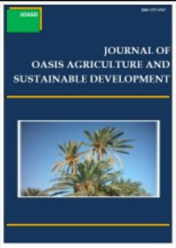
Journal of Oasis Agriculture and Sustainable Development
www.joasdjournal.org

RESEARCH ARTICLE



JOURNAL OF OASIS AGRICULTURE AND SUSTAINABLE DEVELOPMENT

www.joasdjournal.org

JOASD

p-ISSN: 2724 – 699X
e-ISSN: 2724-7007

Participatory tomato variety selection in the lowland areas of North Shewa

Natnael Girma*, Abdu Yassin, Zerihun Kebede, Getaneh Geto, Tigist Firew, Fiseha Desalegne, Alemayehu Ayele, Damtew Aragaw, Dejene Mamo &Teklemariam Ayele

Debere Birhan Agricultural Research center, P.O. box 112, Debre Birhan, Ethiopia.

Article info

Article history:
Received: 17 July 2023
Accepted: 26 September 2023

Keywords: Farmers preference, Participatory selection, Tomato variety, Yield

***Corresponding author**
natigrima66@gmail.com

Conflict of Interest: The authors declare no conflict of interest.

Abstract

The production and productivity of tomatoes in Ethiopia as well as in Amhara Region are very low because of lack of improved and adapted varieties, inadequate knowledge of production and management, and a poor marketing system. The field experiment was carried out during the 2018 irrigation seasons at Ataye and Shewarobit to identify adaptive, high yielding and disease tolerant varieties of tomato. Eight improved tomato varieties were laid out in a randomized complete block design and replicated three times. The collected biological data were analyzed using SAS statistical software version 9.4, and farmers' preferences for those varieties were also assessed based on selection attributes set by them. The combined analysis of variance revealed that there was significant difference between the varieties on the number of fruits per cluster, plant height, marketable number, unmarketable number and average weight of a tomato. The highest number of fruits per cluster was recorded from variety Mersa (3.83), followed by Melkasalsa (3.73) and Melkashola (3.7). The variety Mersa was the tallest followed by Weyno with plant heights of 110.5 cm and 110.96 cm, respectively. The highest average fruit weight was recorded for the variety D2 (61.25 g) followed by Cochoro (46.46 g). Even though it was not statistically significant, the variety Melkashola has given the highest marketable yield (32.98 t ha^{-1}) and showed a better reaction to late blight disease as low as 27.5 %. In addition to this, variety Melkashola was highly preferred by the farmers. Based on the biological data and farmer's preference variety Melkashola has been recommended for Ataye and Shewarobit as well as for other similar agro-ecologies.

1. INTRODUCTION

Tomato (*Solanum lycopersicum* L.) belongs to the family Solanacaea and genus Lycopersicon. In terms of production the cultivated tomato is the world's third most important vegetable after potatoes and sweet potatoes while as a processing crop, it ranks first among all vegetables (Melese and Samuel, 2018). The center of origin of the tomato is believed to be in Tropical America, probably Mexico or Peru (Agrisnet, 2010). In Ethiopia, there is no exact information when tomatoes were first introduced; however, the crop is cultivated in different major growing areas of the country (Getachew et al., 2019). China, India, Turkey, The United States and Italy are the world's leading tomato producers, with 67,636,725 tons, 21,181,000 tons, 13,095,258 tons, 10,475,265 tons and 6,644,790 tons production respectively. While in Africa, Egypt, Nigeria and Algeria are the highest tomato producer countries with production of 6,245,787 tons, 3,575,968 tons and 1,641,636 tons respectively (FAO, 2021).

Tomato is a seasonal climbing plant that is grown as an annual and produced for its fruits. The crop is widely cultivated in tropical, subtropical and temperate climates, with the exception of colder regions (Kelley et al., 2014). It grows both on a small and commercial large scale as a cash crop for vegetable growers and is the most popular and important vegetable for fresh consumption as well as processing. The crop is a good source of vitamins A and C and it is a well-known source of lycopene which is a powerful antioxidant that acts as an anti-carcinogen (William and George, 2006).

