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Research Article

Introduction of superior tomato cultivars (*Lycopersicun escutentum* Mill)

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Abstract

In order to evaluate of twenty-five tomato cultivars for selecting superior genotype(s), an experiment was carried out in Kahriz station of agricultural research center of west Azerbaijan province at two years of 2010-11. Experimental design was Randomized Complete Blocks with three replications. Combined analysis of variance showed that for agronomical and quality related traits were significant differences. Selb-Jino, TO2, Early-Urbana, Carmina, Cal-J-N and Falat-Shof with more than 10.5kg/m^2 had the highest fruit yield. Selb-Jino had more than 260 fruit at per plant, 7.8 flowers at per inflorescence, less than 112 days to first fruit maturity and pH 3.8 at two years. With increasing fruit number at per plant decreased fruit weight. Carmina had 170cm plant height and indeterminate growth. TO4, Chase, Selb-Jino and Carmina with more than 5.2% had the most total soluble solid in fruit. Correlation coefficients of fruit yield with fruit number at per plant (r=0.49*), number of flower in per inflorescence (r=0.48*) were positive and with days to first fruit maturity (r=-0.46*) was negative significant differences. With delaying fruit maturity decreased fruit number (r=-0.78), increased fruit weight (r=0.80**) and pH (r=0.71**). Therefore, varieties with more fruits had low pH (r=-0.75**). From the point of fruit shape Carmina, Nina, Selb-Jno and BSS282 were quite uniform. To4, TO2 and Chase had the most fruit color and Carmia and Seb-Jino were the lowest values. Fruit firmness of cultivars was in four groups of soft, relatively stiff, stiff and very stiff. Blossom-end rot in cultivars of BSS282, Tima and TO4 were less than other varieties. Sunscald was seen in first harvesting. Low percentage of fruit cracking was observed in more varieties and in Selb-Jino, Cal-J, TO2, Carmina and Early Urbana had more amounts.**

Keywords: Genetic diversity, tomato, superior cultivars

INTRODUCTION

Tomato (*Lycopersicun escutentum* Mill.) is a herbaceous of dicotyledonous and has different vegetative period and influenced by environmental conditions (Nika et al., 2005; Kahlo, 1991; Akinfasoye et al., 2011). It is known as an important source of vitamins and minerals due to adequate vitamin A and C, calcium and iron accumulations. Tomato's fruit is consumed in providing salads and cookies. In addition, it is used to can, paste, ketchup, sauce, puree and fruit juice (Maitidevi and Kathmandu, 2008). The approaches to make significant improvement in tomato productions require information regarding nature and magnitude of genetic variation and their interrelationships in the available germplasm, which are important pre-requisites for systematic breeding programs. Several researchers have emphasized the utility of the estimates of genetic components such as coefficient of variation, heritability and expected genetic advance in the prediction of response quantitative and qualitative traits to selection. Golani et al., (2007) in evaluating tomato genotypes with path analysis confirmed that fruit weight had highest positive direct effect followed by number of carpel at per fruit. Wessel-Beaver (1992) point out that heritability and genetic correlations in tomato was high for fruit set, yield and fruit weight.

Although, many of resistant genes are still undiscovered, but in evaluations of wild types identified drought, salinity stresses and insect tolerance damage of genes (Passam et al., 2007; Hanson et al., 2000). Presently, there are demands for improved cultivars for growing under greenhouse and field conditions for different consumes. In Iran planting area and production of tomato are about 150 thousand hectare and 5.7 million ton, respectively in year of 2011 (FAO, 2012). West Azerbaijan province with 5 thousand hectare under planted area and production of 163 thousand ton is one of the important areas.

Evaluation of tomato germ plasm collected from different parts of Kenya showed wide variation in morphological, agronomical and biochemical characterizations. These variations were due to genetic and environmental differences. Also fruit weight was negative significant correlated with fruit number at per plant. In contrast it had positive correlation with length and width fruit (Stevens, 1986). The objective of this experiment was to evaluate of quantitative and qualitative characteristics of twenty-five tomato cultivars under two field conditions and identifying superior genotypes for cultivation in Urmia region.

