



## EVALUATION SOME NEW HYBRIDS FOR CULTIVATION IN CONVENTIONAL SYSTEM IN SPRING CLIMATIC CONDITIONS OF ROMANIA

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Received: November 05, 2012; Accepted: November 22, 2012

**Abstract-** Considering the fact that in Romania, the vast majority of tomatoes harvest comes from the farmers who have relatively small areas of solariums and greenhouses, between 100 and 2000 sqm, farmers are always looking for new hybrids with the special productive performance in low temperature conditions corresponding to beginning of spring, with resistance to diseases and pests.

Aim of this study was to test and recommend farmers from the south of Romania's new tomatoes hybrids with outstanding performance for the culture in solar of the tomatoes in conventional system (culture on soil) with early production.

In this context, it has studied 11 hybrids the Israeli provenance tomatoes.

Among hybrids analyzed, the best results in relation to the tomatoes productive potential per 1m<sup>2</sup> were obtained for 3319 hybrid noted V8 with a production of 16.667 kg/m<sup>2</sup> under the conditions of the early spring with a day maximum temperature of 20°C. In addition, although this hybrid germinated least (only 87% of seeds) and later towards others tested (after 11 days) had the highest early production 9.060kg/m<sup>2</sup> at first harvest from July 1.

In terms of storage conditions at 9°C, the best behavior has had the hybrid 3351 whose firmness was kept undisturbed for 2 weeks.

Such meticulous tests concerning the overall development of hybrids of germination, growth, flowering and production showed the importance of these experiments to identify the most suitable hybrids for envisaged climatic conditions and culture. In this specific, case the hybrid 3319.

**Keywords-** tomatoes hybrids, climatic conditions, solar, productivity

**Abbreviations-** IF: fruit shape index, cm: centimeter, mm: millimeter, %: percent, g: gram, kg: kilogram, cm<sup>2</sup>: square centimeter, m<sup>2</sup>: square meter, MU: Measuring unit, DL: degrees of their liberty, Mt: control, O: significant negative, N: insignificant, \*: significant, \*\*\*: very significant

**Citation:** Draghici E.M. and Pele M. (2012) Evaluation Some New Hybrids for Cultivation in Conventional System in Spring Climatic Conditions of Romania. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 4, Issue 7, pp-299-305.

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### Introduction

Tomatoes are today one of the most respected and consumed vegetables worldwide. In 2010 the area planted with tomatoes was 4,338,834 ha and production of 145,751,507 tons. Actually, tomatoes dominate the production of vegetables in the EU. Area planted with tomatoes Europe represented approximately 13% of the world total area and production achieved was 14% of the world [1]. In addition, the statistical data we noticed that in 2010 the area planted with tomatoes decreased by about 5% compared with 2005, but total production was about 11% higher than the average production in 2005. The main countries tomato producers are Italy and Spain, which assume 2/3 of the total production. In 2012, Romania area cultivated with vegetables accounted for about 9% of the area planted with tomatoes in Europe, and the average production was

at half of the average production in European countries. Therefore the annual production of vegetables in Romania varies around 750 000 tones [2].

For example from official the statistical data published by FAO in 2012 is noted that both Israel and the Netherlands, the main countries supplying tomato hybrids for Romania, areas planted with tomatoes are very small compared to Romania. However, yields obtained on one ha are very high in Holland 479411 kg/ha compared with Israel 85883 kg/ha and especially in Romania of 15446 kg/ha in 2012 [1].

The content of tomatoes in sugars, vitamins, minerals, amino acids and organic acids, which play a large role in the human body's physiological balance, determine also the therapeutic value of

these products. Although in Europe are cultivated of only around 130 years, have come to be consumed both those reached the physiological maturity as well as green. The range of ways in which they are consumed is extremely varied: fresh in simple salads or with other vegetables, pickled, cooked in various broths, soups, processed foods and industrial pasty, broth, canned, regular or spicy juices etc. [3].

In addition to the nutrients listed, tomatoes contain a compound "miracle" for medicine, lycopene. Numerous medical studies have showed the direct action of this pigment on free radicals in the body.

Free radicals are considered particularly strong oxidative molecules that attack cell membranes of various tissues of the body, attacking also human DNA inducing replication defective processes that lead to rapid aging of the body [4].

These properties determine their wide consumption. Thus, in the world of all of the tomatoes produced annually, about 80% are sold in various forms processed and only 20% are consumed fresh.