Tomato is an economically important crop among vegetable crops in Ethiopia. The diversified agro-ecologies of the country allow the production of different crops including tomato in different growing seasons. But due to higher pressure of late blight and bacterial spot diseases in the main rainy season the crop is mostly grown under irrigation condition (Gezahegne et al., 2022). Oromia, Amhara and SNNP regions are the leading tomato producing regions in the country with the production of 13,092 tons, 9,899 tons and 1,320 tons respectively (CSA, 2018).

Despite the importance of this crop, its production and productivity are constrained by different biophysical and socio-economic reasons, such as a shortage of adapted and improved tomato technologies, poor quality seeds, land shortages, a lack of awareness on existing production and processing techniques, poor extension services, a poor marketing system, and high post-harvest loss are a few to mention (Dessalegn et al., 2008).

A number of improved varieties and different agronomic packages have been recommended that aimed to improve the productivity of the crop in Ethiopia. But still, the national average yield of tomatoes in Ethiopia is 5.3 t ha-1 (CSA, 2018), which is incomparable with the average yield of other countries such as the USA, Spain, Turkey, Israel, China, and Egypt with an average yield of 98.04 t ha-1, 87.82 t ha-1, 70.76 t ha-1, 63.53 t ha-1, 57.84 t ha-1 and 38.96 t ha-1 respectively (FAO, 2021).

The importance of enhancing tomato yield in terms of both economics and nutrition should be emphasized. Therefore, it is crucial in Ethiopia to assess and suggest high producing and adaptable tomato cultivars for various agro-ecologies. The current experiment was carried in order to find disease-tolerant, high-yielding, and adaptable tomato cultivars for the North Shewa zone of the Amhara Region.

2. MATERIALS AND METHODS

2.1. Description of the study area

The field experiment was carried out during the 2018 irrigation seasons at Shewarobit on farmers field [latitude of 9o 59.7’ North and longitude of 39o 53.47’ East, 1286 meters above sea level] and Ataye at Yimlo kebele farmers training center [latitude of 10.3o and longitude of 39.9o, 1490 meters above sea level] located 220 and 270 kilometers North of Addis Ababa, respectively. The long term annual mean rainfall, minimum and maximum air temperatures are given in Table 1.

Table 1. The long term mean rainfall, minimum and maximum air temperatures of the study areas.

Location	Mean Rainfall (mm)	Mean Min Temp (°C)	Mean Max Temp (°C)
Ataye	1085	18.7	25.4
Shewarobit	760.2	14.54	29.72

2.2. Experimental materials

Eight tomato varieties that were released from Melkassa and Sirinka Agricultural Research Centers were used in current study. The description of the varieties and their maintaining centers are given in Table 2.

Table 2. Description of released tomato varieties used for the study

Varieties	Shape	Growth habit	Days to maturity	Yield ton/ha^{-1} research field	Yield ton/ha^{-1} farmers field	Year of release	Maintainin center
D2	Plum	Determinate	80	37.2	13	2012	Melkassa
Melkashola	Cylindrical	Semi determinate	90-100	43	14-18	1998	Melkassa
Melkasalsa	Pear	Determinate	90-100	45	13-17	1998	Melkassa
Mersa	Oblong	Indeterminate	100-120	27.6	15.9	2006	Sirinka
Miya	Plum	Indeterminate	82	47.1	14-19	2007	Melkassa
Weyno	Oval to round	Determinate	85-90	24.9	14.4	2006	Sirinka
Chochoro	Oblong	Determinate	86	45	13-17	2007	Melkassa
Sirinka I	Highly round	Indeterminate	95-100	38.2	14.4	2006	Sirinka

Source: Directory of released crop varieties, Ministry of Agriculture, Addis Ababa (2009)

2.3. Experimental Design

A randomized complete block design with three replicates was used for the study. The plot was 2.1 meters wide and 4 meters long with a total area of $8.4m^2$ per plot. A spacing of 1 meter between rows and 30 cm between plants was used. A spacing of 1 meter between plots and 1.5 meter between replications was kept for cultural practices. Seven plants were planted in a row which consists of a total of twenty four plants in a plot.