MATERIALS AND METHODS

Trial was conducted in Kahriz station of agricultural research center of west Azerbaijan province in Iran. The station was located in latitude 45°, 10′ east, longitude 37°, 5' north and 1325m altitude has a semi-arid climate with 296mm rainfall, minimum and maximum temperature 6 and 28ºC, respectively (Table 1). Soil texture was sandy loam soil with pH 7.8 and electrical conductivity 0.9ds/m.

Table 1.Meteorological parameters of agricultural research of Kahriz station

Month	Precipitation(mm)		Relative humidity (%)		Minimum absolute temperature (ºC)		Minimum temperature of soil surface (ºC)	
	2010	2011	2010	2011	2010	2011	2010	2011
April	32.5	69.1	56	48	4.7	5.6	0.9	1.5
May	131.3	73.1	65	57	9.1	9.2	0.6	6.1
Juan	21.4	41.5	45	56	15.3	14.0	11.5	10.4
July	0.0	14.6	42	48	18.9	18.7	15.0	15.0
August	0.0	15.7	39	47	17.9	19.6	14.0	15.9
September	5.3	1.7	47	51	16.1	14.5	12.3	10.6
October	3.7	21.1	49	59	11.4	9.4	7.3	5.4
November	4.4	61.5	53	68	1.0	1.5	-0.5	-1.0

Twenty-five tomato cultivars including TO4, TO2, Chase, Carmina, King-Stone, Super-Stone, Nina, Falat-CH, Falat, Falat-Y, Falat-Shof, Shof, Primo-Falat, Super-Srin-B, Peto-Early-CH, Primo-Early, Early-Urbana-VF, Early-Urbana-Y, Early-Urbana, Pri-Max, Cal-J, Cal-J-N, Selb-Jino, BSS282 and Tima were used in this experiment at two 2010 and 2011 years.

Seeds were obtained from seed and plant improvement institute and planted in single rows. When seedling had 4 to 5 true leaves transferred into the field.

Before planting, one-third of nitrogen fertilizer and total of potassium, phosphor and soleplate of iron and magnesium, zinc, cupper based on soil analysis (Table 2) was mixed with soil at late April the soil was ploughed and disked. Then rows created with 120cm distance. Two-thirds of remaining nitrogen was added before flowering and fruit formation stages. Cultivars were arranged based on a randomized complete blocks design with three replications. Each plot had 3 rows with 5m length.

Insects and fungi were controlled with Zineb and Diazinon 0.2% and 0.1%, respectively.

During growth period three types of quantitative traits including: plant height, flower per inflorescence, fruit per plant, fruit weight, carpel per fruit (Tanksley, 2004) and days to first fruit maturity were determined from randomly selected six plants at each plot. Fruit yield (Al-Aysh et al., 2012) was measured from each total plots. Total soluble solid (Majidi et al., 2011), fruit pH (Ajayi and Olasehinde, 2009) were recorded at related qualitative traits of category.

Table 2. Soil characteristics of experimental location of Kahriz station

Nitrogen (%)	**Phosphorus (%)**	**Potassium (%)**	**Organic carbon (%)**	**Neutral solutes (%)**	**Electrical conductivity (ds/m)**		**Soil saturation (%)**
0.08	7.2	220	0.78	3.5	0.9		29
Cupper (mg)	Zinc (mg)	Magnesium (mg)	Iron (mg)	Clay (%)	Loam (%)	Sand (%)	pH
0.49	0.50	4.18	3.90	11	41	48	8

Descriptive traits including fruit uniformity (Stevens, 1986), fruit color (Frary et al., 2003), fruit firmness (Okmen et al., 2011), fruit shape (Tanksley, 2004), blossom end rot (Passam et al., 2007), sunscald (IPGRI, 2003) and fruit crack (Kallo, 1991) confirmed, Combined analysis of variance for traits of two years were done with SAS software. Means were compared with Duncan's multiple range tests.

RESULTS AND DISCUSSION

Combined analysis of variance showed that interaction between year and cultivar for traits of fruit yield, number of fruit at per plant, fruit weight, total soluble solid and days to first fruit maturity were significant differences ($p \leq 0.05$) (Table 3). Significant interactions of traits demonstrated that cultivars had different responses at two years under field conditions. It can be used in breeding programs for selecting superior genotypes.

