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STUDY ON AGRONOMIC EVALUATION OF TOMATO (*LYCOPERSICON ESCULENTUM, MILL.*) VARIETIES FOR PHONOLOGICAL, GROWTH AND YIELD CHARACTERS

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ABSTRACT

The field experiment was carried out at the research station of Mehoni Agricultural Research Center, Fachagama, Ethiopia in 2013 and 2014 cropping season under irrigation and in 2014 for rain fed experiment only. The experiment consisted of four commercial tomato varieties arranged in a completely randomized block design with four replications. In the 2013 cropping season, days to 50% flowering and maturity, plant height, fruit length, fruit diameter, number of fruits per plant, marketable yield, unmarketable yield and total yield were significantly influenced by varietal difference. Likewise, it was also observed that variety exerted a significance effect on establishment percentage, days to 50% maturity, plant height, number of fruits/plant and marketable yield under both irrigation and rain fed and on unmarketable yield under irrigation conditions of the 2014 cropping year. Under irrigation, the highest marketable yield (414.58 q ha^{-1}) was obtained at Chali variety followed by Miya variety (289.17 q ha-^{1}) in 2014 while the lowest value (110.83 q ha^{-1}) was obtained from Melka sholla in the 2013 cropping season. Whereas the highest (295.58 q ha-1) and lowest marketable yields (283.33 q ha-1) were observed at Chali and Melksa sholla varieties under rain fed condition of the 2014 cropping season.

Keywords: Tomato, Marketable yield, Phonological, Growth, Yield characters, Unmarketable yield, Total yield.

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Contribution/Originality

The paper`s primary contribution is finding that to study the agronomic evaluation of tomato (Lycopersicon esculentum, Mill) varieties for phonological, growth and yield related characters. In that case it provides tangible information and addresses the issues of best adaptable varieties to the specific agro-ecology for tomato growers.

1. INTRODUCTION

Tomato (*Lycospersicon esculentum* Mill) belongs to the family Solanaceae, genus *Lycopersicon*, which is relatively small genus within the large and diverse family consisting of approximately 90 genera. *Lycopersicon* species are native to Ecuador, Peru, and the Galapagon Island though most evidence suggests that the site of domestication was Mexico [1].

It is an essential component of human diet for the supply of vitamins, minerals and certain types of hormones precursors in addition to protein and energy [2, 3]. Commercially tomato is very important throughout the world for both fresh fruit market and processing. Tomato occupied 2.4 million hectares in the world with leadership of Europe followed by Asia and America and produced each year, more than 4 million tones of tomato, but only 15% is produced in the tropics. This is mainly due to climate and to the production techniques which are not well developed [4].

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Tomato plays an important role in human nutrition by providing essential amino acids, vitamins and minerals [5]. Its vitamin C content is particularly high [6]. It also contains lycopene, which is very potent antioxidant that may be an important contributor to the prevention of cancers [7].

Its total production of more than 150 million tons of fresh fruit, produced on 3.7 million hectares, exceeds all other crops, with the exception of the potato and sweet potato [8]. Tomato is cultivated in both temperate and tropical regions of the world. It has very attractive and tasty fruit with a bright red colour that makes it even more appetizing to the consumer. It is consumed in a variety of ways: fresh in salads and sandwiches, cooked, or processed in ketchup, sauces, juices or dried powder.

Tomato is among the most important vegetable crops and both fresh and processed tomato varieties are popular and economically important vegetable crops produced in Ethiopia. According to Lemma, et al. [9] the total production of tomato in the Ethiopia has shown a marked increase recently, indicating that it became the most profitable crop providing a higher income to small scale farmers compared to other vegetable crops. However, the national average of tomato fruit yield under farmers' conditions in Ethiopia is very low and estimated at about 25 t ha^{-1} [10]. A number of improved varieties and other agronomic packages have been recommended to the users to overcome the low productivity and quality of tomato in the country.

In recent times, tomato crops are the most important cultivated crops in the agricultural community of Ethiopia and it is rapidly becoming a popular vegetable among producer and consumers. According to the CSA [11] report, the total area production of tomato in the country was 7,257.45 ha with production of 393,730.22 quintal and yield of 54.25 q ha^{-1}. For proper productivity and production of tomato, good management and cultural practices, development of new cultivars and valuation of the available tomato cultivars are the sustainable strategies. The development of new cultivars is a time taken and luxurious process which also needs professional scientists especially those of plant breeders, horticulturalists and agronomists. However, the assessment of the existing and available tomato cultivars for their amendment and production in the climatic conditions of Ethiopia, particularly to the area where the experiment is conducted is a more rapidly way to improve the tomato production potential.

