

Performance of Introduced Hybrid Tomato (*Solanum lycopersicum* Mill.) Cultivars in the Rift Valley, Ethiopia

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ABSTRACT

Evaluation the adaptability and yield performance of 12 hybrid tomato varieties was carried out on five locations of major growing areas of Central Ethiopia on farmers and researcher fields. The purpose of this study was to test the adaptability of tomato varieties and evaluate the yield potential of the technologies. The performance of hybrid varieties' have shown significant amount of variability among varieties and across locations. The result reveals that mean total yield and fruit number per plant of tomato varieties varied from 46.8 to 87.1 ton per ha and 18.2 to 40.5 fruits per plant, respectively. Based on the overall pair-wise comparisons by locations'; Variety Venise and Tesha took the first and second places in all tested locations; Koka and Debre ziet site respond very good yield over the others. And thus can be safely suggested for demonstrate and scale-up of the crop across the tested areas.

Keywords: Tomato, Hybrid varieties, adaptability, yield

INTRODUCTION

The introduction of cultivated tomato (*Solanum lycopersicum* Mill.) into Ethiopian agriculture dates back to 1940 (Samuel et al., 2009). The Ethiopian Institute of Agricultural Research (EIAR) was established in 1966 (Setotaw, 2006) in which tomato was recognized as a commodity crop. Since 1969 adaptation trial had been carried out but challenged by diseases (Shushay, 2011). Then the first record of commercial tomato cultivation is from 1980 with a production area of 80 ha in the upper Awash by Merti Agro-industry for both domestic as well as export markets (Lemma, 2002). The total area increased to 833 ha by the year 1993 and later on the cultivation spread towards other parts of the country. In 2014/15 Ethiopian Meher (rainfed) cropping season only tomato production was estimated to be 5026.68 ha with a total production of 30,699.95 tones (CSA, 2015). Off season production is estimated higher production coverage than the Meher season.

Currently tomato is one of the major regional export vegetables of the country. In Ethiopia, the crop is produced in the range of 700 up to 2200 meter above sea level, with about 700 to over 1400 mm annual rain fall, in different areas and seasons, in different soils, under different weather conditions, but also at different levels of technology (e.g. with furrow, drip or spate irrigation) and yields (Birhanu and Ketema, 2010).

In Ethiopia, the demand of commercial hybrid vegetables seed has been rapidly increased. After adaptation and verification, more than 90 hybrid vegetable have been approved and registered for production in Ethiopia. Tomato takes the highest share of commercial vegetables, 20 commercial hybrid tomato varieties have verified and under production in Ethiopia (variety release booklet, 2016).

Smallholders have grown tomato for long time for their livelihood needs since the start of its commercialization. However, the average yield of tomato in Ethiopia is low, 8 tone/ha compared with world average yields of 34 tone/ha (FAOSTAT, 2012). This may be related to limited access and use of improved commercial tomato varieties and poor production management. So, the objective of this study was to evaluate the adaptability of commercial hybrid tomato varieties under Ethiopian condition.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted at Melkassa, Debre Ziet, Koka, Wonji and Ziway districts of Central Rift Valley of Ethiopia during off-season by irrigation of the year 2015. Melkassa is located

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8°24'59.20" N latitude and 39°19'15.19" E with an altitude of 1548 m.a.s.l. It has dry climate with an average maximum and minimum temperature 35.4°C and 20.63°C respectively. The soil is sandy loam with a pH of 5.8. The Debre Ziet site is situated 8°45'26.10"N latitude, 39°00'46.42"E longitude, altitude of 1879 m.a.s.l. The area has mean annual maximum and minimum temperatures of 28°C and 10.2°C, with sub-humid climate type and mean rainfall of about 47mm and relative humidity of about 51% during off-season, respectively. Experiment was conducted on soil types: black soil (vertisol) with high water holding capacity, swelling and shrinking properties. The Koka Ethio-VegFru farm located at 8°25'07.25" N latitude, 39°02'29.25" E longitude, 1605 masl. The area characterized by mean minimum and maximum temperature of 12.14°C and 27.39°C, respectively (ESDA, 2010). The last location Ziway is situated 7°58'25.39"N latitude, 38°43'21.15"E longitude, altitude of 1645 m.a.s.l.