Table3. Combined mean square traits of tomato cultivars under field conditions at two 20110 and 2011 years

		Mean squares								
SOV	df	Fruit yield	Fruit/plant	Fruit weight	Carpel /fruit	Soluble solid	pH/fruit	Plant height	flowers per inflorescence	days to first fruit maturity
Year	1	146.20*	0.01^{ns}	676.36*	0.89^{ns}	14.86**	2.15**	14453.13**	10.34**	36.49^{ns}
Rep(Year)	4	8.05	69.42	32.78	0.61	0.11	0.01	422.76	0.50	29.85
Cultivar	24	84.23**	16407.97**	2094.14**	3.36**	0.42**	0.04**	2385.05**	4.75**	89.94**
CultivarxYear	24	128.02**	701.87**	183.74*	0.40^{ns}	0.26*	0.01^{ns}	64.62^{ns}	0.35^{ns}	23.52**
Error	96	30.48	68.32	103.43	0.41	0.15	0.01	108.26	0.52	10.41
Coefficient of variation (%)		9.70	13.80	11.67	16.46	8.25	2.50	13.03	19.23	2.65

ns, * and **: were not significant and significant at 0.05 and 0.01 probability levels, respectively

Agronomic traits

At first year cultivars of Selb-Jino and Falat-Shof had the highest fruit yield with 11.2 and 11.8kg/m^2 respectively. In addition, TO2, Early-Urbana, Carmina and Cal-J-N with more than 10.5kg/m2 fruit yield were the highest values at the second year. In opposite, Early-Urbana-VF, Falat-Y at 2010 season and Pri-Max and Cal-J at 2011 season with less than 8kg/m^2 fruit yield had the lowest values (Table 4). Fruit yield is the genotypic trait which varies from line to line and clone to clone. The result of Hussain et al., (2001) is in confirmation with our statement of fruit yield differences for different cultivars.

Selb-Jino with 354 and 262 fruit per plant had the maximum amounts at 2010 and 2011 years, respectively. With increasing fruit number at per plant decreased fruit weight. Also, Selb-Jino had lower fruit weight. Falat-Y and Pri-Max with 34 and 33 had the minimum fruit at per plant, respectively (Table 4). Researchers reported that genotype× environment interaction was not important for fruit weight (Wessel-Beaver, 1992).

