Introduction

Durum wheat?Triticum durum? L.) is a member of the Gramineae family which belongs to the Triticeae tribe. It is an allotetraploid (two genomes: AABB) with a total of 28 chromosomes (2n = 4x = 28). ?Triticum durum? is believed to be originated thousands of years ago from a hybridization between the wild diploid ?T. monococcum? L. subsp. Boeoticum (Boiss.) (A genome donor) (Synonym: ?Triticum urartu? : AA) and the donor of the B genome which, according to morphological, geographical and cytological evidence, has been recognized as ?T. speltoides? (Tauschi) Gren. Or its closely related species [1]. There are six types of ?Triticum? species of which ?Triticum aestivum? and ?Triticum turgidum? are the most dominantly grown species in Ethiopia.

Durum wheat is grown in Ethiopia since antiquity because of its wide adaptation to the different agro-ecologies of the country, and resistance to biotic and a biotic stresses. Annually, it occupies 500 thousand hectares. However, the national average yield of durum wheat is low 2.2 t ha⁻¹. The use of unimproved local cultivars and biotic and a biotic stresses are partially attributed to the low yield of the crop. Thus, the experiment was designed to develop high yielding, disease resistant and desirable quality improved varieties of durum wheat suitable for diverse agro-ecologies, farming systems and purposes. Eighteen durum wheat genotypes including four standard checks were laid out in randomized complete block design using four replications for two years (2013 and 2014) at eight locations. The combined data analysis across locations and over the years indicated that candidate variety “Utuba” (IDON-MD-2009_off/53/2009) performed better than the four standard checks and other test genotypes. Consequently, Utuba was identified and released for large scale production.

Methodology

IDON-MD-2009_off/53/2009: developed by the ICARDA wheat breeding programme for Africa (Ethiopia), selected for disease, drought and high yield under optimal conditions by Debrezeit agricultural research center until reached to national variety trial. 18 durum wheat genotypes including four standard checks were laid out in randomized complete block design using four replications for two years (2013 and 2014) at eight locations. The combined data analysis across locations and over the years using SAS 9.1 [5], software indicated that candidate variety Utuba (IDON-MD-2009_off/53/2009) performed better than the...
two checks and other test genotypes in all tested parameters. Consequently, Utuba was identified and released Ethiopian durum wheat variety for large and small-scale production.

The seed was drilled by hand at seed rate of 125kg/ha which is equivalent of 45gm/3m² and planting depth was ~5cm. Planting carried out at appropriate planting time for each location and fertilizer applied according to the specific recommendation (200kg/ha of Urea and 100kg/ha of DAP) of each location. The purpose was to develop stable, high yielding; and farmers and consumers preferred durum wheat 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 Mangudo was selected for its high yielding ability, farmer- and consumer-preferred high yielding amber seed color, and wide adaptability. Following a successful germplasm advancement up to two times per year was made using off-season irrigation facilities. As a result, Utuba was selected as a variety through series of multi-environment yield tests in various major durum wheat-growing regions of the country.

**Description of the Variety “Utuba”**

“Utuba” (IDON-MD-2009_off/53/2009) is released as Ethiopian durum wheat variety christened “Utuba” in 2015 [3]. Utuba is amber seeded, high protein content and high yielding potential variety resulting from a simple and top cross and released as an alternative variety to Mangudo and Mukuye. The grain yield performance on research station ranged from 3.4-6.5 t ha⁻¹ and farmers’ fields the grain yield ranged from 2.5-4.5 t ha⁻¹. Utuba takes 62 days to (head) and 108 days to mature. It is 82cm tall.

**Table 1:** Mean agronomic performance of Durum wheat genotypes evaluated in National Variety Trial across locations and over years.