Planting Materials

Twelve known and those believed to be feasible to Ethiopian agro-ecology introduced and evaluated including the previous cultivars. The adaptability and yield performance of 7 newly and 5 previously introduced hybrid tomato varieties was carried out on four locations of major tomato growing areas of Central Ethiopia on farmers and researcher fields.

Table1. List of commercial tomato cultivars

No	Variety	Year of Registration	Responsible Company
1	Galilea	2011	Axum Greenline PLC.
2	Briget 40	2011	
3	Eden	2011	
4	Barnum	2011	Markos PLC
5	Topspin	2011	CropGrow
6	Awasssa	2015	MEKAMBA PLC
7	Awash river	2015	
8	Momtanz	2015	SYNGENTA PLC
9	Chibli	2015	
10	Monica	2015	DAWNT PLC
11	Tasha	2015	GREEN LIFE PLC
12	Venise	2015	MARKOS PLC

Planting, Data collection and Statistical Analysis

Hybrid F1 seeds were sown on seedling try and all management practices like mulching, watering, were carried out according to the recommendation. Thirty days after planting, the seedlings were transplanted in the main fields of respective locations. The plot size was 2 x (5m x 10 m) for each variety and the distance between plants and rows 30 and 100 cm, respectively. The experimental plots were fertilized using 100 kg DAP/ha and 50 kg Urea/ha at transplanting, and the remaining 50kg of UREA was applied as side dressing three weeks after transplanting the seedlings. All relevant data such as total number of fruit, marketable and total yield were taken. Finally the analysis of these traits was performed using Genstat statistical software packages.

RESULT AND DISCUSSION

According to the present study varieties Venis was the highest yielding with preferable quality tomato in Ethiopia. Awassa, Monica and Tesha varieties are also good yielder tomatoes with extended shelf life with low unmarketable yield. Awassa and Awash River tomato varieties are characterized with large fruits size over the rest newly introduced tomatoes. Galilea has still equivalent fruits size with rational fruit number. The newly introduced cultivar Venise and Tesha might be chosen for export due to their reasonable fruit size and low perishable. Tomato cultivars Awassa and Awash River might have good acceptance for local fresh consumption (Table 2).

Table2. Yield and yield components of hybrid vegetables

No	Cultivar	No of fruits per cluster	Yield (tone/ha)	Fruit number per plant	unmarketable %	%TSS	Average fruit wt(gm)
1	Monica	3.1	59.5	24.02	25.51	4	102.7
2	Barnum	7.3	63.7	31.68	25.08	4	62.2
3	Eden	6.6	73.3	23.05	39.17	3.9	111.3

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4	Galilea	6.1	57.9	20.11	39.97	3.7	126.6
5	Tesha	3.6	70.3	36.17	31.02	3.1	83.2
6	Bridget 40	3.7	63.5	30.2	33.87	3	95.7
7	Venise	3.9	87.1	40.49	22.81	3	99.5
8	Awash River	5.6	60.1	23.03	39.07	3.1	126.3
9	Awassa	6.1	69.8	25.07	12.56	3.1	126.9
10	Chibli	3.8	43.4	19.27	23.25	3.9	105.9
11	Momtananz	3.8	54.8	18.16	30.23	3.8	108.5
12	Topspin	3.6	46.8	30.06	22.52	4	73.8
LSD		2.9	38.5	18	20.78	1.4	61.34
CV		12	22.7	15.2	16	13	17

Regarding response of tomato varieties to tested locations, Koka site show the highest of total yield (93.45 tone/ha), more than double of Melkassa area. Tomato varieties show good yield response at Debre ziet site next to Koka, 81.76 ton per ha. Total yield is non-significant between Wonji and Ziway while significantly low yield response at Melkassa. Concerning number and size of fruits, considerably high number of fruits per plant was observed at Koka, while the larger fruits size recorded at Ziway area. From this it is clearly understood that the hybrid tomato varieties are more suitable to Debre zeiet and Koka area which is relatively low temperature and high altitude areas. The low response of tomato at Melkassa might be high temperature of the area and low fertility of the soil that encouraged the disease and insect pest prevalence and forced maturity (Fig 1).