To meet the needs of Tomatoes, the official lists of varieties of the world or the EC as well as in Romania try annually new tomato hybrids with resistance to temperature variations, diseases and pests, with a very high productivity and high capacity storage.

In Romania, the largest tomato production is obtained from small farmers who are particularly interested in newly created varieties. It is known that hybrids may respond differently in terms of production in particular to the environmental conditions. [5,6]. Therefore testing new hybrid tomato concerning their productivity is a priority for most researchers in order to prescribe to farmers the most appropriate hybrid both for the climate [7-11] as well as for the culture system [7].

Due to high demands of tomatoes during the entire year, they are cultivated not only in the field but also in greenhouses and solariums. Exigencies of the consumers concerning the quality of tomatoes have known a strong orientation towards the sensory seeking and appreciating as much as taste and flavor tomatoes even at the expense of a commercial aspect of the fruit perfectly. The biological material choice for tomato cultures setting up is an important sequence of vegetable culture technology under shelter [12-15]. Most of the extra early hybrids introduced in Romania over time were hybrids of Dutch origin.

From officially the statistical data published by FAO in 2012 is noted that in the Netherlands yields obtained on one ha are very high compared with those in Romania [1]. Not all hybrids that are marketed for cultivation in greenhouses and solariums shows adaptability and resistance to all pathogens that attack tomato plants or climate variations in Romania. This may be one of the causes of differences in production per hectare between the two countries. Tomato growers trying to overcome these disadvantages by choosing the hybrids suitable for their culture system offered on the market.

In examining of different varieties are taken into consideration a minimum of characters that tomatoes must cover according to the protocol of Community Plant Variety Office (CPVO)-TP 44/3 of 21.03.2007 [16], namely concerning the seedlings, stem, plant,

flowering, during flowering and fruit maturation period.

In this context, it is necessary that tomato market of Romania to be enriched with hybrids adapted to the conditions in this country. Varieties that besides a high yield to be developed conveniently and in the conditions enabling energy savings through early development even at lower temperatures.

Thus in this paper are analyzed several hybrids of Israel with marketing perspective. These hybrids are supposed to have increased resistance to specific environmental conditions during the Romanian spring (low temperature specific first part of spring, days shorter, high nebulosity, high relative humidity), to pests and diseases but which on the other hand ensures high yields and high quality of early tomatoes respectively their appearance, taste and a long shelf life. In addition the introduction of new hybrids in production is envisaged and diversification of early tomatoes. It also takes into consideration the need to assess the various hybrids under protected culture in order to develop recommendations on their suitability for cultivation in solariums.

## Material and Methods

The experiments were placed in the teaching and experimental field, namely in the unheated solarium of the Department of Vegetable Growing. The experiments were conducted during February to August 2011.

In experiments were used 11 hybrids of Israeli origin: V1-3349; V2-3350; V3-3330; V4-3326; V5-3323; V6-3335; V7-3351; V8-3319; V9-3352; V10-3348; and V11-2821.

Sowing was carried out in greenhouse multiplier, providing a constant optimum temperature for germination of 20°C. For sowing and transplant we used professional substrate Plantaflor stamp to produce seedlings purchased from the Hortigala company, Germany, with the following composition: 30% red peat and 70% black peat with 0-7 mm granulation and pH (H<sub>2</sub>O) of 5.5-6.0. The level of fertilization was of 0.8 kg/m<sup>3</sup>.

Culture was established in the solarium, on 04.04.2011. Planting scheme was as follows: the distance between rows 70cm and 40cm between plants in the row. Culture was mulched with biodegradable foil. Plant density was 3.5714 plants/m<sup>2</sup> respectively 35,714 plants per one ha.

The care works seedlings were applied: daily watering, thinning plants when they grew; 2 treatments with Mospilan 0.2% for greenhouse whiteflies; two preventive treatments with Merpan 0.2% when seedlings had 4 true leaves and 2 days before planting with Topsin 0.2%. The care works cultures were applied. Dripping watering plants whenever it was necessary. Plants were trellising after about 12-14 days after planting. The management and guiding plant growth around the string; pinch off the shoots as they arose when they were about 5-10cm. Growth limited in height after 5-7 inflorescences. Basal leaves defoliation. Phytosanitary treatment with Topsin 0.2%, 0.2% Merpan and 4 treatments for greenhouse whiteflies and spider with Mospilan 0.2% and Nisorun.

The following analysis and determinations were made:

At the seedlings: dynamics of seed germination, dynamic growth in height of tomato seedlings, dynamics of the number of leaves.

