

PRODUCTIVITY OF A TOMATO ASSORTMENT FOR PROCESSING IN THE CONDITIONS FROM „PORUMBENI” INSTITUTE OF KISHINEV

PRODUCTIVITATEA UNUI SORTIMENT DE TOMATE PENTRU INDUSTRIALIZARE ÎN CONDIȚIILE DE LA INSTITUTUL „PORUMBENI” – CHIȘINĂU

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Abstract: *The paper presents the behavior in a comparative trial of an assortment of 20 tomato cultivars from the collection of „Porumbeni” Phytotechnics Institute of Kishinev, Republic of Moldova, in the period 2006-2008. The highest early yields were given by the cultivars: Zagadca (11.12 t/ha), Novicioc (8.76 t/ha) and Leana (8.53 t/ha). The highest total yield was given by the cultivars: Persei (29.31 t/ha), Novicioc (29.17 t/ha) and Nota (27.64 t/ha).*

Key words: tomato assortment, comparative trial, tomato collection.

Rezumat: *Lucrarea prezintă comportarea într-o cultură comparativă a unui sortiment de 20 de cultivare de tomate din colecția Institutului de Fitotehnie „Porumbeni” din Chișinău, Republica Moldova, în perioada 2006-2008. Cele mai mari producții timpurii au realizat cultivarele: Zagadca (11,12 t/ha), Novicioc (8,76 t/ha) și Leana (8,53 t/ha). Producția totală cea mai mare a fost realizată de cultivarele: Persei (29,31 t/ha), Novicioc (29,17 t/ha) și Nota (27,64 t/ha).*

Cuvinte cheie: sortimentul de tomate, cultură comparativă, colecție de tomate.

INTRODUCTION

Productivity represents one of the most important plant breeding objectives as well as one of the most important characters that gives value of use or market value (3,6).

In fact, productivity is determined by the genetic potential of the cultivar, but as we may know, this productivity may be highly influenced by the environment conditions; in other words, according to the norms of general genetics, phenotype (productivity) is the result of the interaction between genotype (cultivar, the gene fund) and the environment conditions (the cultivation technology).

So, productivity depends essentially on the genotype of each cultivar in certain environment conditions. If the environment conditions (the cultivation technology) are identical for all cultivars, it means that the differences among the

used cultivars is an expression of the differences between the genotype of these cultivars (1,3,6).

In the practice of plant breeding, productivity is most of the time the main criterion of selection among the variants of the biologic material under study (breeds, lines, hybrids, selections a.o.). At the same time, productivity is the most important character in the competition between the new creations (cultivars) obtained as a result of the plant breeding work or in the competition between the new cultivars (from other countries); that is why their introduction in the assortment specter of our country is desirable.

The appreciation of productivity consists concretely in knowing the harvest quantity that may be obtained from a plant or the surface unit cultivated with that plant (1,7).

When we study the productivity of an assortment made of several cultivars, we organize comparative trial where we compare among them, from the viewpoint of yield, the cultivars whose productivity we want to find out (5).

Thus, the goal of this research is to establish the agro-productive value of an assortment of twenty cultivars within „Porumbeni” collection. To attain our goal, we established two objectives: (1) analysis of the early (summer) tomato yield at cultivar level and (2) analysis of total tomato yield of all cultivars.

MATERIAL AND METHOD

To attain our objectives, we organized a series of experiments consisting in comparative trial, during 2006–2008, within the experimental vegetable-growing field from „Porumbeni” Phytotechnics Institute from the Republic of Moldova.

Research has been carried out in a comparative culture with tomato breeds for processing or processing and consumption. The comparative culture comprises 20 cultivars (free pollination cultivars) chosen from the existent collection of „Porumbeni” Institute. We took care that the assortment from the comparative culture to be representative for the collection from the viewpoint of productivity, earliness and certain characteristics giving it the agrobiologic value.

The experiment was organized in a design of randomized blocks with four replicates. Each replicate parcel had a surface of 7.0 m² (1.4 m x 5 m), being made of two rows of plants arranged at a distance of 70 cm, ensuring a distance of 30 cm, between the plants in a row and resulting a density of about 4.8 plants/m², 48 thousand plants/ha, respectively.

The establishment of crop was made every year by nursery transplant of about 50 days, corresponding to a phenophase of 6-7 leaves. The moment of planting occurred in the interval May 17th -20th, according to the meteorological conditions of the second decade of May.

During the vegetation period, we applied several care works afferent to the tomato crop with a determined growing, destined to be processed or having a mixed destination; we did not apply any special works (thinning out, tying up, debudding, application of bioactive substances etc.) (2,4). The land on which we placed the experiment is flat, arranged for irrigation and has a carbonated chernozemic soil with a clayish structure, a humus content of 3.1% and pH of 6.9-7.0.

