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NEW PROCESSING TOMATO VARIETIES OBTAINED AT V.R.D.S. BUZĂU

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Abstract

Researchers for improving tomatoes at V.R.D.S.Buzau have been since its beginning, 1957. Here were obtained for the first time in Romania, the tomato hybrid seed under Bulgarian license, the 10 x Bizon famous hybrid. Over time the new valuable, with well-defined genetic constitution varieties were created which currently occupy significant surfaces in culture. Among these are: Buzau 22, Buzau 47, Buzau 1600. Studies undertaken by V.R.D.S.Buzau about the Romanian varieties of tomatoes have spotlighted that old varieties of tomatoes were patented as mixed, with destination for fresh consumption and industrialization. At the same time it was found that these varieties do not always meet the appropriate parameters for both destinations, so after the year 1990 researches were undertaken by the Improvement Laboratory in an intensive system, with the aim of obtaining creations strictly specialized, according to destination. The research started with the establishment of a solid germplasm database, followed then by its knowledge and use in the improvement process. The unit currently has a total of over 1000 genotypes from this species in various stages of improvement. The main objectives for improvement of which were obtained new creations were: productivity, quality of fruit in accordance with the requirements of the processors, the dry substance content, low acidity, pigmentation, the content of lycopene, sugar-acidity ratio, the jointless gene (breaking the fruit without peduncle), and genetic resistance to the main pathogens, concentrated fruit maturation suitable for mechanized harvesting. The researches were completed for a total of 5 new varieties patented and registered in the Official Catalogue of the Crop Plants from Romania. Among these, the varieties Darsirius and Daria present ovoid, plump fruits, Kristinica and Florina 44 R have round fruits, and Florina 44 T has also round fruits that show an easy mucrone, transmitted by the beck gene. Regarding the earliness, the first place is occupied by the variety Kristinica, its fruits reaching the physiological maturity at 90 days after planting and the tardiest is the Darsirius variety, with fruits that reach the complete maturity at 130 days after planting.

Key words*: Darsirius, breeding, Florina , germplasm, Kristinica.*

INTRODUCTION

V.R.D.S. Buzău showed interest for tomatoes breeding since its establishment, in 1957. There were created the first Romanian varieties of tomatoes intended for both industry and fresh consumption. At the same time was obtained hybrid tomato seed for the first time, under the Bulgarian license, the famous hybrid 10 x Bizon, followed by Romanian Export II hybrid made from the crossing of line 24 x XIII.

Currently, the institution has a portfolio of 18 approved and patented varieties, registered in the Official Catalogue of Romanian Crop Plants.

It was found that most Romanian varieties so far have a mixt destination, both for fresh consumption and industrialization. As a result of the increasing demands imposed by growers, processors and consumers, starting with 1996, research undertaken intensively at V.R.D.S. Buzău in terms of tomatoes breeding had the aim of obtaining specialized strictly specialized varieties.

At the same time it was found that Romanian industry varieties offer is currently quite limited in comparison with market needs. In terms of per capita consumption tomatoes are the leading processed vegetables. (Gould et al., 2013). Tomatoes intended for processing must meet certain conditions, to have certain features that are implemented through the breeding process of improvement and genetic resource used.

For instance, certain phenological traits (early flowering and concentrated fruit set) were associated with a set of morphological traits (smaller canopies and low vegetative biomass),

along with gains in physiological traits (biomass N concentration and photosynthetic rates) in modern varieties (Felipe et al., 2014).
The breeding program aimed the fruit quality, especially in terms of their chemical composition. Processing of fresh tomato into paste had an overall positive effect on the contents in phenolic compounds, no effect on lycopene and a slight and high detrimental effect on β-carotene and ascorbic acid, respectively, (Chanforan et al., 2012).
This work presents recent varieties obtained for industry as results of research undertaken in 1996-2015 at V.R.D.S. Buzău

MATERIALS AND METHODS

The research started with the collection of germplasm, its evaluation and division by type (sp- self prunning, SP- half self prunnig and SP^{+}- indeterminate) and depending on the degree of genetic stability (stable, advanced and segregant) (fig.1.).

