 2014). Kora is white-seeded high yielding potential variety resulting from a simple cross and released as an alternative variety to Quncho. The grain yield performance on research station ranged from 2.5-3.2 t ha^{-1} and farmers' fields the grain yield ranged from 2-2.8 t ha^{-1}. Kora takes 46 days to emerge panicles (head) and 113 days to mature. It is 102.5 cm tall in total plant height with average panicle length of 37.3 cm which account for over 36% of the total plant height (Table 1). It has variegated (yellow + red) lemma color, purple anther color, loose panicle form and very white seed color. It got an immense farmer's attention due to its yielding potential, very white seed color and good straw yield (straw yield is no less important than grain yield) at participatory variety selection trials.

Table 1: Mean agronomic performance of Tef genotypes evaluated in National Variety Trial across locations and over years

No.	Genotypes	DTH	DTM	GFP	PH	PL	LI*	SBM	GY
1	(DZ-Cr-387 X Kay Murri) (RIL No 42B)	60	114	53.8	101.0	37.5	72.5	10316.4	2546.2
2	(DZ-Cr-387 X Kay Murri) (RIL No91B)	60	113	52.7	102.1	36.9	72.5	9373.0	2229.5
3	(DZ-Cr-387 X Kay Murri) (RIL No 26)	60	112	52.4	97.1	35.0	74.0	9962.9	2454.5
4	(DZ-Cr-387 X Kay Murri) (RIL No 24B)	60	114	53.7	99.2	36.9	69.8	9506.1	2301.1
5	(DZ-Cr-387 X Kay Murri) (RIL No 61B)	60	114	53.6	102.2	36.9	69.9	10240.2	2542.6
6	DZ-Cr-387 (Quncho)	61	114	53.0	102.9	39.8	74.5	11576.6	2653.0
7	(DZ-Cr-387 X Kay Murri) (RIL No 7)	63	113	49.8	99.7	38.3	69.3	10537.5	2569.1
8	(DZ-Cr-387 X Kay Murri) (RILNo 135B)	59	113	53.7	100.4	37.9	71.7	10128.9	2426.7
9	(DZ-Cr-387 X Kay Murri) (RILNo 118B)	61	114	52.6	100.4	37.6	69.8	9916.0	2449.2
10	**(DZ-Cr-387 X Kay Murri) (RIL No 133B)**	61	113	52.6	102.5	37.3	69.9	10423.8	2634.4
11	(DZ-Cr-387 X Kay Murri) (RIL No 118A)	60	113	52.9	97.5	36.6	70.9	9919.9	2370.8
12	DZ-01-974 (Dukem)	61	117	55.9	100.1	38.5	72.3	10742.2	2712.1
13	(DZ-Cr-387 X Kay Murri) (RIL No 109A)	62	117	54.9	98.5	35.8	66.1	10261.7	2463.3
14	Local	58	113	55.1	92.3	34.3	78.2	9468.8	2403.5
15	(DZ-Cr-387 X Kay Murri) (RIL No 159)	60	113	53.1	115.0	36.8	70.7	9543.0	2389.8
16	Ho-TFS-5521A1	60	119	59.6	94.1	35.8	73.3	9892.6	2722.6
17	Ho-TFS-1407	60	118	57.6	100.6	38.8	70.0	10568.4	2672.3
18	Ho-TFS-1486	61	119	57.5	101.8	39.3	71.4	11011.7	2832.2
Mean		60.4	115	54.1	100.4	37.2	71.5	10188.3	2520.7
LSD (5%)		0.87	1.32	1.53	9.97	1.30	3.04	872.9	141.9
CV		4.17	3.33	4.41	28.6	10.03	10.62	24.69	16.2
R^2		0.91	0.90	0.77	0.36	0.75	0.67	0.65	0.69

N.B: DTH=number of days to heading; DTM=number of days to maturity; GFP=grain filling period; PH=plant height (cm); PL=panicle length (cm); LI=Lodging index; SBM=Shoot biomass (Kg/ha); GY=Grain yield (Kg/ha)

*=lodging index is computed from only six out of eight locations(Debre Zeit light soil, Debre zeit black soil, Minjar, Adet, Bichena, Holeta, Addadi Mariam and Ginchi)

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