2.4. Agronomic Practices

Seedlings of each variety were raised on well prepared seed beds and transplanted to a well ploughed and leveled main field at 3-4 true leaf stage. A synthetic fertilizer of NPS, a compound fertilizer containing nitrogen, phosphate, and sulfur with the ratio of 19% N, 38% P_2O_5, and 7% S, with the rate of 242 kg ha^{-1} and urea with the rate of 100 kg ha^{-1} were applied. The full dose of NPS was applied once at transplanting whereas urea fertilizer was applied in two splits: half at transplanting and the remaining half was applied as a plant side dressing 45 days after transplanting. Transplants have been irrigated every other day for the first three weeks and every seven days thereafter. Other cultural practices such as weeding, hoeing, and stalking were employed uniformly and properly based on the recommendation for tomato production.

2.5. Data Collected

Phenology, yield and yield component data were collected based on descriptors for tomato developed by the International Plant Genetic Resources Institute (IPGRI, 2001). Fourteen plants from two central rows of each plot were used to collect mean quantitative traits data at maturity. Data was collected on traits such as stand count at harvest, number of fruits per cluster, number of cluster per plant, plant height, marketable number, marketable yield, unmarketable number, unmarketable yield and average weight of tomato fruit. Late blight severity was recorded by estimating the percentage of leaf area affected by the disease from the plants in the central two rows of each plot.

2.6. Data Analysis

To detect the presence of statistical difference between the tested varieties analysis of variance in individual environments was performed. To determine the homogeneity of error variance and determine the validity of combined analysis of variance, Bartlett test of homogeneity of variance was performed using SAS statistical software version 9.4. For statistically different traits, the mean differences were calculated using the Duncan multiple range test (DMRT) at a 5% significance level.

2.7. Farmers' selection and participatory evaluation of the varieties

A total of 18 farmers (15 males and 3 females) from Shewarobit were selected with the help of development agents to set selection criteria and compare the varieties. General awareness about the experiment was given to the selected farmers. Then after, farmers were given the chance to discuss and share ideas on issues related to preferences, criteria for evaluation and characteristics of good tomato varieties. After their discussion the farmers group has set transportability, taste, shape, late blight disease tolerance, market demand and yield as the evaluation criteria to select the best tomato varieties among the tested varieties. Then after, the farmers have compared the selected attributes with each other and ranked the attributes based on their order of importance and the pairwise ranking table was constructed in which it used to analyze the position of the varieties and construct the weighted ranking matrix. After this based on each selection criterion, for each variety the farmers given scores of 1 to 5 (1, 2, 3, 4, and 5 representing very good, good, moderate, poor, and very poor, respectively). The weighted ranking matrix was then analyzed using the formula given by Russell (1997) and the varieties were ranked based on their overall mean value with the least mean value ranking first.

$$WFP = \sum_{k=1}^{n} (RV \times NF / TNPF)$$

Where:
WFP = Weighted farmers preference
RV = rank value
NF= number of farmers
TNPF = Total number of participant farmers

3. RESULTS AND DISCUSSION

The individual environment analysis of variance revealed the presence of statistically significant differences in yield and yield related traits of the tested tomato varieties. The varieties statistically differed in the number of fruit per cluster, plant height, marketable number of tomato fruits, unmarketable number of tomato fruits and average weight of tomato at Shewarobit (Table

3) while the varieties differed only in plant height and average weight of fruit at Ataye (Table 4). But there was no statistically significant difference between the varieties in the number of clusters per plant, marketable yield and unmarketable yield at both locations.

tested varieties on the number of fruits per cluster, plant height, marketable number of fruits, unmarketable number of fruits and average weight of a fruit (Table 5). The maximum number of fruit per cluster (3.83) was recorded from variety Mersa followed by Melkasalsa (3.73) and Melkashola (3.7) while the lowest (2.6) was obtained from variety Chochoro (Table 6). Similar findings have been reported by Masho et al. (2016) who recorded the maximum number of fruit per cluster (4.06) from variety