Farmers and tomato growers in the study area prefer tomato cultivars for planting depending on a number of aspects which involves yield potential, market stipulate, provincial adaptability and accessibility of seeds corresponding with their prices. One of the major tomato production hindrances in the study area is lack of high eminence seeds, post harvest management, insect and disease management, integrated nutrient and water management and their use efficiency and inappropriate agronomic practices used by farmers and growers. Those seeds found at growers and farmers hand are usually low viability, vigor and genetic purity; however, very expensive and are low productive, germination capacity and vulnerable to different environmental stresses.

In spite of the miscellaneous compensation of tomato have, research works in Ethiopia, for the most part in the study area on this valuable commodity have been inadequate. This deficit of information on appraise of best adapting cultivar is considered to be among the major hindrance to get on large production and consumption of this economically important crop in the particular area. As a result, it is necessary to evaluate suitable agronomical conditions and well malleable cultivars that would enable to capitalize on growth and yield of tomato plant. For that reason, the objective of this study was to evaluate performance of tomato cultivars for their phonological, agronomic and yield characters under the specific study area.

2. MATERIALS AND METHODS

The field experiment was carried out at the research station of Mehoni Agricultural Research Center (MeARC), Ethiopia in 2013 under irrigation and 2014 under both irrigation and rain fed conditions. The center is situated at about 678 km north of Addis Ababa. Geographically it is located at 12° 41' 50" North latitude and 39° 42' 08" East longitude with an altitude of 1578 m.a.s.l. The site receives mean annual rainfall of 750 mm with an average

minimum and maximum temperature of 18 and 25°C, respectively. The soil textural class of the experimental area is clay loam with pH of 7.9.

Treatments were arranged in a randomized complete block design (RCBD) with four replications. Seeds of four tomato varieties, namely; Miya, Chali, Melka salsa and Melka shola were sown in seedbeds and grown at the nursery for 30 days. Uniformly grown seedlings were selected, hardened and transplanted to the experimental field after attaining 13-15 cm height or 30 days of sowing in the nursery site. Seedlings of tomato taken from the nursery were transplanted to experimental field having a plot size of 5 m length and 5 m width. During the experiment seedlings were planted at 70x30 cm between rows and plants, respectively. A spacing of 1.5 m and 1 m was also maintained between replications and rows. Plants in the 5 middle rows out of the 7 rows per plot constituted the net plot used as the sampling unit. Ten plants from the middle rows were taken for sampling and data analysis. All appropriate agronomic practices such as weeding, watering and hoeing were conducted uniformly both at the nursery and experimental field.

Data on establishment percentage, plant height (cm), days to 50% flowering, days to 50% maturity, Fruit length (cm), fruit diameter (cm), number of fruits per plant, marketable yield (q ha^{-1}), unmarketable yield (q ha^{-1})) and total yield (q ha^{-1}) was collected and analyzed.

Data on phonological, agronomic and yield components were subjected to analysis of variance (ANOVA) using SAS PROC GLM (2002) at $P<0.05$. The Least Significant Difference (LSD) Test was used to compare the mean separations at $P<0.05$

3. RESULTS AND DISCUSSION

3.1. Phonological and Growth Characters

3.1.1. Establishment Percentage

Analysis of variance Table 1 revealed that variety did not exert any significant influence ($P>0.05$) on establishment percentage in 2013, which, however it was significantly ($P<0.05$) affected in 2014 cropping season under both irrigation and rain fed condition (Table 1 and 6). In 2014 under irrigation condition, significantly higher establishment percentage (84.61%) was obtained at Chali which, however, did not statistically different with Melka sholla (83.23%) variety; whereas, significantly lower establishment percentage was obtained at Melka salsa (71.79%) which was at parity (75.90%) with Miya varieties (Table 3). On the other hand, in 2014 under rain fed the highest establishment percentage (88.65%) was recorded at variety Chali while the lower value (74.83%) was evidenced at Melka salsa variety (Table 7).