| S. No | Genotype | DTH  | DTM  | TGW  | PH   | YLD   |
|-------|----------|------|------|------|------|-------|
| 1     | IDON-MD-2009_off/12/2009 | 61.54 | 109.78 | 36.95 | 79.7 | 4355.82 |
| 2     | IDON-MD-2009_off/34/2009 | 58.94 | 109.55 | 42.09 | 82.59 | 4731.26 |
| 3     | IDON-MD-2009_off/53/2009 | 58.92 | 109.5 | 42.65 | 83.89 | 5113.29 |
| 4     | DSP2009_off. F3.2H.22_meh.1H.26 | 58.8 | 109.04 | 40.1 | 78.27 | 4157.81 |
| 5     | DSP2009_off. F4.1H.783_meh.4H.259 | 58.15 | 108.73 | 38.6 | 76.19 | 4281.5 |
| 6     | DSP2009_off. F4.1H.785_meh.2H. | 57.72 | 107.97 | 40.16 | 77.07 | 4260.23 |
| 7     | DSP2009_F6_off/1508/2009 | 61.42 | 110.23 | 37.62 | 81.28 | 4355.94 |
| 8     | IDON-MD-2009_off/25/2009 | 60.7 | 109.9 | 42.53 | 95.73 | 4147.48 |
| 9     | DSP2009_off. F4.1H.378_meh.4H. | 59.2 | 109.19 | 42.25 | 73.32 | 4394.3 |
| 10    | DSP2009_off. F4.3H.639_meh.1H. | 67.71 | 112.62 | 38.51 | 80.29 | 4395.05 |
| 11    | DSP2009_off. F4.2H.712_meh.1H. | 61.73 | 110.92 | 40.39 | 97.22 | 4985.18 |
| 12    | DSP2009_off. F4.2H.735_meh.2H | 58.27 | 108.4 | 38.84 | 73.79 | 4108.89 |
| 13    | DSP2009_off. F4.3H.976_meh.2H | 62.04 | 109.73 | 36.73 | 75.4 | 4194.25 |
| 14    | Hitossa | 61.47 | 110.34 | 34.26 | 81.27 | 4570.12 |
| 15    | Mangudo | 58.84 | 109.65 | 43.64 | 83.28 | 4409.32 |
| 16    | Ude | 61.06 | 108.94 | 39.59 | 81.52 | 4256.93 |
| 17    | Yerer | 65.37 | 112.14 | 40.38 | 78.71 | 4235.26 |
| 18    | Local | 61.78 | 111.09 | 42.4 | 95.69 | 3714.91 |
| 19    | Heritability | 0.93 | 0.76 | 0.84 | 0.91 | 0.73 |
| 20    | LSD@5% | 1.09 | 1.13 | 1.49 | 2.89 | 283.92 |
| 21    | CV | 4.02 | 2.04 | 9.1 | 8.65 | 14.71 |

**Note:** DTH=days to heading, DTM=days to maturity, TGW=thousands grain weight (gm), PH=plant height (Cm), HLW=hector liter weight.

**Table 2:** Stem rust, Leaf rust and yellow rust durum wheat disease response.

| S. No | Genotypes   | Leaf Rust | Stem Rust | Stripe Rust |
|-------|--------------|-----------|-----------|-------------|
| 1     | IDON-MD-2009_off/12/2009 | 10MS      | 10MS      | 0           |
| 2     | IDON-MD-2009_off/34/2009 | 15MS      | 15MS      | 0           |
| 3     | IDON-MD-2009_off/53/2009 | TR        | 10MS      | 0           |
| 4     | DSP2009_off. F3.2H.22_meh.1H.26 | 5MS      | 10MS      | 0           |

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“Utuba” has several preferred advantages that make it attractive to farmers. On one hand, this provides more spikes and therefore more yield, the trait most appreciated by farmers. However, the extra stems also provide more straw to be used for feeding livestock, another critical trait for smallholder farmers. Another advantage is early heading, which allows it to avoid the negative effect of the terminal drought and desiccating wind that occur with higher frequency toward the end of the season. Farmers near East shewa saw their neighbors’ bread fields completely wiped by stems rust, but with Utuba, even the worst rust infections only affected 5% of the stem. This high level of resistance to rust was one of the most visually compelling decision points for farmers to adopt the variety. Protein content in this variety tends to be high, the gluten is strong, and the color of the semolina is excellent amber yellow (Table 1&2).

Diseases notes are to be taken at least three times using standard procedures. For rust diseases the modified Cobb’s scale applied; i.e. disease severity (%) with reaction types (R, MR, MS and S for resistant, moderately resistant, moderately susceptible & susceptible reactions, respectively). This variety “Utuba” showed excellent level of resistant for stem rust (10MS) which is 10% of moderately susceptible at the most hot spot area of the country (Debezzait) and resistant to yellow and leaf rusts. Originally, this variety consists minor (many) resistant genes. Also known as slow rusting, horizontal or partial resistant genes. As defined by Caldwell [6] and Johnson [7], slow rusting is a type of resistance where disease progresses at a retarded rate, resulting in intermediate to low disease levels against all patho types of pathogen. Partial resistance, as defined by Parlevliet [8], referring to leaf rust resistance in barley, is a form of incomplete resistance characterized by a reduced rate of epidemic development despite a high- or susceptible-infection type. The components that cause slow rusting of a cultivar are longer latent period, low receptivity or infection frequency, as well as smaller uredial size and reduced quantity of spore production. All these components could make the variety preferable by the farmers than local and recently released standard check varieties. Existing durum wheat varieties having major resistance genes frequently lacked “durability”, that is, the ability of a widely-deployed resistance gene to provide an economic level of protection over an extended period of time [9].

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