In culture: dynamic growth in the solarium of plants height, the dynamics of the inflorescences, the number of leaves per plant, the number of inflorescences, the number of flowers and fruits in the inflorescence, the average weight of fruits, the early and total production, fruits characteristics concerning average weight, shape index, fruits colour and the characteristics concerning the fruits keeping of under controlled conditions.

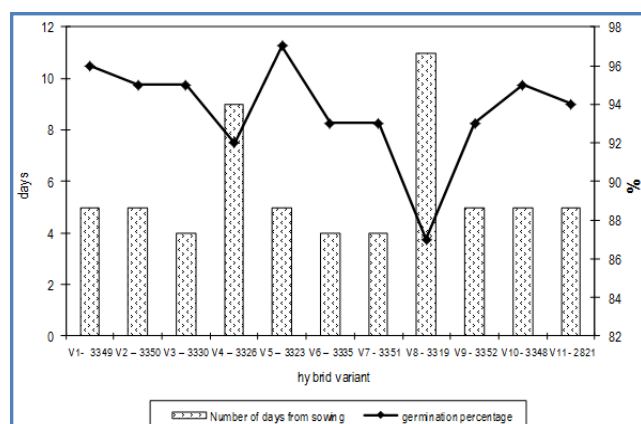
The measurements concerning of plants height growth were made at an interval of 10 days. The number o leaves appeared were regularly recorded.

Harvested tomato fruits have been counted, weighed individually on inflorescences and was determined fruit shape index (fruit shape index = IF).

Statistical calculations were performed to highlight differences between experimental variants.

## Results and Discussion

Among the 11 hybrids tested differences have appeared even from the germination. Thus, hybrids V3, V6 and V7 have sprung up fastest namely 4 days after sowing. Variants V1, V2, V5, V9, V10 and V11 have sprung up to 5 days, but two hybrids were germinated after 9 days (V4) respectively 11 days (V8). It can be noticed also that not all seeds germinate. The highest percentage of germination is 97% at the variant V5. V4 and V8 variants have sprung up at the latest and the germination percentages were also the lowest of 92% and 87% [Fig-1].



**Fig. 1-** Number of days from sowing to sprouting and the percentage of seeds sprung

The data presented in [Table-1] noted that seedling height determined on 25. 03. 2011 ranged from 6.33cm to 12.33cm for V8 respectively for V11. It seedling height was expected to be the smallest for V8 considering that this variant has sprouted at the latest. Nevertheless, it is interesting however, that the variant V11, which has sprouted at five days, has a height greater than the variants that arose after 4 days. This shows a higher growth capacity of this hybrid.

From statistical point of view, the differences concerning the height between the seedlings at planting in solar were insignificant.

Another factor chased it was to determine the number of leaves in seedlings. The average results are shown in [Fig-2]. Can be noticed that in general the number of leaves of seedlings was about

5. Variant V1 is distinguished with an average number of leaves 7 and variant V11 with an average number of 6 leaves. The lowest number of leaves had the variant V8 with an average of 4.33 leaves.

**Table 1-** Dynamic of growth in height of tomato seedlings

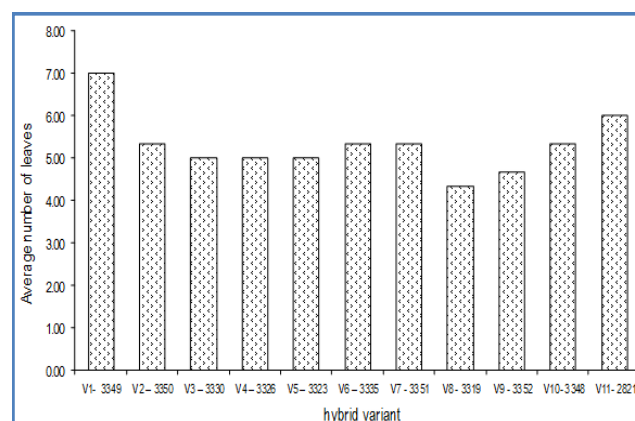
Variants	Measuring unit (MU)	Determination of the Height of Seedlings at:		The difference		The Significance	The daily average of growth rate
		March 25 2011	April 04 2011	cm	%		
V1-3349	cm	9.5	14.25	-0.52	96.5	N	0.317
V2-3350	cm	10.33	14.33	-0.44	97.04	N	0.318
V3-3330	cm	10.67	15.67	0.9	106.12	N	0.348
V4-3326	cm	7.67	12.67	-2.1	85.8	N	0.295
V5-3323	cm	8	16	1.23	108.35	N	0.356
V6-3335	cm	10	15	0.23	101.58	N	0.333
V7-3351	cm	10	14.85	0.08	100.57	N	0.33
V8-3319	cm	6.33	12.33	-2.44	83.5	N	0.308
V9-3352	cm	10.33	15.33	0.56	103.82	N	0.341
V10-3348	cm	11.67	15.67	0.9	106.12	N	0.348
V11-2821	cm	12.33	16.33	1.56	110.59	N	0.363
The average		9.71	14.77	0	100	Control	