3.1.2. Days To 50% Flowering

Table 1 also indicated that days to 50%flowering, which was found highly significant, in which the maximum days to 50% flowering were observed in variety Melka sholla (53.00 days) followed by Cahli variety (48.33 days), where as the minimum value was observed in Miya variety having 45.00 days under irrigation condition of 2013 (Table 3). However, days to 50% flowering was not affected by the varietal effect in both irrigation and rain fed conditions of 2014 cropping year (Table 1 and 6). Therefore, from the 2013 cropping year with irrigation, Miya was flowered much earlier than those other three tomato varieties.

3.1.3. Days to 50% Maturity

The effect of variety on days to 50% maturity (Table 1 and 6) was indicated significant effect ($P<0.05$) in both irrigation and rain fed conditions of the 2014 cropping year and it exerted very highly significant influence ($P<0.001$) in 2013 under irrigation condition (Table 1). Concerning the mean value in 2013 and 2014 cropping season under irrigation, significantly higher and lower days to 50% maturity were found 86.33, 76.67 and 100.67, 90.67 days, at those varieties of Melka sholla, Miya and Melka sholla and Chali, respectively (Table 3). Conversely,

in 2014 growing season with rain fed, the highest (99.67 days) days to 50% maturity was recorded at Melka sholla followed by Melka salsa (97.67 days) and were both statistically at parity while the lowest value (89.67 days) was observed at Chali variety (Table 7). This showed that both Miya and Chali matured much earlier than that of Melka sholla variety.

3.1.4. Plant Height

The results from the analysis of variance data revealed that there was significant and highly significant effect ($P<0.05$ and $P<0.010$) on tomato plant height by varietal difference under the irrigation condition of both 2013 and 2014 cropping years, respectively (Table 1) and to the same extent variety was put forth very highly significant influence ($P<0.001$) on plant height in 2014 under rain fed condition (Table 6). Based on the mean comparison Table 3 drastically higher plant height (66.28 cm) was obtained from Melka sholla followed by Melka salsa (61.08 cm) while the lowest plant height (53.47 cm) was obtained at Chali variety, which however, did not statistically different with variety Miya (56.43 cm). Similarly, in the 2014 cropping year under rain fed the highest plant height (68.80 cm) was produced from variety Miya whereas the lowest value (60.12 cm) was recorded in variety Chali which was on par with Melka sholla variety having 60.60 cm (Table 7).

3.1.5. Fruit Length

This agronomic character was significantly influenced ($P<0.05$) by the varietal difference of tomato plant by using irrigation in 2013 cropping year (Table 1). Nevertheless, it was not significantly affected ($P>0.05$) in 2014 cropping period under both irrigation and rain fed provision (Table 1 and 6). In 2013, Melka salsa was produced the highest fruit length (5.45 cm); which did not statistically different with Melka sholla variety (5.33 cm) and Chali (5.14 cm). But the lowest fruit length (4.70 cm) was obtained from Miya variety (Table 4).

3.1.6. Fruit Diameter

Fruit diameter had been significantly affected ($P<0.01$) due to the variation in variety in 2013 with irrigation; which, however, it did not influenced ($P>0.05$) in 2014 cropping year under both irrigation and rain fed stipulation (Table 2 and 6). In 2013, cropping season Miya variety produced significantly higher fruit diameter (4.59 cm); however, it was statistically at par with those of Chali (4.44 cm) and Melka sholla (4.07 cm). Nevertheless, the lower fruit diameter (3.07 cm) was obtained at variety Melka salsa (Table 4).

3.2. Yield Components

3.2.1. Number of Fruits per Plant

Results from the two years experiment under both irrigation and rain fed condition, showed that variety had significant influence on number of fruits per plant. Variety had been exerted highly significant ($P<0.01$) influence in 2013 cropping year while it had significant ($P<0.05$) effect in 2014 under both irrigation and rain fed conditions (Table 2 and 6). In 2013 cropping year, significantly higher (44.67) fruit number per plant was obtained at Melka salsa variety followed by Chali (41.33). But significantly lower (37.33) number of fruits per plant was obtained at Miya variety (Table 4). In similar manner, the highest number of fruits per plant was also found at Melksa sholla (38.00) followed by Chali (36.67) and Melka salsa (34.33) and at Melksa sholla (39.10) followed by Chali (37.77) and Melka salsa (35.43) in 2014 under both irrigation and rain fed, respectively. However, the lowest values of number of fruits per plant (37.33, 30.67 and 31.77) were obtained from Miya variety in 2013 under irrigation and 2014 under off and main seasons (Table 4 and 7).