Table 3. Yield and yield related traits of tomato varieties at Shewarobit, 2018

	Treatment	NCPP	NFPC	PH (cm)	MN (ha^{-1})	MY (t/ha^{-1})	UMN (ha^{-1})	UMY ($t\ ha^{-1}$)	AWT (gm)	LBS
1	Sirinka 1	15.20^{a}	3.80^{a}	111.00^{a}	570278^{abc}	17.87^{a}	146825^{a}	2.70^{a}	30.93^{b}	23.33
2	Weyno	16.60^{a}	3.53^{a}	131.26^{a}	809280^{a}	26.07^{a}	176191^{a}	4.42^{a}	30.98^{b}	50.00
3	Mersa	15.06^{a}	3.66^{a}	121.60^{a}	799389^{a}	22.01^{a}	155555^{a}	2.23^{a}	29.44^{b}	11.67
4	Melkasalsa	19.66^{a}	3.53^{a}	79.00^{b}	833995^{a}	22.33^{a}	142064^{a}	2.06^{a}	25.55^{b}	23.33
5	Chochoro	17.13^{a}	2.53^{b}	84.46^{b}	353889^{bc}	19.17^{a}	42064^{b}	1.69^{a}	54.46^{a}	36.67
6	D2	16.33^{a}	2.66^{b}	72.73^{b}	248765^{c}	16.79^{a}	28572^{b}	1.01^{a}	50.88^{a}	50.00
7	Miya	14.73^{a}	3.60^{a}	86.73^{b}	60365^{ab}	21.04^{a}	184920^{a}	4.66^{a}	34.80^{b}	46.67
8	Melkashola	18.80^{a}	3.80^{a}	84.93^{b}	677222^{ab}	35.72^{a}	218254^{a}	3.04^{a}	26.51^{b}	43.33
Mean		16.69	3.39	96.46	612058.7	22.62	136805.6	2.73	35.44	35.62
CV%		29.91	14.11	12.42	22.03	12.42	18.22	17.53	19.0	34.06

NCPP=number of clusters per plant, NFPC= number of fruits per cluster, PH = Plant height in centimeter, MN = Marketable number of fruits per hectare, MY=Marketable yield ton per hectare, UMN= Unmarketable number of fruits per hectare, UMY =unmarketable yield ton per hectare, AWT= average weight of tomato fruit in gram, LBS=late blight severity.

Table 4. Yield and yield related traits of tomato varieties at Ataye, 2018

	Treatment	NCPP	NFPC	PH (cm)	MN (ha^{-1})	MY ($t\ ha^{-1}$)	UMN (ha^{-1})	UMY ($t\ ha^{-1}$)	AWT (gm)	LBS
1	Sirinka 1	10.4^{a}	3.3^{a}	73.33^{bc}	719798^{a}	23.54^{a}	58730^{a}	0.8^{a}	32.65^{b}	33.33
2	Weyno	10.8^{a}	3.4^{a}	89.73^{ab}	905092^{a}	25.82^{a}	112698^{a}	2.2^{a}	27.80^{b}	30.00
3	Mersa	10.8^{a}	4.0^{a}	100.33^{a}	1027579^{a}	19.63^{a}	114286^{a}	1.4^{a}	21.23^{b}	26.67
4	Melkasalsa	11.7^{a}	3.9^{a}	58.93^{cd}	628175^{a}	39.58^{a}	212698^{a}	3.4^{a}	18.89^{b}	23.33
5	Chochoro	8.6^{a}	2.7^{a}	53.86^{cd}	587037^{a}	18.68^{a}	61111^{a}	1.4^{a}	38.48^{b}	30.00
6	D2	7.2^{a}	2.6^{a}	49.66d	280776^{a}	22.90^{a}	64286^{a}	3.1^{a}	71.63^{a}	56.67
7	Miya	12.3^{a}	3.6^{a}	71.40^{bc}	1123457^{a}	32.14^{a}	161111^{a}	2.5^{a}	26.92^{b}	28.33
8	Melkashola	12.0^{a}	3.7^{a}	49.86^{d}	878307^{a}	30.23^{a}	121428^{a}	1.4^{a}	24.89^{b}	11.67
Mean		10.5	3.4	68.39	7687776	26.56	113293.6	2.07	32.81	30.01
CV%		4.61	23.31	15.97	29.20	25.37	30.81	29.11	19.22	31.37