DL = degrees of their liberty

DL5%= 2.740 DL5% in %= 18.5557

DL1%= 3.900 DL1% in %= 26.4114

DL01%= 5.640 DL01% in %= 38.1949



**Fig. 2-** Average number of leaves per hybrid at planting

According to UPOV characteristics, an important criterion for differentiating of cultivars is also the anthocyanin coloration of the plantlets hypocotyl in the seedling stage. At V1, V2, V9, V10 and V11 variants were noticed a purple colour of hypocotyls and for the rest of variants was green coloration. Dynamics of growth in height of tomato plants after planting was observed in the solar measuring the height of thereof at intervals of 10 days. Thus, the evaluation of plant growth dynamics of tomatoes in solar of the hybrids tested is represented in [Fig-3]. As it is observed, the increase rate was more than 2.2cm (centimeter) per day to all hybrids. Have increased the fastest variants V1 followed by V2 and V6. The variants with belated germination have had the smallest growth rate namely V8 the smallest with 2.21cm/day and V4 with 2.29cm/day.

A heeded character to knowing the hybrids recommended for high tunnel and greenhouse cultures is also leaf length and size of leaflets. Between hybrids analyzed variants 3, 4, 7 and 11 presented

rich foliage with the length of leaves between 37cm and 45cm. This is important for determining distances of planting and carrying out of some works to remove some leaves with the aim for better circulation of the air among plants but also for better lighting the basal part.

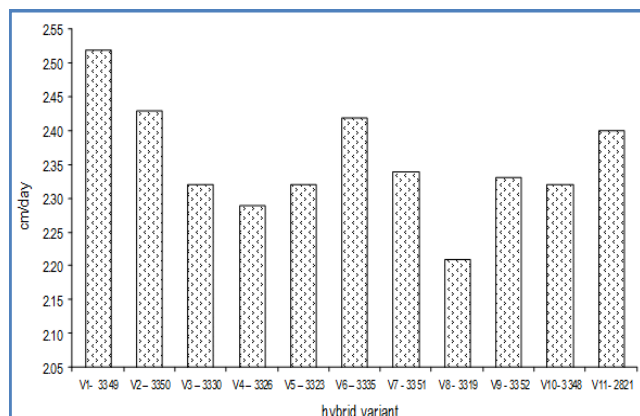


Fig. 3- Average daily rate of growth of different hybrids in cm/day

From the point of view of tomato growers, the most important factors are obviously the number and amount of fruit formed by each hybrid. In this context was observed the evolution of inflorescences formation, distance between them and fruits formation.

To the hybrids analyzed, it was observed that the number of inflorescences varied between 4 to 7 with a number of flowers per plant formed between 22 and 52. Thus, the variant 7 had four blossoms and a total of 22 flowers while at variant 1 have formed a number of 7 inflorescences with a total of 52 flowers per plant. Most of the flowers were formed at variant 2, namely 53 [Table-2].

Table 2- Total number of flowers formed in inflorescences and on the plant

Variants	Inflorescences							Total number of flowers/plant formed
	I	II	III	IV	V	VI	VII	
V1- 3349	6	9	9	7	7	7	7	52
V2-3350	11	9	6	9	9	9		53
V3-3330	7	8	6	8	8			37
V4-3326	9	9	9	9	5			41
V5-3323	7	7	7	9	7	5		42
V6-3335	7	7	7	6	7			34
V7-3351	6	6	4	6				22
V8-3319	7	7	7	7	6	3		37
V9-3352	6	6	6	6	6			30
V10-3348	5	6	6	4	5			26
V11-2821	9	6	6	6	6	6		39

Determining the average distance between inflorescences is important to assess the productive capacity of the hybrid. Distance between inflorescences was different from one hybrid to another, in average it was 19.36cm per variants. Shorter distances between inflorescences were recorded at variants 1 (17cm), 8 (17cm) and 11(17.5cm). The greatest distance between inflorescences, 24.5cm was recorded at the variant 7 [Table-3].