3.2.2. Marketable Yield

Analysis of variance, Table 2 and 6 indicated that the presence of a highly significant difference among the different varieties ($P<0.01$) in 2014 cropping year under both irrigation and rain fed conditions and significant ($P<0.05$) in 2013 under irrigation (Table 2). The mean comparison Table 4 revealed that in 2013, Chali produced considerably higher (219.03 q ha^{-1}) marketable yield followed by Melka salsa (195.67 q ha^{-1}) and Miya (171.33 q ha^{-1}). However, significantly lower (110.83 q ha^{-1}) marketable yield was obtained at Melka sholla variety. On the other hand in 2014, the highest (414.58 q ha^{-1}) and (295.58 q ha^{-1}) marketable yield was recorded at Chali variety in both irrigation and rain fed condition, respectively. On the contrary, the lowest (248.75 q ha^{-1}) and (283.33 q ha^{-1}) marketable yield values were recorded at those varieties of Melka sholla and Melka salsa under irrigation and rain fed season, correspondingly (Table 4 and 7). In 2013, according to the mean of marketable yield Chali was superior by 97.63% from the lowest yielder of Melka salsa variety. Likewise, in 2014 under irrigation condition, Chali was advanced by 66.67% over Melka sholla variety.

3.2.3. Unmarketable Yield

Mean square of analysis of variance, Table 2 revealed that the existence of significant difference ($P<0.001$ and $P<0.01$) for unmarketable yield due to variation in variety under irrigation in 2013 and 2014 cropping season, respectively. However, in 2014 under the rain fed condition it did not significantly ($P>0.05$) influenced by the tomato varietal difference (Table 6). In 2013, the highest unmarketable yield (94.10 q ha^{-1}) was obtained from Miya variety; however it was statistically at parity with those of Chali (88.00 q ha^{-1}) and Melka salsa (74.30 q ha^{-1}) whereas the lowest value (35.67 q ha^{-1}) was obtained from Melka sholla variety. On the other hand, in the 2014 cropping year through the application of irrigation, the highest (217.08 q ha^{-1}) and lowest (77.92 q ha^{-1}) unmarketable yields were produced from those tomato varieties of Melka sholla and Chali, respectively (Table 5). Likewise, even though there was no significant difference among the treatment means in 2014 under rain fed conditions, both slightly higher (206.04 q ha^{-1}) and lower (133.58 q ha^{-1}) unmarketable yield values were obtained from Melka salsa and Chali varieties, correspondingly (Table 7).

3.2.4. Total Yield

There was significant difference on total yield with respect to varietal effect of tomato plant. In 2013, variety exerted highly significant ($P<0.01$) effect on total yield (Table 2); which, however, did not influence ($P>0.05$) in 2014 under both irrigation and rain fed conditions (Table 2 and 6). Considerably higher total yield (307.03 q ha^{-1}) was obtained from Chali variety; however, it did not statistically different with Melka salsa (270.00 q ha^{-1}) and Miya (265.43 q ha^{-1}) varieties. On the contrary, the lower total yield value (146.50 q ha^{-1}) was obtained at Melka sholla variety (Table 5). Even though variety did not affected the total yield of tomato in 2014 under both irrigation and rain fed conditions Chali variety was produced somewhat higher (492.50 and 429.17 q ha^{-1}) total yield; but both Melka sholla and Melka salsa were produced lower (465.83 and 421.38 q ha^{-1}) total yield, respectively (Table 5 and 7).

Table-1. Mean square from the first year (2013) and second year (2014) analysis of variance for performance of tomato under irrigation condition

SOV	DF	Establishment (%)		Days to 50% flowering		Days to 50% maturity		Plant height (cm)		Fruit length (cm)	
		2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Replication	2	13.21	128.92	1.00	20.08	16.33	21.58	3.49	0.85	0.02	0.24
Variety	3	73.72^{ns}	110.92*	33.22**	22.75^{ns}	29.64***	60.08*	94.13*	26.04**	0.33*	0.07^{ns}
Error	6	82.89	22.03	1.89	23.08	1.22	9.25	15.10	1.17	0.05	0.18
CV (%)		11.49	5.95	2.83	7.58	1.34	3.17	6.55	7.53	4.19	8.21

ns; not significant at P< 0.05, * significant at P< 0.05; ** significant at P<0.01 and *** significant at P< 0.001 probability level.