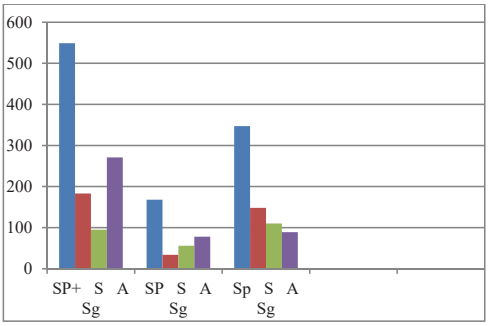

Figure 1. Tomatoes germplasm composition

SP+ (indeterminate)- 549 lines from which:
S (Stable) 183,
A (advanced) - 95
Sg (segregant) - 271
SP (half self-pruning lines) - 168 lines from which:
S (Stable) 34,
A (advanced) - 56
Sg (segregant) -78
Sp-(self-pruning lines)- 347 lines from which:
S (Stable) 148
A (advanced) - 110
Sg (segregant) -89
After germplasm evaluation, it was divided into two fields, the general collection field where were maintained the collected genotypes and work field composed from promoted genotypes in accordance with the breeding process objectives.
Priority had self-pruning genotypes genetically stabilised totalling 148.
Breeding applied methods were specific for tomatoes, especially individual repeated selection.
After the evaluation and tests carried out in the test fields over a long period of time, 5 genotypes showed stability and genetic superiority in terms of productivity and meeting specific industry characteristics and were approved under the following names: Daria (Măriuca), Florina R, Florina T, Darsirius and Kristinica.
As control variant in the experience has been used well-known variety Rio Grande.
The applied technology was specific to tomatoes specifying that the establishment of culture, for all the cultivars was done through direct sowing and planting stock. Sowing for seedling production has been carried out on the 10th of March and the planting was carried out on the 25th of April (Fig.2.).


Figure 2. Seedlings

For direct sowing variant, all cultivars were seeded on the 20th April.
Soil preparation was made in sSeptember through leveling, followed by fertilization. The work was followed by deep ploughing. In spring, the soil has been mobilized with disc harrows, followed by soil modeling. Maintenance work was specifically, irrigations (7-8) during the vegetation period, filling in gaps, manual and mechanical cultivation.
Planting has been carried out using the following scheme of crop establishment (fig.3.):

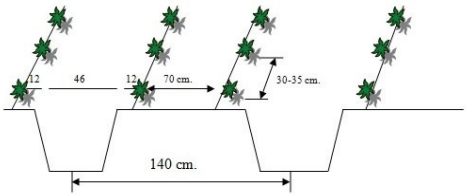

Figure 3. Crop establishment scheme on modeled soil

The same establishment scheme was used to direct sowing crop variant specifying that the norm of seed was 1 kg/ha, followed by sparing work, after the plants have reached the cross stage.

RESULTS AND DISCUSSIONS

The researches were completed with obtaining a rich and varied assortment of new Romanian varieties at this species. The new varieties have distinct genetic and phenotypic features that correspond to the proposed objectives for industrialization.

The main features of the newly created varieties are:

Florina R variety of tomato (fig. 4.) has determined growth intended for field crop. Special taste and aroma and also the dry matter percentage over 6.2% recommends it for industrialization. Immature fruit is green, with green shoulder (U gene) and at physiological maturity turns bright red. The fruit are firm, split and burning sun resistant and has a long shelf life after harvest (over 10 days). The fruit has commercial, attractive aspect with pleasant and balanced taste. The fruit can be jointed harvested because of the short stem, increasing the duration of storage after harvesting.

Plant vigour is average, presents a number of 60-80 leaves with leaflets of medium size.

In the inflorescence can be found 4-6 large, round fruit, medium weight of fruit is 220 g.

In cross section the fruit shows a pericarp thickness of 7-8 mm and 4 seminal lodges.

The fruit has a small number of seeds, between 60-80 that are well developed and visibly covered with yellow thin hairs.

Production potential = 50-60 t/ha.

The Florina T variety (fig. 5) is similar to the Florina R variety, having at the obtaining base the same origin but differentiates itself by the following characteristics: the fruit is round with easy mucron (Beck gene). At the same time the yield level is low but the shelf life is longer due to the higher firmness.