From the Statistical point of view the variant 7 has made a very significant difference compared to the average of variants. Differences significant negative were at the variants 1 & 8. Variant 6 also showed a significant positive difference. The others hybrids did not show significant differences towards average of experiences.

Table 3- The average distance between inflorescences (at inflorescences 1-4)

Variants	Distance between inflorescences	Difference		Significance
	cm	cm	%	
V1- 3349	17	-2.36	87.79	O
V2-3350	18	-1.36	92.96	N
V3-3330	20	0.64	103.29	N
V4-3326	19	-0.36	98.12	N
V5-3323	17,5	-1.86	90.38	N
V6-3335	22	2.64	113.62	*
V7-3351	24,5	5.14	126.53	***
V8-3319	17	-2.36	87.79	O
V9-3352	21,5	2.14	111.03	N
V10-3348	19	-0.36	98.12	N
V11-2821	17,5	-1.86	90.38	N
Average	19.36	0	100	Mt

DL5%= 2.230, DL1%= 3.170, DL01%= 4.590, O= significant negative, N= insignificant, \*= significant, \*\*\*= very significant, Mt= control.

To all the hybrids analyzed, the inflorescences were simple, unbranched. One aspect observed only at one hybrid (V10-3348) it was issuance in large numbers of adventitious roots overall stalk.

Number of fruits produced in inflorescences and per total plant was between 17 fruits at V7 and 41 to V2. This data and the percentual assessment of fruits produced per inflorescence, per floors and per total plant are presented in [Table-4].

The lowest number of fruits per inflorescence it was seen at V7 namely an average of 4.25 fruits and the highest number at V2 of 6.83 fruits.

An interesting behavior had variant 1. Thus, we can notice that the overall percentage of fruits produced per plant, was the lowest at this variant of only 61.54%. However, this hybrid almost had the highest average flowers, formed per plant. It can be noticed that the lowest percentage of binding in accordance with the period when have been developed the inflorescences it was for one inflorescence I of only of only 33.33% and 28.57% for inflorescence VII. Therefore, it was the first and last inflorescence. Thus can be assumed that in this case extreme temperatures or lower or very high sunstroke would cause the low percentage of binding.

The best percentage of binding per plant was observed at the variant 8 (no. 3319) of 91.89%. It likewise remarks at this hybrid, which in general on inflorescences percentage was maximum at inflorescences 1, 2, 5 and 6. In addition, this percentage was high and the other inflorescences. Thus to inflorescence 3 was 85.71% and 71.43% in inflorescence 4 [Table-4].

Fruits evaluation was performed depending on their number and the weight of each fruit.

Fruits with small masses between 30-68 g were obtained only for three hybrids namely 33 to the variant V4, 11 to the variant V2 and 2 to the variant V6. Fruits with higher average weights between 141 g -170 g were in number of 5 to V1, V3 and V8, Of 10 respectively 24 fruits to variants 6 and 9.

The average weight of fruits was generally different from one inflorescence to another. Thus in the [Table-5] are presented the average values of tomatoes weights per inflorescence for each hybrid.



Table 4- The average number and the percent of fruits produced per inflorescence and plant

Variants	Inflorescences							The average number of fruits per inflorescence	Total number and percent- age of fruits per plant
	I nr/ %	II nr/ %	III nr/ %	IV nr/ %	V nr/ %	VI nr/ %	VII nr/ %	Chunks number	nr/%
V1- 3349	2/33.33	8/88.89	7/77.78	6/85.71	4/57.14	3/42.86	2/28.57	4.57	32/61.54
V2-3350	11/100	7/77.78	5/83.33	6/66.67	3/33.33	9/100	-	6.83	41/77.36
V3-3330	7/100	6/75.00	6/100	2/25.00	2/25.00	-	-	4.6	23/62.16
V4-3326	9/100	8/88.89	6/66.67	6/66.67	4/80.00	-	-	6.6	33/80.49
V5-3323	5/71.43	6/85.71	6/85.71	2/22.22	6/85.71	4/80.00	-	4.83	29/69.05
V6-3335	7/100	4/57.14	3/42.86	5/83.33	7/100	-	-	5.2	26/76.47
V7-3351	6/100	4/66.67	3/75.00	4/66.67	-	-	-	4.25	17/77.27
V8-3319	7/100	7/100	6/85.71	5/71.43	6/100	3/100	-	5.67	34/91.89
V9-3352	6/100	5/83.33	4/66.67	5/83.33	4/66.67	-	-	4.8	24/80.00
V10-3348	3/60.00	6/100	5/83.33	4/100	4/80.00	-	-	4.4	22/84.62
V11-2821	8/88.89	5/83.33	6/100	4/66.67	4/66.67	5/83.33	-	5.33	32/82.05

In [Table-6] are presented total masses on inflorescences and on plant harvested.

