

## Registration of a Newly Released Sweet Potato Variety “Hawassa-09” for Production in Ethiopia

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### Abstract

Hawassa-09 (TIS-8250-1) is a white fleshed sweet potato variety that was selected from 12 genotypes and one local and three previously released varieties used as checks. The variety was developed by Hawassa Agricultural Research Center in southern part of Ethiopia. Hawassa-09 was released in 2017 for adaptation to low and mid altitude areas of southern and similar agro-ecologies of Ethiopia. Hawassa-09, along with the rest genotypes, has been evaluated in national variety trials across three locations, Hawassa, Halaba and Dilla for two consecutive years, 2014 and 2015. This variety gave a mean storage root yield of 49.2 t ha<sup>-1</sup> with 56% and 283% yield advantage over the standard and local check, respectively. Then after selecting Hawassa-09 as a best variety, a variety verification trial was conducted for one more season in order to see the performance of the variety along with the checks across locations both on-station and on-farmers' fields on a 10 × 10 m plots. Finally, Hawassa-09 was officially released and registered as a new variety due to its outstanding performance. It is a stable, best adapted variety with medium sized roots and good resistance to sweet potato virus disease, the major sweet potato disease in Ethiopia.

**Keywords:** Hawassa-09; Registration; Storage root yield; Variety; verification

### Introduction

Sweet potato [*Ipomoea batatas* (L.) Lam] is among world's most important food crops, especially in developing countries where it is produced as a staple food crop having adapted to a wide range of environmental conditions [1,2]. In Ethiopia, sweet potato is grown by smallholder farmers as one of the food security crops [3-5]. Sweet potato covered over 59,000 ha with production of over 2.7 million tons in the 2014/15 cropping season [6]. Sweet potato is an integral part of the cropping system in the eastern, southern and south western parts of the country [4,6-11]. Sweet potato is considered as life vest in its major production areas since it can give some yields when other cereal and legume crops fail due to drought and other weather related constraints. The adaptability of the crop to marginal environments and its production with minimal inputs makes it an important food security crop in the country [5].

There are about 18 white fleshed and six orange fleshed sweet potato varieties released in Ethiopia [4,12]. However, most of these varieties are obsolete and are not under production. Currently, only three varieties, namely Awassa-83, Kulfo and Tula are being produced by farmers. These varieties give relatively better root yield in areas where sweet potato virus diseases pressure is low. However, in hot spot areas, they are affected by sweet potato virus disease and the root yield is highly affected [13,14]. Resistance to sweet potato virus disease is one of the major breeding objectives since sweet potato virus disease is the major sweet potato disease in East Africa [15,18].

Hawassa-09 (TIS-8250-1) was selected from a number of genotypes introduced from the International Potato Center (CIP) and the Asian Vegetable Research and Development Center (AVRDC). The variety was mainly selected for resistance to sweet potato virus disease and high root yield. After performing a multi-stage performance trial over locations and years, Hawassa-09 was officially released and registered in 2017 as a new variety due to its outstanding performance.

### Materials and Methods

#### Plant materials

Twelve genotypes along with one local (farmer variety) and three standards (released varieties) were used for the national variety trials. A variety verification trial consisting of two candidate and two check varieties was conducted for one year. The list of the 16 genotypes (12 genotypes and four checks) used in the national variety trials is given in Table 1.

#### Test environments

Over 114 genotypes were evaluated in 2012 and 2013 and 12 genotypes were selected based on resistance to sweet potato virus disease and root yield and promoted to the national variety trial. Then the 12 genotypes and the four checks were evaluated at three locations, namely Hawassa, Halaba and Dilla for two consecutive years, 2014 and 2015. Finally, a variety verification trial consisting of two candidate varieties, TIS-8250-1 and CN-1754-5 and two check varieties, farmers' variety and released variety (Beletech) was conducted for one year (2016). The variety verification trial was conducted at the above three locations both on-station and on six farmers' fields (two on-farm trials at each location). The trials were evaluated by the national variety verification technical committee and Hawassa-09 (TIS-8250-1) was approved by the committee for release and registration as a new variety for low and mid altitude areas of Ethiopia.

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## Results and Discussion

### Characteristics of the variety

Hawassa-09 is a white fleshed sweet potato variety with cream skin colour. It has high levels of resistance to sweet potato virus disease and produces high root yields. The agronomic and morphological characteristics of the variety are displayed in Table 2.

### Yield performance

Hawassa-09 gave a mean storage root yield of 49.2 t ha<sup>-1</sup> with 56% and 283% yield advantage over the standard and local check, respectively. The storage root performance of the 16 sweet potato genotypes tested across locations and years is given in Table 3.

### Reaction to sweet potato virus disease

Sweet potato virus disease is the major sweet potato disease in Ethiopia and Hawassa-09 was found to be free from viruses with visual observation and disease scoring. Serological test was also conducted and the result revealed negative reaction of the variety to the common sweet potato viruses in Ethiopia.