Table 4. Mean comparison of interaction between years and tomato cultivars

Cultivar	Fruit yield (kg/m^2)		Fruit weight (g)		Fruit/plant		Soluble solid		Day to first fruit maturity	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
T04	10.2ac	9.3dm	70.5km	60.5m	68.0ce	79.0c	5.8a	4.5em	115kl	118fj
Chase	8.2im	9.0dm	80.5jl	80.7fl	46.0hp	47.3gp	5.6ab	4.4fm	123ai	120di
Carmina	9.0dm	10.8ad	89.2ck	89.2ck	43.0hp	63.7dg	5.2af	5.6ab	116hj	120di
King-Stone	9.7bk	9.5ck	98.9bh	123.5a	40.7kp	46.3hp	4.7ck	4.9bi	124af	121di
Nina	9.9bi	8.2im	101.2bg	96.50bi	47.7gp	44.7hp	5.1ah	4.1km	121di	128a
Falat-Ch	9.7bj	8.3hm	80.4gl	95.70bi	53.3en	41.7jp	5.3ae	4.2im	121bi	125af
Super-Srin-B	10.1ah	8.2im	85.2ek	91.50cj	49.7ep	41.0kp	4.7ck	4.1km	125af	127ac
Primo-Early	10.2ae	10.2ac	85.6ek	112.67ab	47.4gp	50.0fo	5.1ah	4.5em	118fj	121di
Falat-Primo	8.4gm	9.5ck	95.8bi	101.3bf	48.0gp	56.0el	5.3af	4.7gl	124ci	123ag
Peto-Early-CH	10.6ae	9.6ck	91.8cj	99.2bh	46.0hp	42.0ip	5.1ah	4.3hm	121di	121di
Early-Urbana-VF	7.6lm	9.3dm	64.0lm	81.0fi	49.7fp	58.7di	5.1ah	4.7ck	122bi	122bi
Pri-Max	9.7bk	7.5m	79.0hm	88.2ck	52.7en	33.0p	4.9bi	4.5em	119ei	127ac
Cal-J	9.7bk	7.8km	97.4bi	79.5hm	47.7gp	55.0en	5.1ah	4.1km	124af	120di
Falat-Shof	11.2ac	9.9bi	102.5bj	108.3ac	47.0gp	44.hp	5.0bi	4.1km	120di	126ad
Selb-Jino	11.8a	8.5fm	16.24n	14.0n	354a	262b	5.5ac	5.2ae	103k	112j
Cal-J-N	9.4cl	10.6ae	91.9bk	106.5ad	43.7hp	58.0ej	5.2af	4.5em	127ab	127ab
Early-Urbana	9.0dm	10.9ac	97.4bi	102.5be	39.0mp	56.3ek	4.7ck	4.8bk	124af	124af
Shof	10.5af	8.5fm	93.2bj	92.8bj	41.2jp	39.3lp	5.0bi	4.3hm	121bi	121ci
Early-Urbana-Y	9.3cl	9.6ck	98.8bh	86.7dk	39.7kp	49.0fp	5.0bi	3.9ml	125af	126ad
Super-Stone	10.5ae	8.8em	106.4ad	98.5bh	39.7kp	44.3hp	4.9bi	4.0km	122bi	122bi
Falat-Y	8.0jm	9.2dm	95.6bm	91.7cj	34.0op	50.7fo	5.2af	4.6dm	125af	119ei
BSS-282	9.2dm	10.0ai	72.8jm	80.8fl	49.7ep	55.7em	5.3ae	4.9bi	123ag	117gj
Tima	10.4af	8.4gm	79.2hm	88.0ck	52.0en	38.7no	5.0bi	3.9m	121di	118fj
TO2	9.6bk	11.5ab	71.1km	80.0hm	59.7dh	73.7cd	5.1ah	4.6dm	119ei	119ei
Falat	9.4cl	10.0ai	77.1im	79.5hm	56.3ek	65.0cf	5.2af	4.7ck	116hj	118fj

Means with the same letters in each column were not significant differences at 0.05 probability level

Super-Stone with 106g fruit weight at 2010 year and King-Stone, Primo-Early and Falat-Shof with more than 108g fruit weight at 2011 year allocated the highest values. In contrast, Selb-Jino had the lowest value with 16 and 14g fruit weight at two years, respectively.

King-Stone with 5.3 carpel had the highest amount. Also, Super-Srin-B, Early-Urbana-Y, TO4 and Nina had more carpel in per fruit. In opposite, Selb-Jino and Cal-J-N with 2.4 carpel in per fruit allocated the lowest values (Table 5). Existence of high heritability for carpel/fruit implies that there is less influence of environment and consequently selection can be effective for this trait (Asati et al., 2008).

Carmina with 170cm length had the highest plant height and Falat-CH, Primo-Falat, Shof and TO2 were lower plant height (68cm) within cultivars. Carmina due to indeterminate growth and high plant height is suggested for greenhouse cultivation. Lerner, (2009) also reported that indeterminate tomatoes increase in height throughout the growing season because the terminal of the stem continues to produce foliar growth rather than set flowers. The flowers and thus fruits on these plants are produced continually through the season along the side shoots of the plant. Indeterminate tomatoes are the choice to spread out the harvest over a long period of time. Short height cultivars due to take low spacing under field conditions, therefore with increasing plant density arise fruit yield. Also, these cultivars have determinate growth, similar maturities and selected for mechanized cultivation.

Selb-Jino with 7.8 flowers at per inflorescence was significant differences with other cultivars. The effect of environmental parameters on this trait is low and affected by genetic control (Zdravkovic et al., 1998).

Cal-J-N, Nina, Super-Srin-B, Pri-Max with more than 127 days and Selb-Jino with less than 112 days to first fruit maturity were lateness and earliness cultivars, respectively. Lerner, (2009) categorized tomato cultivars in to early, mid and late seasons in regards to time of ripening. In our experiment cultivars with 127 and 112 days to ripening are lateness and midness maturities, respectively.