The Darsirius variety (fig. 6.) has ovular shape fruits with an average weight of over 80 g, immature fruits have uniform green colour (U.G. gene) and riped fruits are glossy dark red. The fruits are firm, with small abscission area without hard tissues into the fruit, jointless, easily to be harvest and it is split resistant, reddish-burgundy colour in ripe. Due to the concentrate ripening and jointless fruits, the variety is suitable also for mechanized harvesting.

Fig. 4. Florina R variety

Fig. 5. Florina T variety

It has a high content of dry matter of more than 5.5 percent. It can be grown in organic farming, being created in our country concerning the specific climate conditions. Plant has determined growth with a height ranging between 50-60 cm with 4-6 vigorous shoots.

Figure 6. Darsirius variety

Variety is genetically endowed with genes of resistance to specific tomatoes diseases and Nematodes (Mi gene) and has a long shelf life after harvesting for over 10 days.

The Kristinica variety (fig. 7.) has a determined growth, registering an average height of 60 cm, small vigor and shallow foliage.

Figure 7. Kristinica variety

Thanks to this feature it can enlarge the surface density and shows an average number of 6 fruit per truss. Before maturity, the fruit presents green shoulders (U gene).

The fruit is round shaped and has an average weight of 120 g. Fruits are firm and are red colored. The shelf life of the fruit both on the plant and after ripened, after harvest is over 30 days, without yield depreciating. Yield production: 50-60 t/ha, 2, 5 kg/plant. Yield can increase significantly if it interferes with additional technological links.

Beeing the first obtained and patented variety of V.R.D.S. Buzau for industry, it was tested in the six main vegetable romanian institutions in comparative crop with Rio Grande. The obtained results are presented in table no.1.

Table 1. testing of potential yield production (t/ha) of tomato variety Kristinica in comparative crop, in six of the main romanian vegetable institutions

Variety	Locality						Average		STAS of total**	Early yield of total***
	Tc.	Ov.	Cl.	Cf.	Tu,	Tg.	t/ha	%	%	%
Rio Grande (control variant)	52.2	22.9	44.2	68.3	9.8	37.5	39.2	100	77.2	5.4
Kristinica	41.8	29.2	50.3	82,0	20.4	40.3	44	112.2	86.9	21.2

*Locality: Tc.=Tecuci; Ov.= Ovidiu; DL 5%=8,8 t/ha
Cl.= Calarasi; Cf.= Calafat; Tu.= Turda DL 1%=13,8 t/ha
Tg= Targoviste DL 0,1%=23,5 t/ha
**Fruits with weight of over 33 g;
***Yield obtained until 31st of July- in the south; 10th of August- in the rest of area

Daria (Măriuca) variety (fig. 8) is determined growth, medium vigor, with an average height of 55 cm, a vigorous stem, from which 6-8 sprouts start. The leaves are medium sized, dark green, slightly embossed.

Figure.8. Daria (Măriuca) variety

The fruit is slightly ovular shape, immature fruit is uniform green (UG gene) and red riped. The fruits are firm, with a pericarp of 8-9 mm and a total of 3 seminal lodges where there are between 60-80 seeds. The shelf life of the fruit is good, for more than 30 days. Average production per plant is 2.5 kg but can increase significantly if it interferes with additional technological links.

In terms of yields obtained at V.R.D.S. Buzău in 2010-2015 period, is noted that compared to Rio Grande control variant, the 5 varieties for industrialization have recorded higher yields (table.no. 2.).

Daria (Măriuca) registered in 2014, 108.9 t/ha, being the highest yield compared to Rio Grande who registered just 75.2 t/ha in the same year, and highest yield recorded by this variety.

The smaller productions were obtained in 2011 (21.5 tonnes/hectare at Florina R) but with the difference that the climatic conditions of that year were not favourable for the tomatoes.

On average, all 5 varieties are superior compared to the control variant with a maximum value of 17.8 percent registered by Daria (Măriuca).

In order to obtain an early yield the concentrated ripening fruit was aimed and Florina T recorded the highest percentage of total early yield, of 9.6%, while Florina R had 6.9 percent.