Table-2. Mean square from the first year (2013) and second year (2014) analysis of variance for performance of tomato under irrigation condition (*Continued*)

SOV	DF	Fruit diameter (cm)		Number of fruits/plant		Marketable yield (q ha^{-1})		Unmarketable yield (q ha^{-1})		Total yield (q ha^{-1})	
		2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Replication	2	0.08	0.58	27.75	5.08	127.53	3.63	119.63	9.76	427.68	462.02
Variety	3	1.40**	0.40^{ns}	229.78**	30.92*	6494.40*	104.38**	2065.76***	78.95**	14572.81**	230.08^{ns}
Error	6	0.10	0.33	11.53	5.64	818.51	7.06	113.32	5.09	1149.65	1272.24
CV (%)		7.70	13.69	9.18	6.80	16.42	10.83	15.93	16.35	13.71	9.30

ns; not significant at P< 0.05, * significant at P< 0.05; ** significant at P<0.01 and *** significant at P< 0.001 probability level.

Table-3. Mean performance of tomato varieties from the first year (2013) and second year (2014) analysis of variance for performance of tomato under irrigation condition

Variety	Establishment age (%)			Days to 50% flowering			Days to 50% maturity			Plant height (cm)		
	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean
Chali	80.23	84.61a	82.42	48.33b	61.33	54.83	83.00b	90.67c	86.84	53.47b	59.45c	56.46
Miya	83.93	75.90ab	79.92	45.00c	63.33	54.17	76.67c	94.33bc	85.50	56.43b	64.03b	60.23
Melka salsa	80.72	71.79b	76.26	47.67bc	67.33	57.50	82.33b	98.67ab	90.50	61.08ab	66.47a	63.78
Melka sholla	72.28	83.23a	77.76	53.00a	61.67	57.34	86.33a	100.67a	93.50	66.28a	64.27b	65.28
LSD $_{0.05}$	ns	9.34		2.75	ns		2.21	6.08		7.76	2.16	
CV (%)	11.49	5.95		2.83	7.58		1.34	3.17		6.55	7.53	

Means followed by the same letter in the same column are not significantly different at 5% level of probability.

Table-4. Mean performance of tomato varieties from the first year (2013) and second year (2014) analysis of variance for performance of tomato under irrigation condition (*Continued*)

Variety	Fruit length (cm)			Fruit diameter (cm)			Number of fruits/plant			Marketable yield (q ha^{-1})		
	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean
Chali	5.14a	5.07	5.11	4.44a	4.60	4.52	41.33ab	36.67a	39.00	219.03a	414.58a	316.81
Miya	4.70b	5.35	5.03	4.59a	3.77	4.18	37.33b	30.67b	34.00	171.33a	289.17b	230.25
Melka salsa	5.45a	5.20	5.33	3.07b	4.10	3.59	44.67a	34.33ab	39.50	195.67a	275.00b	235.34
Melka sholla	5.33a	5.00	5.17	4.07a	4.40	4.24	24.67c	38.00a	31.34	110.83b	248.75b	179.79
LSD $_{0.05}$	0.43	ns		0.62	ns		6.78	4.74		57.16	5.31	
CV (%)	4.19	8.21		7.70	13.69		9.18	6.80		16.42	10.83	

Means followed by the same letter in the same column are not significantly different at 5% level of probability.

Table-5. Mean performance of tomato varieties from the first year (2013) and second year (2014) analysis of variance for performance of tomato under irrigation condition (*Continued*)

Variety	Unmarketable yield (q ha^{-1})			Total yield (q ha^{-1})		
	2013	2014	Mean	2013	2014	Mean
Chali	88.00a	77.92b	82.96	307.03a	492.50	399.77
Miya	94.10a	189.17a	141.64	265.43a	478.33	371.88
Melka salsa	74.33a	206.04a	140.19	270.00a	481.04	375.52
Melka sholla	35.67b	217.08a	126.38	146.50b	465..83	146.50
LSD $_{0.05}$	23.24	4.51		67.74	ns	
CV (%)	15.93	16.35		13.71	9.30	

Means followed by the same letter in the same column are not significantly different at 5% level of probability.

