Evaluation of tomato varieties for their use by small organic farmers in Buenos Aires, Argentina

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Abstract

Argentina is experiencing a significant increase of the domestic organic market. Vegetables make up a large percentage of the organic volume traded, and an increasing interest in heritage type products is noticed. Being yet the development of such kind of goods almost incipient a number of tomato cultivars were recovered in order to characterize its production profile and asses their potential adoption by organic vegetables farmers. A greenhouse trial with 12 tomato cultivars was conducted: Peace Vine, Red and Yellow Ildi, Black Plum, Chadwick, Saint Pierre, Thessaloniki, TSW10, Platense Gentile, Moneymaker, Mars and Uco Plata, and commercial hybrids were used as controls. Phenological and reproductive characteristics were evaluated and a profile of each cultivar was established. The results show that some cultivars are suitable to be included in the organic vegetables trade, such Ildi cultivars, Black Plum, and Chadwick. Platense Gentile and Uco Plata would need further research.

Introduction

Argentina occupies the second place worlwide for its organic certified production area (9), but its domestic market is still small (7). Vegetable production has been the mainstay of organic consumption in commercial channels of Buenos Aires area (1, 6, 8, 7). The organic consumption was affected by Argentine economic crisis. However, since 2010 this products are involved in a consumer boom (2),and some kinds of heirloom products are also valued. This includes varieties, which were reappraised by their shapes, colors or flavors, different from those massively consumed today (4). Organic techniques for this kind of goods have also become widespread among farmers prompted to seek consumer niches as natural marketplaces and to look for consumers who appreciate this products (3). Consumers regard tomato as one of the most esteemed product. Therefore tomatoes from organic collections were evaluated, in order to assess their adoption by organic farmers in Horticultural Zone of Buenos Aires.

Material and methods

Twelve non-commercial tomato *(Solanum lycopersicum* L.*)* cultivars collected worldwide were evaluated. This included five cherry type ('Peace Vine', 'Red Ildi', 'Yellow Ildi', 'Black Plum' and 'Chadwick'), seven round tomato type ('Saint Pierre', 'Thessaloniki', 'TSW10', 'Platense Gentile', 'Moneymaker', 'Mars' and 'Uco Plata') and two commercial hybrids, cherry-type Koyi F1® (De Ruiter Seeds Group Co. Ltd., Netherlands), and round-type Elpida F1® (Syngenta AG, Switzerland), were included in order to have a pattern for comparison. The trial was carried out in 2013 in a metal parabolic greenhouse in Gorina Experimental Station (Ministerio de Asuntos Agrarios of Buenos Aires Province). A randomized complete block design with three replications per Treatment was adopted. Transplant was made on January 21st. Plants were placed in a 0,4 x 1 m planting frame, each experimental unit including five plants of which only three central plants were evaluated in order to avoid border effects. All cultivars were vertical trained and permanent pruned to single stem, except for 'Peace Vine', that was pruned to three stems. The 28th March were recorded data at the vegetative and reproductive stages: leaves number and height at anthesis, distance between clusters, growth type, plant height, clusters number, flowers number per cluster, fruit set percentage, and referrals to fruit weight and occurrence of disorders. Yield per hectare and percentage of dead plants (May 17th) were estimated. Effect of cultivar on each one of the evaluated variables was made by ANOVA and comparison of means (LSD Test, $P < 0,05$) with the statistical package Infostat. Different varieties were classified according to their agronomic profile.

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Results and discussion

All the evaluated tomatoes achieved a suitable performance and reached a production profile according to their potential and the prevailing environmental conditions throughout the production cycle (January 21st to June 6th). Evaluation of 'Mars' and 'TSW10' lead to their classification as determinate varieties, type not recommended for greenhouse production in Buenos Aires. 'Peace Vine' resulted the earliest cultivar, since anthesis and harvest occurred 14 days at 53,8 days after planting respectively. Other small fruit size cultivars (cherries cv.), (Koyi F1, 'Red Ildi' and 'Yellow Ildi') followed it (Table 1 and 2). 'Mars' (determinate) followed them in precocity, and the rest were grouped as later. Medium sized cherries ('Black Plum', 'Chadwick' and 'Moneymaker') were not earlier in anthesis, but they exceeded larger round tomatoes in precocity at harvest time (Table 1 and Table 2). These varieties were also characterized by having the largest height (122,33 to 142,78 cm) and the greatest number of clusters (from 6 to 7,44) at March 28th. The other indeterminate varieties ('Platense Gentile',' Uco Plata', 'Thessaloniki', 'Saint Pierre') reached a lower height (65,46 cm) and a lower number of flowers per cluster (3,57). The quantity of flowers and the fruit set percentage are good yields components. In this regard, the cultivar with the highest average number of flowers per cluster was Koyi F1 with 14,07 flowers per cluster. None of the cultivars presented a very large amount of flowers except for TSW10. This variety presented even some clusters with more than 30 flowers. A great variability between clusters and plants was observed. When considering all the cultivars the average number of flowers per bunch ranges from 4,76 to 14,67. Nonetheless this information is played down by the percentage of fruit set per cluster (Table 1).