Table 5- The average weight of fruits per inflorescence (g)

Variants	Inflorescence						
	I	II	III	IV	V	VI	VII
V1-3349	122.5	82.78	103.43	122.33	124	157.33	162.5
V2-3350	49.66	93.86	108.2	104.5	117.66	82.66	
V3-3330	90.37	99.33	103.33	140.5	143.5		
V4-3326	48.44	51.38	55	53.67	56.25		
V5-3323	121.8	103	103.71	133.5	103.14	124.5	
V6-3335	98.71	121.25	123.67	120.4	83.71		
V7-3351	113.17	148	171.66	156.25			
V8-3319	134.86	136.43	137.33	140	135.33	144	
V9-3352	153.67	153.4	173.75	159.4	187		
V10-3348	121.67	115.67	120.4	122.5	119		
V11-2821	81.88	94.6	95.67	96	95	95.2	

Table 6- Total mass of fruits produced on inflorescences and on total plant

Variants	Total harvested per inflorescence, g							Total harvested per plant in g
	I	II	III	IV	V	VI	VII	
V1-3349	245	737	724	734	496	472	325	3733
V2-3350	585	664	546	633	356	753		3537
V3-3330	716	596	620	286	292			2510
V4-3326	44.5	51.38	55	53.66	56.25			1724
V5-3323	609	715	720	267	716	498		3525
V6-3335	691	485	371	602	586			2735
V7-3351	679	592	515	625				2411
V8-3319	944	955	824	700	812	432		4667
V9-3352	922	767	695	797	748			3929
V10-3348	365	694	602	490	476			2627
V11-2821	655	473	574	384	380	476		2942

At V1, the lowest fruits with an average of 82.78 g were obtained the second inflorescence. Within these inflorescences were obtained fruits even of 55-69 g. From inflorescences 1, 3, 4 and 5 were harvested fruits over 100 g. From inflorescences, 6 and 7 fruits were fewer on inflorescence but the average weight of over 157 g. The average weight of fruits harvested per plant was of 3733g.

From V2 were obtained smallest fruits in inflorescence 1. Within that inflorescence were formed 11 fruits. Also at inflorescences, 2 and 6 fruits were below 100 g. The fruits from inflorescences 3, 4 and 5 had a little over 100 g. This variant has formed the most irregular fruits. Per plant were harvested on average 3537 g tomatoes.

The fruits harvested from the variant 3 were on average around 100 g. The inflorescences 4 and 5 were formed only 2 each fruits and their average weight was about 140 g. Per plant were harvested on average 2510 g tomatoes.

From variant 4 were harvested fruits between 48.44 g average mass from inflorescence 1 and 56.25 g from inflorescence 5. Fruits generally small but uniforms characterize this hybrid. Total average weight per plant was harvested 1724 g.

From the variant 5 were obtained fruits with average weight over 100 g. Of over 120 g fruits were harvested from inflorescences 1, 4 and 6. At the 4<sup>th</sup> inflorescence were obtained of over 130 g fruits but were only two fruits. In total 3525 g were harvested tomatoes on the plant.

The fruits harvested from V6 were below 100 g in the case of inflorescences 1 and 5 but were produced a large number of fruits per inflorescence. In this situation could have been limit the number of fruits per inflorescence so that the fruit to grow in weight. Otherwise, fruits were uniform, with average weights about 120g. This variant gave an average of 2735 g per plant tomatoes.

Large fruits characterize the variant 7. Inflorescence 1 presented fruits with average weight of about 113 g. The rest of the inflorescences had fruits were over 140 g, and to inflorescence 3 the fruits were over 170 g. The total mass of fruits harvested per plant was 2411 g.

At the variant V8 were harvested fruits averaging about 135 g each. Their size was generally uniform for all inflorescences. From this variant was harvested largest amount fruit on plant, namely 4667 g.

In the case of variant 9 the fruits had higher weights over 153 g. At this variant was observed that the inflorescences were broken under the weight of fruits. This variant gave 3929 g fruits per plant.

At the variant V 10 were obtained generally uniform fruits over about 115 g. Most fruits have had about 120 g. From the inflorescences were harvested from 365 g to inflorescence 1, from 694 g to inflorescence 2. A total of 2627 g per plant were harvested.