NCPP=number of clusters per plant, NFPC= number of fruits per cluster, PH = Plant height in centimeter, MN = Marketable number of fruits per hectare, MY=Marketable yield ton per hectare, UMN= Unmarketable number of fruits per hectare, UMY =unmarketable yield ton per hectare, AWT= average weight of tomato fruit in gram, LBS=late blight severity.

Bartlett test of homogeneity of error variance has confirmed the validity of combined analysis of variance for all measured traits (Table 5). The combined analysis of variance revealed that there was significant difference among the

the Mersa. Abrham et al. (2018) and Masho et al. (2016) also reported the lowest number of fruits per cluster of (3.43) and (2.46), respectively from the variety Chochoro. The variety Mersa was the tallest followed by the variety Weyno with 110.96 cm and 110.5 cm respectively, while variety D2 was the shortest (Table 6). These results were in complete accordance with the work of Masho et al. (2016) and Mesfin (2022) who reported that the variety Mersa and Weyno were the tallest variety while variety D2 was the shortest variety. The variety Mersa has given the maximum marketable number of fruits followed by the varieties Miya and Weyno varieties. These three varieties were however statistically similar in their marketable number of fruits.

Variety D2 has given the highest fruit weight (61.25 g) followed by the variety Cochoro (46.46 g). This result is in complete conformity with the finding of Masho et al. (2016) who scored the maximum average fruit weight from these two varieties. On the contrary, the lowest fruit weight (22.22 g) was scored from the Melkasalsa variety (Table 5), which is in agreement with the finding of Seifudin et al. (2016) and Mesfin (2022) who also reported that the fruit size of the variety Melkasalsa was very low. Though it is non-significant, variety Melkashola has given the

Table 5. Combined ANOVA of Yield and yield related traits of tomato varieties at Shewarobit and Ataye and Bartlett test of homogeneity of error variance

	Source of Variation	NCPP	NFPC	PH	MN	MY	UMN	UMY	AWT	LBS
1	Location	462.52**	0.003NS	9458.46**	294729NS	18645.66NS	663374NS	516.46NS	83.31NS	0NS
2	Replication (Location)	14.56NS	0.626NS	380.76*	156390NS	53079.60**	177921NS	223.66**	207.34NS	0**
3	Treatment	10.82NS	1.48**	2350.43**	298666**	17196.63NS	167941**	340.04NS	1043.06**	0NS
4	Location * Treatment	8.11NS	0.11NS	134.20NS	633210NS	8616.50NS	549477NS	395.29NS	175.72NS	0NS
	Pr > X^2	0.9686	0.2044	0.3805	0.2941	0.6402	0.3721	0.1038	0.1102	0

NCPP=number of clusters per plant, NFPC= number of fruits per cluster, PH = Plant height in centimeter, MN = Marketable number of fruits per hectare, MY=Marketable yield ton per hectare, UMN= Unmarketable number of fruits per hectare, UMY =unmarketable yield ton per hectare, AWT= average weight of tomato fruit in gram, LBS=late blight severity.

Table 6. Combined mean yield and yield related traits of tomato varieties at Shewarobit and Ataye, 2018