Table-6. Analysis of variance for performance of tomato varieties under rain fed condition in 2014 cropping season

SOV	DF	EP	D50%F	D50%M	PH	FL	FD	NFPPL	MY	UMY	TY
Replication	2	128.92	20.08	21.58	5.94	0.24	0.58	5.08	50.13	7.12	37.59
Variety	3	110.92*	22.75^{ns}	60.08*	48.16***	0.07^{ns}	0.40^{ns}	30.92*	109.46**	34.37^{ns}	49.24^{ns}
Error	6	22.03	23.08	9.25	0.59	0.18	0.33	5.64	10.08	24.15	24.76
CV (%)		5.95	7.58	3.18	7.53	8.21	13.69	6.80	10.83	3.56	9.30

ns; not significant at P< 0.05, * significant at P< 0.05; ** significant at P<0.01 and *** significant at P< 0.001 probability level.

SOV: Source of variation, DF: Degree of freedom, CV: Coefficient of variance, EP: Establishment percentage, D50%M, Days to 50% maturity, PH: Plant height (cm), FL: Fruit length (cm), FD: Fruit diameter (cm), NFPPL: Number of fruits/plant, MY: Marketable yield (q ha^{-1}), UMY: Unmarketable yield (q ha^{-1}), TY: Total yield (q ha^{-1})

Table-7. Mean performance of tomato varieties under rain fed in 2014 cropping season

Variety	EA	D50%F	D50%M	PH	FL	FD	NFPPL	MY	UMY	TY
Chali	88.65a	61.33	89.67c	60.12c	5.07	4.60	37.77a	295.58a	133.58	429.17
Miya	79.90ab	63.33	93.33bc	64.03b	5.35	3.77	31.77b	283.44b	138.04	425.27
Melka salsa	74.83b	67.33	97.67ab	68.80a	5.20	4.10	35.43ab	283.33b	206.04	421.38
Melka sholla	86.23a	61.67	99.67a	60.60c	5.00	4.40	39.10a	283.75b	138.42	422.17
LSD $_{0.05}$	9.37	ns	6.08	1.54	ns	ns	4.74	66.37	ns	ns
CV (%)	5.95	7.58	3.18	7.53	8.21	13.69	6.80	10.83	3.56	9.30

Means followed by the same letter in the same column are not significantly different at 5% level of probability. LSD: Least significant difference, CV: Coefficient of variance, EA: Establishment percentage, D50%M: Days to 50% maturity, PH: Plant height (cm), FL: Fruit length (cm), FD: Fruit diameter (cm), NFPPL: Number of fruits/plant, MY: Marketable yield (q ha^{-1}), UMY: Unmarketable yield (q ha^{-1}), TY: Total yield (q ha^{-1})

4. CONCLUSION

Tomato (*Lycospersicon esculentum* Mill) belongs to the family Solanaceae, genus *Lycopersicon*, which is a relatively small genus within the large and diverse family. It plays an important role in human nutrition by providing essential amino acids, vitamins and minerals and its vitamin C content is particularly high. It also contains lycopene, a very potent antioxidant that may be an important contributor to the prevention of cancers. From this research output, Chali produced greatly higher (219.03 q ha^{-1}) marketable yield in 2013 whereas significantly lower (110.83 q ha^{-1}) marketable yield was obtained at Melka sholla variety. In 2014 under irrigation condition, the highest (414.58 q ha^{-1}) marketable yield was recorded at Chali variety while this variety also produced higher (295.58 q ha^{-1}) marketable yield under rain fed in the same cropping year. On the contrary, the lowest (248.75 q ha^{-1}) and (283.33 q ha^{-1}) marketable yield values were recorded at Melka sholla and Melka salsa varieties in both irrigation and rain fed conditions, respectively. From the mean of marketable yield Chali was superior by 97.63% from the lowest yielder of Melka salsa variety in 2013 cropping year and it was superior by 66.67% in marketable yield than Melka sholla. Therefore, it could be concluded that Chali variety might be recommended for farmers and growers of tomato plant in the study area.

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