Small Fruits, averaging about 80 g to about 96 g were collected from V11. Fruits were generally uniform within inflorescences. The large number of fruits in inflorescences determined to obtain on inflorescence between 380 g and 655 g and 2942 g per plant.

There have been a number of 4 harvests. To variants 4, 5, 10 and 11 there has been no harvesting on 1 July 2011 as result these hybrids are later.

The data obtained concerning plant production are recorded in [Table-7].

Table 7- The graph of tomatoes harvest and average production obtained per plant

Variants	Total production g/plant	1st harvest Jul-01 g/plant	2nd harvest Jul-15 g/plant	3rd harvest Jul-23 g/plant	4th harvest Aug-01 g/plant
V1-3349	3733	779	865	1150	939
V2-3350	3537	1120	780	975	662
V3-3330	2510	784	577	380	769
V4-3326	1724	0	830	450	444
V5-3323	3525		1650	985	890
V6-3335	2735	1463	530	375	367
V7-3351	2411	709	1320	382	0
V8-3319	4667	2537	650	875	605
V9-3352	3929	1695	1275	630	329
V10-3348	2627		1157	878	592
V11-2821	2942		1415	875	652

Analyzing hybrids in terms of the early production was found that the highest percentage of 54.36% of total production was registered at hybrid V8. The data recorded can appreciate the production capacity of hybrids analyzed per m<sup>2</sup>. These assessments are presented in [Fig-4]. It can notice that in this case too hybrid V8 recorded the highest yield at 1 m<sup>2</sup> in a period of only three months of vegetation. The hybrid V4 showed the lowest production, of only 6.1 kg/m<sup>2</sup> but also the most belated.

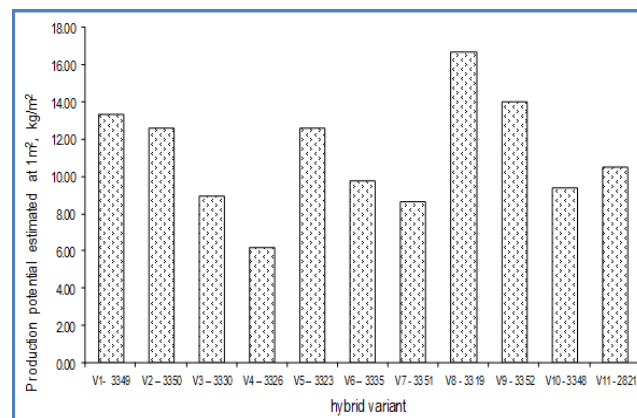


Fig. 4- Production potential estimated at one m<sup>2</sup>

In [Table-8] the characteristics of tomato fruits are presented to all hybrids analyzed. Thus index of form, relationship between the height and the diameter of the fruit, showed that the fruits have had generally spherical shape flattened on most variants except of variant 11 where the fruits were elongated, the index being 1.25.

In cross section was observed that the number of the seminal loggias was lower at variants 11 and 8 (2-3 loggias).

Immature fruits showed a uniform green color to the variants 1,2,3,5,6,8 and 11 and only at the variants 4, 7, 9 and 10 was noted the presence of dark green with collaret. At the physiological maturity the fruits have had deep red color except of variant 11 where the fruits were red-orange easily.

Table 8- The characteristics of tomato fruits to hybrids tested

Variants	Shape of the fruit IF	Number of seminal loggias	Unripe fruit color	Physiological maturity of the fruit color	Fruit appearance	Pericarp thickness, cm	Size of the pestle area, mm	Peak shape
V1-3349	0.85	4-5	Uniform green	Red uniform	Smooth	0.7	2-3 mm	Without peak
V2-3350	0.79	4	Green	Red uniform	Fruit coated prone to cracking easily	0.8	4-5 mm	Without peak
V3-3330	0.84	4	Green	Red uniform	Smooth	0.5	2-3 mm	Without peak
V4-3326	0.75	3	Green with collaret	Red uniform	slightly rippled	0.6	1-2 mm	Without peak
V5-3323	0.84	3-4	Green	Red uniform	easily coated	0.7	2-3 mm	Without peak
V6-3335	0.73	3-4	Green	Red uniform	easily coated	0.7	4-5 mm	Without peak
V7-3351	0.67	4	Green with collaret	Red uniform	Smooth	0.9	1-2 mm	Without peak
V8-3319	0.85	2-3	Green	Red uniform	Smooth	0.8	1-2 mm	Without peak
V9-3351	0.82	4	Green with yellow collaret	Red uniform	Smooth	0.7	2-3 mm	Without peak
V10-3348	0.85	4	Green with collaret	Red uniform	Smooth	0.7	2-3 mm	Without peak
V11-2821	1.25	2	Green	Red-orange	Smooth	0.5	absent	Without peak