Treatment		NCPP	NFPC	PH (cm)	MN (ha^{-1})	MY (tha^{-1})	UMN (ha^{-1})	UMY ($t\ ha^{-1}$)	AWT	LBS
1	Sirinka 1	12.8a	3.56a	92.16b	645038ab	20.71a	102778 ab	1.79a	31.79 c	28.33
2	Weyno	13.7a	3.46a	110.5a	857186a	25.94a	144445 a	3.32a	29.39 c	40.00
3	Mersa	12.9a	3.83a	110.96a	913484a	20.82a	134921 a	1.85a	25.33 c	19.17
4	Melkasalsa	15.7a	3.73a	68.96cd	731085ab	30.95a	177381 a	2.74a	22.22 c	23.33
5	Chochoro	12.9a	2.6b	69.16cd	470463bc	18.92a	51587 b	1.57a	46.46 b	33.33
6	D2	11.8a	2.63b	61.20d	264771c	19.84a	46429 b	2.05a	61.25 a	53.33
7	Miya	13.5a	3.6a	79.06bc	863554a	26.59a	173016 a	3.62a	30.85 c	37.50
8	Melkashola	15.4a	3.7a	67.4cd	777765ab	32.98a	169841 a	2.25a	25.7 c	27.50
Mean		13.6	3.4	82.44	690418.1	24.59	125049.6	2.4	34.12	32.81
CV%		28.4	19.29	13.91	16.5	18.6	16.71	17.34	20.15	33.15

NCPP=number of clusters per plant, NFPC= number of fruits per cluster, PH = Plant height in centimeter, MN = Marketable number of fruits per hectare, MY=Marketable yield ton per hectare, UMN= Unmarketable number of fruits per hectare, UMY =unmarketable yield ton per hectare, AWT= average weight of tomato fruit in gram, LBS=late blight severity.

highest marketable yield of 32.98 t ha-1, followed by variety Melkasalsa (30.95 t ha-1) with yield advantages of 74% and 63%, respectively, as compared to the lowest yielding variety Chochoro which has given 18.92 t ha-1.

3.1. Correlation Analysis

The correlation analysis has confirmed the presence of strong positive correlation between the unmarketable numbers of fruits and the unmarketable yield. Also, there is a positive correlation between the marketable number of fruits and the marketable yield. This result is in agreement with the findings of Yeshiwas *et al.,* 2016, Mesfin (2022) and Ademe and Melaku (2023) who reported that number of fruits per plant were positively correlated with the marketable yield of the varieties. On the contrary negative correlation was observed between the average weight of tomato fruit and the marketable number of fruits per hectare; the number of fruits per cluster and the unmarketable number of fruits per hectare (Table 7). This indicates that when the number of fruits per cluster and the marketable and unmarketable number of fruits increase the average weight of the fruit decreases accordingly. In general, tomato fruits obtained from varieties with less number of fruit per plant are bigger in size (Seifudin, 2016).

3.2. Farmers' preferences

The participated tomato growing farmers, after making a group discussion they have set transportability, taste, shape, late blight disease tolerance, market demand and yield as a selection criteria to identify best tomato variety. Using pair-wise ranking the selected criteria was ranked by the farmers by comparing the selection criteria with each other. Based on their ranking, market demand, disease tolerance and transportability were selected as the top three most important attributes to compare the tested varieties (Table 8). Mesfin 2022 also reported that farmers at Kobo district of Northern Ethiopia have used yield, fruit size, fruit color, fruit shape and disease resistance as selection criteria to compare and rank tomato varieties though there was little difference on ranking of the attributes as they have ranked productivity, market preference and diseases resistance as the top three priorities attributes for the selection of tomato varieties. Using each selection attributes, the farmers compared the tested tomato

Table 7. Correlation analysis of yield and yield related traits of tomato varieties

	NCPP	NFPC	PH	MN	MY	UNMN	UNMY	AVW
NCPP	1							
NFPC	0.14252ns	1						
PH	0.302*	0.25975ns	1					
MN	-0.01536ns	0.17646ns	0.15244ns	1				
MY	0.03493ns	0.0211ns	-0.07293ns	0.47705**	1			
UNMN	0.41163**	0.38787**	0.2238ns	0.32735*	0.32376*	1		
UNMY	0.28295ns	0.166ns	0.21755ns	0.14327ns	0.37531**	0.71525**	1	
AVW	-0.53337ns	-0.53337**	-0.20904ns	-0.47592**	0.02229ns	-0.45343**	0.07478ns	1

NCPP=number of cluster per plant, NFPC= number of fruit per cluster, PH = Plant height MN = Marketable number per hectare, MY=Marketable yield ton per hectare, UMN= Unmarketable number per hectare, UMY=unmarketable yield quintal per hectare, AWT= average weight of tomato in gram.