### Quality attributes

Hawassa-09 is a white fleshed sweet potato variety with attractive

storage root color and medium marketable root size. This variety can reach maturity in less than four months' time. It is resistant to the major sweet potato viruses in Ethiopia and is a high yielding variety with good overall acceptance after boiling.

S. No.	Genotypes	Status
1	TIS-841-6	Accession
2	TIS-82/0602-12	Accession
3	TIS-82/0602-2	Accession
4	TIS-9068-6	Accession
5	TIS-82-0602-6	Accession
6	TIS-8250-1	Accession
7	TIS-70357-2	Accession
8	Mae	Released variety
9	CN-2063-6	Accession
10	CN-2066-2	Accession
11	CN-1754-5	Accession
12	CN-1752-6	Accession
13	Becule-type-1	Accession
14	Bercume	Released variety
15	Local	Farmer variety
16	Guntute	Released variety

Table 1: List of sweet potato varieties used in the national variety trials.

Growth characteristics	
Growth habit	Spreading
Petiole length	16-20 cm
Petiole pigmentation	Green with purple petiole near to the leaf
Abaxial leaf vein pigmentation	Lower surface of the veins totally purple
Leaf colour at maturity	Green upper surface, purple vein lower surface
Shape of central leaf lobe	Semi-elliptic
General outline of the leaf lobe	Lobed
Leaf lobe number	03-May
Flowering habit	Not flowered in most cases in the test environments or 5% white flower
Major agronomic attributes	
Adaptability	Low to mid altitude areas: 1500- 2000 meters above sea level for optimum yield
Soil texture	Loam and sandy loam
Planting date	Mainly June and July. But can be planted any time if irrigated.
Spacing	60 cm b/n rows and 30 cm b/n plants
Seed rate	55,555 cuttings per ha
Resistance to diseases	Resistant to major sweet potato viruses in Ethiopia
Resistance to insect pests	Tolerant to sweet potato weevil
Days to maturity	100-120
Root yield	49 t ha <sup>-1</sup>
Storage root characteristics	
Root shape	Round elliptic
Root formation	Dispersal
Predominant root skin color	Cream
Predominant root flesh color	White
Root length	16-20 cm
Root diameter	7-10 cm
Individual root weight	0.8-1.5 kg
Sensory attributes	
Texture of boiled roots	Moderate dry
Colour of boiled roots	Cream
Taste	Intermediate sweet
Overall acceptance	Accepted by most of the panelist farmers

Table 2: Agronomic and morphological characteristics of Hawassa-09 (TIS-8250-1).

Genotypes	2014				2015				Overall mean	YAOSC (%)	YAOLC (%)
	Hawassa	Dilla	Hallaba	Mean	Hawassa	Dilla	Hallaba	Mean			
TIS-8441-6	16.7	8	9.8	11.5	5.1	6	3.3	4.8	8.1	-74.2	-36.6
TIS-82/0602-12	10.4	17.2	10.2	12.6	5	7.9	1.9	4.9	8.7	-72.3	-31.9
TIS-82/0602-2	9.5	7.8	9.6	9	3.7	6	2.2	4	6.5	-79.5	-49.6
TIS-9068-6	15.4	19.1	14.8	16.4	7.5	7.1	2.5	5.7	11.1	-65	-13.9
TIS-82/0602-6	19.6	16.5	8.7	14.9	13.4	4.7	8.9	9	12	-62	-6.7
TIS-8250-1	57.4	55.9	49.8	54.4	47	47.9	37	44	49.2	56	283.3
TIS70357-2	50.2	53.5	51.9	51.9	41.4	36.6	38.2	38.7	45.3	43.6	253
Mae	37	32.8	38.9	36.2	41.5	19.1	19.9	26.8	31.5	0	145.8
CN-2063-6	13.7	10	12.6	12.1	5.2	13.1	16.2	11.5	11.8	62.6	-8
CN-2066-2	12.1	16.3	11.9	13.4	8.2	9.3	4.1	7.2	10.3	67.3	-19.7
CN-1754-5	55.6	54.6	53.2	54.5	46.8	32.4	38.3	39.2	46.8	48.5	264.8
CN-1752-6	58.7	55.4	49.8	54.6	41.2	38.9	35.4	38.5	46.6	47.7	262.9
Becule-type-1	7.8	6.4	8.9	7.7	6.2	3.7	3.2	4.4	6	-80.8	-52.9
Berkume	18	7.2	11.1	12.1	6.3	9	5.4	6.9	9.5	-69.9	-26
Local	18.3	14.8	13	15.4	5.9	10.4	14.6	10.3	12.8	-59.3	0
Guntute	16.3	24.5	10.2	17	7.4	9.5	4.1	7	12	-74.2	-6.5
Mean	26.1	25	22.8	24.6	18.2	16.3	14.7	16.4	20.5	-	-
LSD (5%)	13.4	10.9	7.2	6.1	9	7.9	9.5	5	3.9	-	-
CV (%)	31.8	25.3	19	26.4	33.1	26.2	38.6	32.3	28.9	-	-
R <sup>2</sup>	89.9	92.3	96.4	92.6	91.3	95.5	90.7	92.9	93.2	-	-

\*YAOSC: Yield advantage over standard check (%), YAOLC: Yield advantage over local check (%)

**Table 3:** Combined mean storage root yield (t ha<sup>-1</sup>) performance of sweet potato genotypes tested over three locations and two years.