In the experimental period, at the level of the three-year research series within the comparative trial, we carried out the observations and determinations necessary to appreciate the agro-productivity of the used cultivars. Harvesting was made in seven

stages to mark the staging and dynamics of yield; we mention that normally, we effectuate 2-4 harvestings, depending on the maturation dynamic and the duration of the maturation period of fruits. The harvesting was made only after the full (physiological) maturity of fruits. The primary data on the crops obtained in each replicated parcel were reported accordingly to one hectare surface.

The experimental data were processed by specific statistical-mathematic methods, of variance analysis (Fisher test) and comparison analysis using the Student test and the limit differences for three confidence degrees: 95% (LSD 5%), 99% (LSD 1%) and 99.9% (LSD 0.1%) (5). The comparison of yield results was effectuated against the arithmetic average of yields for each variant (experiment average). The significance of differences as compared to the experimental average was established by comparing these to the three levels of the limit differences (LSD).

RESULTS AND DISCUSSIONS

The summer crop yield registered on August 28th is presented in table 1.

Table 1

Analysis of summer crop (25.08) within the comparative culture (average 2006-2008)

no. crt	Variant		Yield (t/ha)	% as compared to	Differences as comp. to	Difference significance
		cultivar				
1.	Amulet		3.17	58	-2.34	00
2	Balada		5.04	91	-0.47	
3	Caterina		3.28	60	-2.23	0
4	Evrica		5.16	94	-0.35	
5	Fakel		5.92	107	+0.41	
6	Gruzinca rozovii		5.60	102	0.09	
7	Leana		8.53	155	+3.02	xxx
8	Mihaela		5.92	107	+0.41	
9	Nota		3.48	63	-2.03	0
10	Novicioc		8.76	159	+3.25	xxx
11	Novinca prednestrovie		3.30	60	-2.21	0
12	Persei		6.69	121	+1.18	
13	Potoc		3.47	63	-2.04	0
14	Sibirskii scorospelii		3.39	62	-2.12	0
15	Start		5.10	93	-0.41	
16	Svitanoc		6.91	125	+1.40	
17	Venus		5.09	92	-0.42	
18	Victorina		4.55	83	-0.96	
19	Viteazi		5.69	103	+0.18	
20	Zagadca		11.12	202	+5.61	xxx
\bar{x}	Experiment average		5.51	100	-	

LSD 5% = 1.69 t/ha

LSD 1% = 2.26 t/ha

LSD 0.1% = 2.97 t/ha

The yield of summer tomatoes varied between 3.17 t/ha (for Amulet cultivar) and 11.12 t/ha (for Zagadca cultivar), whereas the experimental average has the value of 5.51 t/ha. If we calculate the median of yields, this is 7.15 t/ha. By comparing the average to the median, it results that the median is much bigger than the average of yields what demonstrates that more cultivars give yields under the experimental average.

The highest yields, statistically ensured with a probability of 99.9% (LSD 0.1%) were obtained by cultivars Zagadca (11.12 t/ha), Novicioc (8.76 t/ha) and Leana (8.53 t/ha).

The lowest yield was registered by Amulet breed (3.17 t/ha) with a negative difference highly significant when to the experiment average. Low yields statistically ensured with significant negative differences were also registered by the cultivars: Caterina (3.28 t/ha), Novinca prednestrovie (3.30 t/ha), Sibirskii scorospelii (3.39 t/ha) and Potoc (3.47 t/ha). The other cultivars gave yields within the variation limits of the experimental average, with insignificant differences as compared to the average.

We mention that the average yield for the summer crop represents about 23% from the total yield. For some cultivars this represents a much higher percentage. If we take into account the cultivars with the highest yields, we may notice that the summer crop represents 52% from the total yield for Zagadca cultivar, 44% for Leana cultivar and only 30% for Novicioc cultivar. These data demonstrate the earliness of the cultivars Zagadca and Leana.

On the basis of the data presented, we may appreciate as early all cultivars that have yields superior to the average, namely with yields higher than 5.51 t/ha. By the table order these varieties are: Fasel (5.92 t/ha), Gruznică rozovii (5.60 t/ha), Leana (8.53 t/ha), Mihaela (5.92 t/ha), Novicioc (8.76 t/ha), Persei (6.69 t/ha), Svitanc (6.91 t/ha), Viteazi (5.69 t/ha) and Zagadca (11.12 t/ha). As we already showed, significantly superior yields to the experimental average are registered only by the three varieties already mentioned: Zagadca, Novicioc and Leana. In any case, in the group of early cultivars we must not include the cultivars with the lowest summer yields as compared to the experimental average: Caterina, Novinca prednestrovie and Sibirskii scorospelii.

The total tomato yield is presented and analyzed in table 2.