Table 8. Pairwise ranking of selection attributes for tomato at Shewarobit, 2018

Attributes	Transportability	Taste	Shape	Disease tolerance	Market demand	Yield	Scores	Rank
Transportability		TR	TR	DT	MD	TR	3	3
Taste			TA	DT	MD	TA	2	4
Shape				DT	MD	YD	0	6
Disease Tolerance					MD	DT	4	2
Market Demand						MD	5	1
Yield							1	5

TR: transportability, TA: taste, SH: shape, DT: disease tolerance, MD: market demand, YD: yield varieties by giving a scores of 1 to 5 (1, 2, 3, 4, and 5 representing very good, good, moderate, poor, and very poor, respectively). Accordingly, based on their overall mean values variety Melkashola, Mersa and Cochero were the top three selected varieties by the farmers (Table 9).

Table 9. Farmer's preference ranking matrix summary sheet

	Mean of farmers selection attributes							
Varieties	Market Demand	Disease tolerance	Transpor-tability	Taste	Yield	Shape	Mean	Rank
Melkashola	1.80	2.80	2.8	2.0	1.6	2.54	2.26	1
Mersa	2.46	2.54	3.0	2.54	2.15	2.4	2.52	2
Cochero	2.46	2.30	1.7	3.1	3.46	2.46	2.6	3
Melkaselsa	3.77	3.54	3.4	3.6	3.6	3.7	3.6	4
Miya	4.50	3.77	4.1	3.6	4.15	3.9	4.0	5

N.B. Mean value 1= Best, 5 = Least

Variety Melkashola was their first choice as it was better than other varieties in terms of expected yield, market demand and convenience in transportability. On the other end, the variety Miya was the least preferred variety by the farmers though it had the highest number of fruits per cluster and marketable number of fruits on the combined analysis of variance. This finding is in agreement with the findings of Tewodros and Negasi (2014) who reported that the variety Melkashola was the most preferred variety by Areka and Gofa districts tomato growing farmers. In addition Seifudin (2016) and Mesfin (2022) also reported that variety Miya was the least preferred variety by farmers among the tested tomato varieties evaluated at Delo Mena and Barbare districts of Bale zone of South Eastern Ethiopia and Kobo district of Northern Ethiopia respectively.

4. CONCLUSION

A smart strategy to boost crop yield and productivity as well as the rate at which new varieties are adopted is to take farmers' preferences into consideration when choosing varieties. Therefore, eight released varieties were assessed in Ataye and Shewarobit in North Shewa, Amhara Region using a participative approach in order to discover and recommend adaptable, disease-resistant, and high-yielding types. The combined analysis of variance showed that there were substantial differences between the tested types in terms of the average fruit weight, the average number of fruits per cluster, the height of the plants, and the number of fruits that could be sold. The variety Melkashola produced the most fruits per cluster. The variety Melkashola has produced the best commercial yield and displayed a stronger response to the late blight disease, despite the fact that it was not statistically significant. In addition, farmers favoured the Melkashola variety over all others. Therefore, variety Melkashola has been suggested for production in Ataye, Shewarobit and other related agro-ecologies based on biological data and farmer preferences. In the future studies the optimum fertilizer packages will be explored for the recommended variety.

ACKNOWLEDGMENTS

The authors would like to thank Amhara Regional Agricultural Research Institute, Debre Birhan Agricultural research center for financial and logistics support for conducting this experiment.

REFERENCES

Abrham, S., Selamawit, K., Yosef, A., Lemma, A. (2018). Participatory tomato (*Lycopersicum esculentum* Mill) variety evaluation and selection for yield and quality in Wolaita Zone, Southern Ethiopia. *International Journal of Agronomy and Agricultural Research* (IJAAR), 12(4), 70-77.