Table 2. Yield obtained at V.R.D.S. Buzău in 2010-2015

Variety	Yield (t/ha)								STAS* of total yield	Early yield of total**
	Year						Average			
	2010	2011	2012	2013	2014	2015	t/ha	%	%	%
Rio Grande	34.8	25.6	24.5	62.9	75.2	73.2	49.4	100	93.6	8.3
Florina T	33.4	25.5	36.0	54.2	71.8	63.1	47.3	95.7	94.3	9.6
Florina R	33.5	21.5	32.4	81.0	93.5	53.9	52.6	106.5	93.1	6.9
Daria	31.2	22.7	51.6	71.8	108.9	63.1	58.2	117.8	93.0	8.1
Darsirius	31.8	22.3	37.2	74.5	76.4	75.6	53.0	107.3	93.3	7.2
Kristinica	30.9	25.2	36.7	68.0	71.3	77.5	51.6	104.5	93.4	7.9

* fruits with weight of over 33 g
**Yield obtained until 31st of July

DL	5%	10.3	20.9 %
DL	1%	14.0	28.3 %
DL	0,1%	18.7	37.8 %

The industry varieties were biochemical analysed and it was found that in the case of dry matter content, due to the pericarp density, Darsirius variety ranked the first place with 5.8%; dry soluble matter remains at the rate of 5% as in the case of the variety Kristinica (table no. 3). In the case of varieties of Florina T, R and r. Daria (Măriuca) an equal value of 4.5% was recorded. Also, Kristinica has registered a value of 0.43% acidity, at the opposite side being Darsirius with 0.35%. The highest content in sugar was recorded by Darsirius while Daria (Măriuca) has registered a rate of 2.44 percent.

Regarding the sugar : acidity ratio, Darsirius was first valued with 8.97%, followed by Florina R with 16%. The highest content in ascorbic acid was measured at Florina T followed by 11.97% at Darsirius with 9.58%. The highest content of lycopene 9.08% was recorded by Florina R.

Table 3. Biochemical analysis of tomatoes for industrialization

Parametre	Variety					Average values*
	Daria (Măriuca)	Kristinica	Florina T	Florina R	Darsirius	
d.m.c. %	5.18	5.26	5.35	5.30	5.8	5.98±0.83 (cv=14%)
s.m.c. %	4.5	5.00	4.5	4.50	5.00	4.75±0.35 (cv=7%)
Acidity (Citric acid), %	0.41	0.43	0.39	0.37	0.35	0.38±0.03 (cv=8%)
Sugar total,%	2.44	2.97	2.88	3.02	3.14	3.37±0.77 (cv=21%)
Ratio sugar: acidity	5.95	6.91	7.38	8.16	8.97	10.76±0.09 (cv=1%)
Ascorbic acid, mg/100 g^{-1}	8	7.02	11.97	8.30	9.58	9.67±0.65 (cv=7%)
Lycopene, mg/100 g^{-1}	6.5	5.00	8.18	9.08	6.00	8.00±1.5 (cv=19%)
Average weight,g± a.s.	93.5±22.1 (cv=24%)	108.9±13.5 (cv=12%)	139.9±29.1 (cv=21%)	167.9±26.0 (cv=15%)	86.9±13.3 (cv=15%)	92±10 (cv=11%)

* Viorica and Vipon varieties (RDIVFG Vidra)
d.m.c. – dry matter content
s.m.c. – soluble matter content

CONCLUSIONS

The researches were completed so far with the achievement of a germplasm resource at this species consisting of 1064 genotypes, both evaluated and computerized stored from which in the future will be able to obtain new

varieties. 5 new varieties of tomatoes for industrialization have been obtained and approved: Kristinica, Darsirius, Florina T and R and Daria (Măriuca), genotypes with distinct features that enrich the current industry tomatoes assortment.

All five varieties behaved positively to the both crop systems direct sowing and planting stock specifying that the plants were more vigorous in the direct sowing crop, but with 15-20 days later yield. Recorded yields and physical and chemical properties of fruits demonstrates that the objectives of the proposed research breeding program were reached.

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