Table 5. Mean comparison traits of tomato cultivars

Cultivar	Carpel/Fruit	Fruit pH	Plant height (cm)	Flower/inflorescence
T04	4.6ab	4.11ac	81.7be	3.6bc
Chase	4.0be	4.08bc	69.5de	2.9c
Carmina	3.8be	4.18ac	170.5a	4.3b
King Stone	5.3a	4.11ac	83.4bd	3.5bc
Nina	4.5ac	4.15ac	73.3ce	3.8bc
Falat-C-H	4.1bc	4.17ac	68.9de	3.6bc
Super Strain-B	4.5ac	4.12ac	77.6be	3.3bc
Primo Early	4.4bc	4.14ac	77.5be	3.5bc
Falat Primo	4.4bc	4.20ac	67.9e	3.6bc
Peto-Early-CH	4.2bc	4.2ac	72.7ce	3.7bc
Early Orbana-V-F	4.2bc	4.08bc	85.5bc	3.0c
Primax	4.4bc	4.21ab	78.5be	3.3bc
Cal-J	3.3df	4.22ab	72.4ce	3.8bc
Falat-Shof	3.6ce	4.20ac	70.9ce	3.7bc
Selb-Jino	2.3g	3.83d	83.1bd	7.8a
Cal-J-N	2.2g	4.24a	90.2b	3.9bc
Early Orbana	3.2be	4.06c	76.0be	3.5bc
Shof	4.3bc	4.12ab	68.4e	3.6bc
Early-Orbana-Y	4.5ab	4.14ac	72.5ce	3.6bc
Super-Stone	4.4bc	4.12ac	76.4be	3.3bc
Falat-Y	3.9be	4.08bc	76.2be	3.5bc
BSS-282	3.7fg	4.15ac	88.2b	3.6bc
Tima	3.1ef	4.15ac	76.2be	3.5bc
TO2	3.1ef	4.06c	66.9e	3.8bc
Falat	4.0be	4.01c	70.2de	3.7bc

Means with the same letters in each column were not significant differences at 0.05 probability level

Related quality traits

At first year of experiment cultivars of TO4, Chase and Selb-Jino with 5.8, 5.6 and 5.5% and at the second year Carmina and Selb-Jino with 5.6 and 5.2% had the most total soluble solid in fruit. Early-Urbana-Y and Tima were the lowest values with 3.9%. Soluble solid is one of the most important quality traits in processing tomato. 50% to 65% of soluble solid contents are sugars, glucose and fructose and their amount and proportion influences the organoleptic quality of tomatoes (Adedeji et al. 2006). Remaining soluble solid are mainly citric and malic acids, lipids and other components in low concentrations. Variations of soluble solid in wild varieties were more than cultivated (Kallo, 1991). Purkayastha and Mahanta (2010) reported that soluble solid varied in genotypes from 4.1 to 5.9%. High total soluble solid is desirable to higher yield of processed products. Cultivars were also different in terms of fruit pH. Cal-J-N and Selb-Jino with 4.2 and 3.8 were the highest and lowest pH, respectively. Other cultivars had between them. Selb-Jino due to has low pH and pathogen activity in processed products it may be used to preparation of pickles. One of the aims of selection cultivars in tomato were adequate soluble solid, pH and suitable flavor of fruits for processing. Botulism disease delayed in tomato products at lower pH than 4.5 (Agong et al., 2001). In ripen fruits acid content was high enough to prevent botulism diseases. Agong et al., (2001) introduced pH and soluble solid as the main criteria for assessing related quality traits in tomato.

Descriptive traits

In selecting superior tomato genotypes, morphological, market-demand and tolerance to biotic and abiotic stresses were important. From the point of fruit shape cultivars characterized in six groups including: round, long round, shaped heart, cylindrical, oval and vary-form. Shapes of long round and oval had the highest and lowest frequencies (Table 6).