Fruit shapes of several cultivars resulted attractive. Among them 'Black Plum' (famous mahogany color tomato with green and persistent shoulder tomatoes and ovate form), 'Red Ildi' (small piriform red cherry) and 'Yellow Ildi' (small piriform yellow cherry) were the most prominent. All of them showed good agronomic and marketing characteristics. On the other hand Mars, 'Saint Pierre', 'Thessaloniki', 'TSW10', 'Platense Gentile' and 'Uco Plata' stood out for the low plant survival. 'Uco Plata', a typical tomato in Argentina selected for its resistance to insect pests, produced fruits with an heterogeneous forms, being some of them ribbed and flattened but other globular and smooth. The 'Thessaloniki' accession evaluated in this trial did not show good production profile under our assay conditions. Elpida F1 showed the greatest yields, followed by cherry Koyi F1 and by middle sized tomatoes fruits like 'Moneymaker' ' Black Plum' and finally 'Chadwick'. Ildi varieties also showed high yields (Table 2) and on this point can even be compared with commercial tomatoes grown in the area at the same season (MCBA, 2008).

Table 1: Main characteristics of the evaluated cultivars.

Cv.	Days to flowering	Days to harvest	Height (28-3-13)	Clusters nr. (28-3-13)	Flowers per cluster	% Fruit set/cluster
Peace Vine	14,57 A *	53,80 A	138,22 AB	7,44 A	11,25 DEF	89,24
Koyi F1	22,67 B	58,00 A	142,78 A	6,00 B	14,07 EF	75,27
Red Ildi	24,22 B	64,00 B	130,44 AB	6,89 AB	10,31 DE	63,34
Yellow Ildi	25,78 B C	69,00 B	122,33 B	6,56 AB	9,52 BCD	67,44
Mars	28,89 C D	71,22 C D	42,56 F	2,78 E	5,30 AB	60,75
Uco Plata	30,44 D	77,00 DEF	95,56 C	3,56 CDE	10,91 DEF	49,77
Moneymaker	30,44 D	72,89 CD	132,67 AB	6,33 B	12,24 DEF	78,02
Black Plum	30,44 D	73,78 CDE	127,67 AB	6,44 B	9,80 CD	85,00
Elpida F1	32,00 D	79,67 EFG	126,89 AB	4,00 CDE	4,76 A	78,15
Saint Pierre	32,00 D	80,89 FG	92,56 CD	3,78 CD	11,63 DEF	48,41
Thessaloniki	32,00 D	84,78 G	91,33 CD	3,56 CDE	10,65 DE	42,07
Platense Gentile	32,00 D	81,00 FG	77,89 DE	3,56 CDE	5,78 ABC	47,92
TSW10	32,00 D	84,56 G	73,00 E	2,89 DE	14,67 F	36,61
Chadwick	32,00 D	70,22 C	141,56 A	6,22 B	10,09 D	74,63

* Means followed by the same letter are not significantly different among them (Fisher's LSD Test, $P< 0,05$)

Table 2: Main productive characteristics of the evaluated cultivars.

Fruit Type	Cv.	Yield (t/ha)	Weight (g)	Equatorial diameter (cm)	Polar diameter (cm)
Large-size	Elpida F1	62,6 A*	203,1 A	7,3 A	5,9 A
	Platense Gentile	39,0 B	173,5 B	7,4 A	5,1 B
	UcoPlata	37,1 BC	148,3 BC	7,1 A	4,6 C
	TSWV10	33,1 BC	141,0 CD	6,6 B	5,0 B
	Thessaloniki	30,7 BC	127,9 CD	5,8 C	4,5 C
	Mars	22,1 C	113,8 DE	5,8 C	5,2 B
	St Pierre	35,5 BC	88,4 E	5,5 C	4,4 C
Medium-size	Black Plum	42,1 A	38,9 A	3,6 A	4,8 A
	Moneymaker	36,0 AB	27,7 C	3,6 A	3,3 B
	Chadwick	30,0 B	32,7 B	3,8 A	3,4 B
Small-size (Cherry type)	Koyi F1	27,9 A	19,6 A	2,8 A	3,8 B
	Peace Vine	24,3 AB	5,4 C	2,0 C	2,0 C
	Yellow Ildi	16,8 B	15,7 B	2,7 B	2,7 A
	Red Ildi	15,6 B	16,5 B	2,8 A	4,2 A

* Means followed by the same letter are not significantly different among them (Fisher's LSD Test, *P*< 0,05)

Conclusions

Heirloom tomatoes represent a new niche market in Buenos Aires. From the results of our trial, it can be suggested the incorporation to this market of 'Yellow Ildi" and 'Red Ildi' (for their fruit quality fitness), 'Black Plum' (for its color fruit and performance) and 'Chadwick' (for its fruit quality and performance). Further studies on 'Platense' varieties are suggested: this landrace tomato is the most appreciated by the inhabitants of the Buenos Aires city, and, on the other side, has shown an acceptable production profile.

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