## Variety maintenance and dissemination

The breeder seed of the variety is maintained by Hawassa Agricultural Research Center. Seed multiplication of the variety is underway and dissemination of the variety to the beneficiary farmers will be facilitated in collaboration with the bureau of agriculture.

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## References

- Lebot V (2010) Sweet potato: root and tuber crops. Springer Science+Business Media, LLC, New York, USA.
- Wang Z, Li J, Luo Z, Huang L, Chen X, et al. (2011) Characterization and development of EST-derived SSR markers in cultivated sweetpotato (*Ipomoea batatas*). *BMC Plant Biol* 11: 131-139.
- Tadesse T (2006) Evaluation of root yield and carotene content of orange-fleshed sweetpotato clones across locations in southern region of Ethiopia. MSc Thesis, Hawassa University, Hawassa.
- Tofu A, Anshebo T, Tsegaye E, Tadesse T (2007) Summary of progress on orange-fleshed sweetpotato research and development in Ethiopia. In: Proceedings of the 13th International Society for Tropical Root Crops (ISTRIC) Symposium, Arusha. ISTRIC, Arusha, Tanzania.
- Gurmu F, Hussein S, Laing M (2015) Diagnostic assessment of sweetpotato production in Ethiopia: constraints, post-harvest handling and farmers' preferences. *Res Crops* 16: 104-115.
- CSA (2015) Ethiopia Agricultural Sample Survey 2014/2015: Report on Land Utilization (Private Peasant Holdings, Meher Season). Central Statistical Agency (CSA), Federal Democratic Republic of Ethiopia, Addis Ababa, Ethiopia.
- CSA (2010) Crop Production Forecast Sample Survey, 2010/11 (2003 E.C.). Report on Area and Crop Production Forecast for Major Crops. Central Statistical Agency of Ethiopia, Addis Ababa, Ethiopia.
- CSA (2011) Agricultural Sample Survey 2010/2011 (2003 E.C.). Report on Area and Production of Major Crops. Central Statistical Agency of Ethiopia, Addis Ababa, Ethiopia.
- CSA (2012) Agricultural Sample Survey 2011/2012. Report on Area and Production of Major Crops. Central Statistical Agency of Ethiopia, Addis Ababa, Ethiopia.
- CSA (2013) Agricultural Sample Survey 2012/2013. Report on Area and Production of Major Crops. Central Statistical Agency of Ethiopia, Addis Ababa, Ethiopia.
- CSA (2014) Ethiopia Agricultural Sample Survey 2013/2014: Report on Land Utilization (Private Peasant Holdings, Meher Season). Central Statistical Agency, Addis Ababa, Ethiopia.
- ARC (2015) Sweet potato production and field management in Ethiopia, Production Manual. Awassa Agricultural Research Center, Hawassa, Ethiopia.
- Mekonen S, Handoro F, Gurmu F, Urage E (2014) Sweetpotato diseases research in Ethiopia. *Int J Agric Inn Res* 2: 2319-1473.
- Mekonen S, Bekele B, Tadesse T, Gurmu F (2016) Evaluation of exotic and locally adapted sweetpotato cultivars to major viruses in Ethiopia. *Greener J Agric Sci* 6: 69-78.
- Mwanga ROM, Kriegner A, Cervantes-Flores JC, Zhang DP, Moyer JW, et al. (2002) Resistance to sweetpotato chlorotic stunt virus and sweetpotato feathery mottle virus is mediated by two separate recessive genes in sweetpotato. *J Am Soc Horti Sci* 127: 798-806.
- Settumba BM, Patrick RR, Jari PTV (2003) Incidence of viruses and viruslike diseases of sweetpotato in Uganda. *Plant Disease* 87: 329-335.
- Mwololo JK, Mburu MWK, Njeru RW, Ateka EM, Kiarie N, et al. (2008) Resistance of sweetpotato genotypes to sweetpotato virus disease in Coastal Kenya. In: Kasem, Z.A., editors. The 8<sup>th</sup> African Crop Science Society (ACSS) Conference Proceeding, El-Minia, Egypt. 27-31 October, 2007 *Afr Crop Sci Soc p* 2083-2086.
- Ndunguru J, Kapinga R, Sseruwagi P, Sayi B, Mwanga R, et al. (2009) Assessing the sweetpotato virus disease and its associated vectors in northwestern Tanzania and central Uganda. *Afr J Agric Res* 4: 334-343.