Table 9- Fruits firmness and dry substance content on 7-19-2011

Variants	At the temperature of 9°C Firmness kgf/cm²	At ambient temperature Firmness kgf/cm²	At the temperature of 9°C Dry substance %	At ambient temperature Dry substance %
V1	1.79	4.7	4.7	5.1
V2	1.96	5.4	5.4	5
V3	1.19	5.5	5.5	5
V4	2.07	5.4	5.4	4.6
V5	2.32	5.3	5.3	4.7
V6	1.74	4.6	4.6	4.6
V7	2.11	5.7	5.7	6
V8	1.59	5.2	5.2	4.9
V9	3.7	5.4	5.4	5.4
V10	1.9	5.3	5.3	4.6
V11	1.17	5.6	5.6	4.8

The thickness of pericarp was small only to V11 meaning of 0.5cm.

Another characteristic was the size of pestle area that most of the times when this is large can be characterized as a defect because the fruit can crack this area. Most fruits showed a smooth appearance except variants 2,4, 5 and 6, where appearance was slightly coated. All variants showed no peak fruits appearance being rounded.

Fruit firmness at harvest was between 4.6 and 5.7 kg/cm<sup>2</sup> to 6 kg/cm<sup>2</sup> V to V7. In terms of 9°C temperature, storage for 14 days it was observed that fruit firmness was lowers [Table-9].

## Conclusion

The analysis of assessment of those 11 hybrids from Israel in early spring climatic conditions of Romania led us to some interesting conclusions. Thus between the seeds those 11 hybrids the lowest germination rate have had hybrids V4-3326 and V8-3319. While most of hybrids were germinated in 4-5 days hybrid V4-3326 hybrid germinated after 9 days and V8-3319 after 11 days. In addition, they had the lowest germination percentage namely 92% for V4 and 87% for V8.

In terms of seedlings developing, has been an increase between 0.295cm/day and 0.363cm/day. The lowest rate of growth of seedlings had the variant V4 and the highest the variant V11.

At planting tomato seedling with the fewest leaves was hybrid noted V8 with an average of 4.33 leaves while the most for V1 with an average by 7 leaves/plant. In addition at planting seedlings of 1,2,9,10 and 11 variants showed hypocotyls of purple color.

As it was found until, planting the variant V8 showed the worst performance followed by the variant 4. Even in the solar, the lowest height has had a hybrid V8-3319.

Pursuing formation of inflorescences and then fruits is one of the most important issues for horticulturists. Thus, plants had a different number of inflorescences respective flowers. Ratio between the number of flowers and the fruit produced was also different. Thus, although hybrid V1 has had one of the largest numbers of flowers of which only 61.54% have produced fruit, being one of the weakest production hybrids. At the same time the hybrid that look the weakest growth during seedling production (v8) produced the highest percentage of fruit connected, namely 91.89%.

In terms of fruits size the smallest fruits with an average of 52.24 g/fruit were produced by the hybrid V4-3326 and the highest with an average of 163.7 g/fruit were produced by the variant V9-3352.

Evaluating the production capacity per plant and the potential production per 1m<sup>2</sup> has found that the variant V4 has the lowest potential of 6.1571 kg/m<sup>2</sup>. It is very interesting that the greatest potential productive it has the variant 8 (hybrid 3319) of 16.667 kg/m<sup>2</sup>, the one that was seen from the start as the variant with the lowest capacity of germination and growth. This is extremely significant because this hybrid not only has a large production capacity but it is the earliest of all hybrids tested. Thus even from the first harvest gathered 54.4% of the total production at this hybrid.

As regards of fruits firmness in storage conditions for 2 weeks at 9° C most resistant fruits proved those provided by the hybrid V7-3351.

These results lead to the suggestion of the experiments to improve germination capacity of the hybrid V8 and recommendations for early crops in solar, in climate conditions in Romania.

## Acknowledgements

This paper is supported by a contract funded by Executive Unit for Financing Higher Education, the Research, Development and Innovation Grant PN-II-PT-PCCA-2011-3.2-135, CNCIS-UEFISCSU-Partnerships Program, Bucharest, Str. D.I. Mendeleev nr. 21-25, sector1, Romania.

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