The total yield varied between large limits, from 16.26 t/ha (Gruznică rozovii variety) up to 29.31 t/ha (Persei variety); in the same conditions, the experimental average was 23.98 t/ha. From the extreme yield data it results an experimental median of 22.78 t/ha, relatively close to median, wherefrom results that the studied assortment is relatively balanced, from the viewpoint of total yield, with maximum and minimum yields approximately equally spaced out as compared to the experiment average. Thus, from the yield data (t/ha or % as compared to average) we may notice that 11 cultivars are situated above the experimental average from the viewpoint of yield and nine are under this average.

Table 2

**Analysis of total crop within the comparative culture
(average 2006-2008)**

No. crt.	Variant		Yield (t/ha)	% as comp. to	Difference as comp to.	Difference significance
	Cultivar					
1.	Amulet		23.35	97.37	-0.63	
2	Balada		25.54	106.51	+1.56	
3	Caterina		27.38	114.18	+3.40	X
4	Evrica		26.15	109.05	+2.17	
5	Fakel		22.19	92.54	-1.79	
6	Gruzinca rozovii		16.26	67.81	-7.72	000
7	Leana		19.33	80.61	-4.65	00
8	Mihaela		23.09	96.29	-0.89	
9	Nota		27.64	115.26	+3.66	x
10	Novicioc		29.17	121.64	+5.19	xx
11	Novinca prednestrovie		21.84	91.08	-2.14	
12	Persei		29.31	122.23	+5.33	xx
13	Potoc		25.73	107.30	+1.75	
14	Sibirskii scorospelfii		24.23	101.04	+0.25	
15	Start		20.75	86.53	-3.23	0
16	Svitanoc		21.55	89.87	-2.43	
17	Venus		26.64	111.09	+2.66	
18	Victorina		24.09	100.46	+0.11	
19	Viteazi		24.24	101.08	+0.26	
20	Zagadca		21.12	88.07	-2.86	
\bar{x}	Experiment average		23.98	100.00	0.00	

LSD 5% = 3.08 t/ha

LSD 1% = 4.12 t/ha

LSD 0.1% = 5.42 t/ha

From the analyzed data, it results that two cultivars, Persei (29.31 t/ha) and Novicioc (29.17 t/ha) registered yield increases of about 22% as compared to the experimental average and they were appreciated as highly significant. Significant yield increases were registered by the cultivars Nota (27.64 t/ha) and Caterina (27.38 t/ha), exceeding the experimental average by about 14-15%.

The yields below the experimental average were registered by nine breeds, but the yield differences are significant only for three cultivars. The lowest yield was registered by the cultivar Gruzinca rozovii with 16.26 t/ha, 67.81% respectively as compared to the experimental average; the difference as compared to the average is negative and highly significant. Yields below the experimental average were also registered by the cultivar Leana, with 19.33 t/ha, 80.61% respectively as compared to the average and with negative differences highly significant as compared to the experimental average.

In the same line of significant inferior yields as compared to the experimental average is the cultivar Start, with a yield of 20.75 t/ha, 86.53% respectively, from the experimental average of 23.98 t/ha. In these conditions, the Start variety registers

significant negative differences as compared to the average of yields of the comparative culture.

The appreciation of the agro-productive value from the angle of total yield must be corroborated with the early (summer) yield. Thus, the varieties registering the highest total yields - Persei, Nota and Caterina – had summer yields within the variation limits of average or significantly below the average of this yield. We may not say the same about Novicioc breed that registered significantly superior yields both at the level of total yield and at the level of summer yield. In the same way, the cultivars with the highest early yields - Zagadca and Mihaela give total yields below the experimental average (Zagadca) or distinctly significant below this average.

These considerations impose the appreciation of the agro-productive value separately for the early yield and the total one.

At the same time, for the cultivars specialized for industrialization and mechanized harvesting, the concentration of fruit maturation or the ripening (maturity) simultaneousness of fruits is a very important and appreciated characteristic being preferred the cultivars with simultaneous maturation of fruits on the same plant. This condition is positively correlated to the “specialization” of cultivars as early and late. In the same line, we must notice that the Novicioc variety, registering high yields both early yields and total (late) yields, has a too large spacing out of fruit maturation. Consequently, this variety is recommended for consumption in fresh state and a spaced out harvesting during a long period of time, from summer up to late autumn.

CONCLUSIONS

The highest early yields were registered by the cultivars: Zagadca (11.12 t/ha), Novicioc (8.76 t/ha) and Leana (8.53 t/ha).

The cultivars with the highest total yields were: Persei (29.31 t/ha), Novicioc (29.17 t/ha) and Nota (27.64 t/ha).

Novicioc breed is remarkable for both its summer yield and the total yield having a larger spacing out, what recommends it for consumption in fresh state and spaced out harvesting.

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