Table 6. Descriptive traits of tomato cultivars

Characteristic	Group	Cultivar	Frequency (%)
Fruit shape	Round	Carmina, King-Stone, TO2, Selb-Jino	16
	Long round	Chase, Early-Urbana-VF, Falat-Y, Peto-early-CH, Pri-Max, Tima, Cal-j, Falat-CH, Falat-Shof, Primo-Early	40
	Shaped heart	Nina, Super-Stone, Super-Srin-B, Falat, Early-Urbana-Y	20
	Cylindrical	Falat-Primo, Early-Urbana, BSS-282	12
	Oval	Cal-J-N, TO4	8
	Vari-form	Shof	4
Fruit color	Light red	Carmina, Super-Srin-B, Selb-Jino, Shof, Falat-Y, Falat-CH	24
	Medium red	Nina, Early-Urbana-VF, Pri-Max, Cal-J, Cal-J-N, Falat-Shof, Early-Urbana, Early-Urbana-Y, BSS-282	36
	Dark red	Chase, King-Stone, Primo-Early, Falat-Primo, Peto-Early-CH, Super-Stone, Tima, Falat	32
	Very dark red	TO4, TO2	8
Fruit firmness	Soft	Carmina, Selb-Jino, TO2, Falat	16
	Relatively stiff	TO4, Falat-CH, Super-Srin-B, Primo-Early, Peto-early-CH, Early-Urbana-VF, Pri-Max, Cal-J, Falat-Shof, Early-Urbana-Y, Tima	44
	Stiff	Chase, King-Ston, Nina, Falat-Primo, Early-Urbana, Shof, Super-Stone, Falat-Y	32
	Very stiff	Cal-J-N, BSS-282	8
Uniformity furit	Quite uniform	Carmina, Nina, Selb-Jino, BSS-282	16
	Uniform	King-Stone, Falat-Primo, Falat-Y, TO2	16
	Relatively uniform	Chase, Super-Stone, Falat-Shof, Super-Srin-B, Early-Urbana-VF, Early-Urbana-Y, Early-Urbana, Pri-Max, Cal-J-N, Tima, Falat	44
	Non-uniform	Falat-CH, Shof, Peto-Early-CH, Primo-Early, Cal-J, TO4	24

Researchers reported that wild and semi wild forms of tomatoes bear fruits that are almost invariably round, whereas cultivated tomatoes come in a wide variety of shapes: round, oblate, pear-shaped, torpedo-shaped and bell pepper-shaped (Tanksley, 2004).

From the view of uniformity, fruits placed in to quite uniform, uniform, relatively uniform and non-uniform. More cultivars were in relatively uniform (Table 6). For increasing market-demand and reduction of harvesting costs, large fruits with high color intensity, tart and synchronized mature is preferred to indeterminate growth and non-uniforms (Bennett et al., 2000).

Fruit color of cultivars distinct in light red, medium red, dark red, very dark red groups (Table 6). To4, TO2 and Chase had the most fruit color and Carmia and Seb-Jino were the lowest values. With increasing fruit red color will be market-demand and paste and sauce be pretty color. Fruit color in tomato is being formed from lycopene and carotene pigments. In red tomatoes predominant lycopene pigment and inversely in orange fruit tomatoes carotene has in high value (Hart and Scott, 1995). Wild species may have more lycopene as commercial cultivars (Dorais et al., 2001). Beside being influenced by genotype, some fruit constituents are also influenced by environmental conditions. For example, lycopene contents are strongly affected by light intensity and temperature (Davies and Hobson, 1981).

Fruit firmness of cultivars was in four groups of soft, relatively stiff, stiff and very stiff. More of cultivars located in relatively stiff group (Table 6). Ability of transport and storage capability is important in tomato. Varieties with soft tissue have less maintenance, rapid decayed and damaged in mechanized harvest, therefore must be immediately consumed (Kallo, 1991).

Blossom-end rot in cultivars of BSS282, Tima and TO4 decay rate due to drought stress and lack of calcium absorption were less than other varieties.

Sunscald was seen in first harvesting. Varieties are grouped in three less, low and medium sunscald. Cultivars of Super-srin-B, Early-Urbana-Y, Nina, Falat-Y, Tima, TO2 and Falat-Shof had medium sunscald (35 fruit at per plot) and Falat-CH, TO4, Primo-Early, Peto-Early-CH, Early Urbana-VF, Cal-J, Cal-J-N, Shof and BSS282 had less than 10 fruit.