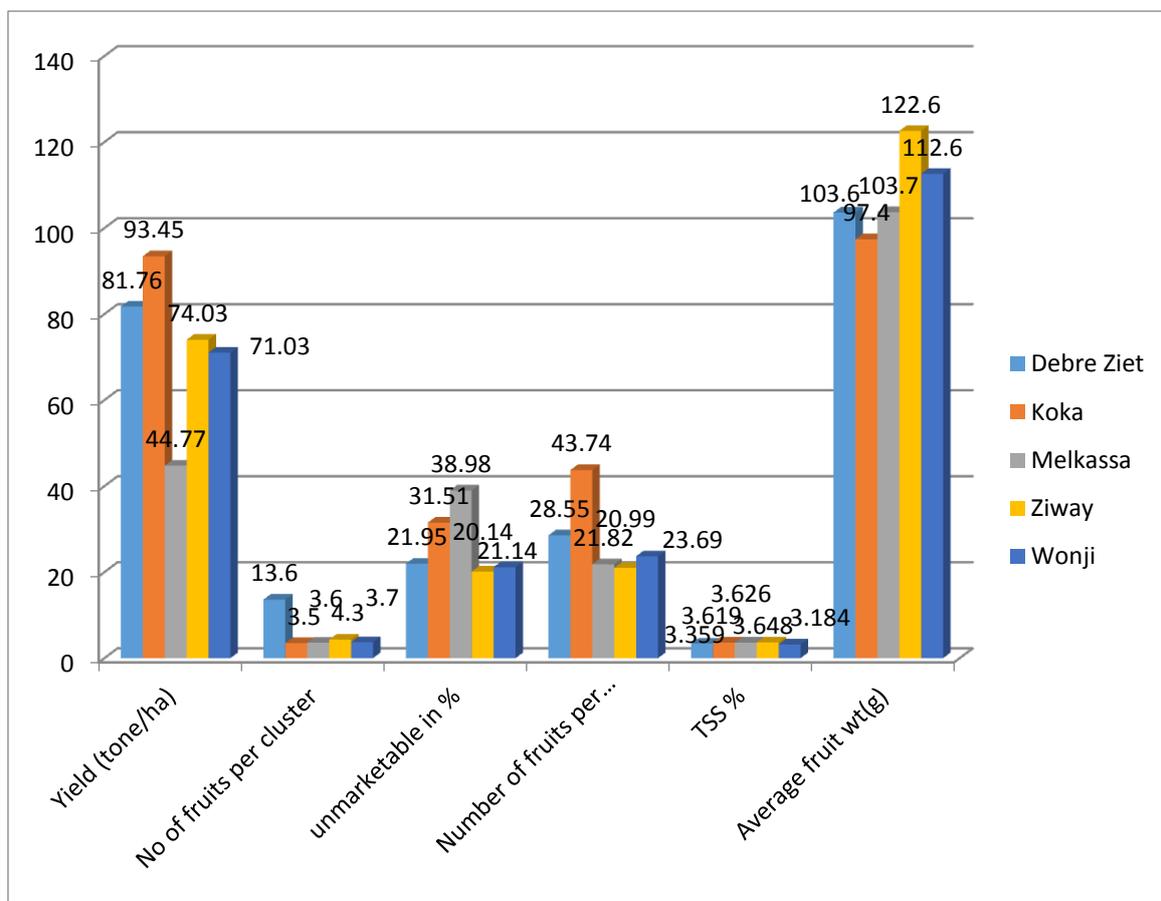


Figure1. Performance of tomato varieties across Rift Valley of Ethiopia

CONCLUSION

Tomato is the most widely grown vegetable in the world being recognized as a rich source of vitamins and minerals. It is one of the most important edible and nutritious vegetable crops in Ethiopia. Yet, average yield of tomato in Ethiopia is low. This is due to the fact that tomato production is highly constrained by several factors including the type of tomato varieties used.

From the present study it is concluded that hybrid tomato varieties performed very good yield and quality response. Tomato cultivars Venise, Tesha, Monica, Awash River and Awassa have given

higher yield and quality with higher marketable yield over the previous cultivars. These all performed best at Debre zeit and Koka than Melkassa and Wonji areas. So, demonstration and popularization of the cultivars to tomato growers is very important task to advance tomato productivity of the country.

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