Ademe, M., Melaku, A. (2023). Participatory evaluation of tomato (Lycopersicon esculentum Mill.) varieties under irrigation condition at Abergelle Woreda, Ethiopia. Agro Bali : Agricultural Journal, 6(1).

Agrisnet. (2010). Tomato. Department of Agriculture, Sikkim, India.

CSA (Central Statistical Agency). (2018). Federal Democratic Republic of Ethiopia. Central Statistical Agency Agricultural Sample Survey 2017 / 2018 (2010 E.C.): Report on Area and

Production of Major Crops (Private Peasant Holdings, Meher Season). Statistical bulletin 586. Addis Ababa, Ethiopia.

Dessalegn, L., Shimels, A., Ketema, S., Abyote, A. (2008). Varietal development of major vegetables in the rift valley region: *Proceedings of the First Conference of Ethiopian Horticulture Science Society* 23-24 March 2006, Addis Ababa, Ethiopia, pp. 83-89.

FAO (Food and Agricultural Organization). (2021). *World Food and Agriculture – Statistical Yearbook 2021.* Rome.

Getachew, E., Neim, S., Tewodros, M. (2019). Adaptation of Released Tomato Varieties (Solanum lycopersicum L.) Under Jimma Condition South West Ethiopia. *Journal of Natural Sciences Research,* 9(20).

Gezahegn, F., Awoke, M., Alemayehu, W. (2022). Adaptability evaluation of improved Tomato (*Lycopersicon esculentum* Mill.) varieties for yield and other quantitative traits in Arba Minch, Southern Ethiopia. Int. J. Agril. Res. Innov. Tech, 12(1), 79-83.

IPGRI, ECP/GR, AVRDC. (2001). Descriptors for *Tomato* (*Lycopersicon* spp.). International Plant Genetic Resources Institute, Rome, Italy; European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR), Asian Vegetable Research and Development Center, Taiwan

Kelley, T., Boyhan, G., Harrison, E., Kerry, A., Sumner, P., Langston, D., Sparks, A., Culpepper, S., Hurst, W., Fonsah, E. (2014). Commercial tomato production hand book. UGA-Extension, USA, pp. 48.

Masho, A., Melkamu, A., Getachew, A. (2016). Performance evaluation of tomato varaieties for irrigation production system in Mecha District of west Gojiam Zone, Amhara Region, Ethiopia.

Melese, W., Samuel, S. (2018). Review on Disease Management Practice of Tomato Wilt Caused Fusarium oxysporum in Case of Ethiopia. Journal of Plant Pathology and Microbiology, 9(1), 460.

Mesfin, K. (2022). Variability and participatory evaluation of Tomato (*Lycopersicum Esculentum*, Mill.) genotypes for growth, yield and quality parameters in Kobo District of North Wollo Zone, Amhara Region, Ethiopia. M.Sc. Thesis, Bahir Dar University.

Russell, T. (1997). “Pair-wise ranking made easy,” in PLA Notes No 28, Methodological Complementarity International Institute of Environmental and Development (IIED), London, UK.

SAS (Statistical Analysis Software). (2013). Users’ Guide Statistics Version 9.4. SAS Institute Inc., Cary.

Seifudin, M., Mohammed, B., Yonas, W. (2016). Participatory variety selection of improved tomato (Lycopersicum esculentum Mill.) varieties in the lowlands of Bale, South Eastern Ethiopia. African Journal of Agricultural Economics and Rural Development, 4(7), 458-462.

Tewodros, M., Tekeste, N. (2014). Evaluation of improved tomato (*Solanum lycopersicum* L.) varieties through participatory approach in South Ethiopia. Herald J Agric Food Sci Res, 3(1), 55-60.

William, T.K., George, B. (2006). Commercial Tomato Production Hand book: History, Significance, Classification and Growth. University of Georgia, USA.

Yeshiwas, Y., Belew, D. Tolessa, K. (2016). Tomato (*Solanum lycopersicum* L.) yield and fruit quality attributes as affected by varieties and growth conditions. World Journal of Agric ultural Science,12(6), 404-408.