In other varieties was not seen sunscald. Cultivars with more foliage prevented directly radiation and then fruits didn't damage for sunscald (Lerner, 2009).

Low percentage of fruit cracking was observed in more varieties and in Selb-Jino, Cal-J, TO2, Carmina and Early-Urbana had more amounts. Fruit crack like blossom-end rot increased in drought stress and subsequently decreased market-demand and shelf-life (Kallo, 1991).

Correlation coefficient of traits

Fruit yield with fruit at per plant (r=0.49*) and number of flower at per inflorescence (r=0.48*) were positive and with days to first fruit maturity (r=-0.46*) was negative significant differences (Table 7). Fruit yield in tomato is obtained from multiplied plant density, number of fruit at per inflorescence and fruit weight (Zdravkovic et al., 1998). Increasing one of components reduce other portions. Number of fruit at per plant was correlated with number of flower at per inflorescence (r=0.95**). Golani et al., (2007) showed that fruit yield with number of fruit at per plant was correlated positively but contrary related with fruit weight. Blay et al., (1999) introduced number of fruit at per plant the most important part in fruit yield. By increasing number of fruit at per plant decreased fruit weight (r=-0.85**) and carpel in per fruit (r=-0.46*).

With delaying fruit maturity decreased fruit number (r=-0.78**) and increased fruit weight (r=0.80**) and fruit pH (r=0.71**). Therefore, varieties with more fruits had low pH (r=-0.75**).

Soluble solid with fruit weight (r=-0.55**) and fruit number at per plant (r=0.50**) were negatively and positively significant differences. Thus, with increasing number of fruits at per plant increased fruit soluble solid and in heavy and large tomatoes decreased total soluble solid. Researchers reported negative correlation between fruit weight and total soluble solid (Golani et al., 2007).

Table 7. Simple correlation coefficient traits of tomato cultivars

Trait	Fruit yield (kg/m^2)	Fruit weight (g)	Fruit/plant	Carpel/plant	Soluble solid (%)	pH/fruit	Plant height (cm)	flower per inflorescence
Fruit weight (g)	-0.02							
Fruit/plant	0.49*	-0.85**						
Carpel/plant	-0.29	0.48*	-0.46*					
Soluble solid (%)	0.13	-0.55**	0.50**	-0.30				
pH/fruit	-0.14	0.72**	-0.75**	0.17	-0.39			
Plant height (cm)	0.14	-0.06	0.05	-0.12	0.55**	0.10		
flower per inflorescence	0.48*	-0.73**	0.95**	-0.51**	0.48*	-0.62**	0.17	
Day to first fruit maturity	-0.46*	0.80**	-0.78**	0.32	-0.64**	0.71**	-0.20	-0.73**

* and **: were significant at 0.05 and 0.01 probability levels, respectively

CONCLUSIONS

Results showed that for selecting a variety in a region not only fruit yield but also fruit quality, fruit size, shape and color must be considered before choosing. Market-demand and shelf-life appeared stronger criteria for variety selection. This could be better for most tomatoes produced for both local and distance market. Cultivars of Falat-Shof, TO2, Primo-Early, Peto-Early-CH, Carmina, Cal-J-N, Early-Urbana, TO4, Falat, King-Stone, BSS282 and Super-Stone had more than 10.5kg/m^2 fruit yield. Overal and cylindrical fruit shape with stiff firmness is recommended for salad preparation and frying. Earliness cultivars had more fruit at per plant and subsequently increased fruit yield and total soluble solid and reduced pH. With reducing of fruit pH arise shelf-life of proceed products. Selb-Jino and TO2 due to have low pH and small fruits are recommended in preparing pickle. TO4, Carmina and Selb-Jino had more total soluble solid and recommended for paste, sauce and ketchup. Cultivars of Falat-Shof, Super-Stone, King-Stone and Tina had great fruits and market-demand. Super-Stone, King-Stone and Tima had stiff fruit firmness and suitable for transport and shelf-life. Carmina due to have indeterminate growth period and high plant height is suggested for planting under green house conditions.

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