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ASSESSING TOMATO GERMPLASM FROM V.R.D.S. BUZAU TO IDENTIFY GENOTYPES WITH DISTINCT FEATURES

Bianca ZAMFIR[1], Dorel HOZA[2], Costel VÎNĂTORU[1], Camelia BRATU[1], Elena BARCANU[1]

[1]Vegetable Research and Development Station Buzău, No. 23, Mesteacănului Street, zip code 120024, Buzău, Romania
[2]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania

Corresponding author email: zamfir_b@yahoo.com

Abstract

V.R.D.S. Buzau is well known for tomato breeding, over time here were obtained valuable varieties appreciated by both consumers and growers. Currently, V.R.D.S. Buzau has an important germplasm collection consisting of over 1500 genotypes in different breeding phases. Since 1996, research on breeding this species were intensively undertaken, been obtained for the first time in our country hybrids with a certain destination. The research carried out so far has mainly focused on the germplasm evaluation accumulated to identify genotypes with distinct features for the breeding process, as well as availability and genetic stability in the progeny. The study aimed the observation of shape, size and fruit color to identify distinct features. The stable identified genotypes were organized into two groups: cherry type varieties and large fruits of different shapes like pear, bell peppers, long pepper, lemon, banana varieties, with different colors like white, various shades of yellow, red, pink, brown, black, burgundy varieties. Two of these genotypes have been proposed for patenting and are to be expanded on a large scale in production.

Key words*: biodiversity, breeding, Estera, Hera*, *specific destination.*

INTRODUCTION

Tomatoes were brought to Europe quite late, in the 16th century and more lately in Romania, 19th century. Although they were brought recently in Romania, this species is the most cultivated among vegetables. Edible tomato has its origin in the small and yellow wild tomato. Both plant and fruits sepals of the wild tomato are covered by big aggressive spines. Cultivars with red edible fruits of different sizes were obtained by selection and breeding methods and nowadays are cultivated on large scale. Domestication is often controlled by a limited number of chromosomal regions with major phenotypic effect In tomato, edible fruits, attractive red colour and fruit size increase are characterizing this process (Purugganan et al, 2009).

Following the selection and modern breeding methods, nowadays were obtained numerous genotypes of this species with distinct phenotypic traits. Also the consumers and producers demands imposed new breeding directions to obtain cultivars with precise use.

From first domestication to modern breeding, the tomato has been continually subjected to human selection for a wide array of applications in both science and commerce. Current efforts in tomato breeding are focused on discovering and exploiting genes for the most important traits in tomato germplasm. In the future, breeders will design cultivars by a process named 'breeding by design' based on the combination of science and technologies from the genomic era as well as their practical skills (Yuling Bai, 2007). Beside the recent breeding aims, crop yield and quality remain the main objectives The major goals of tomato breeders (higher productivity, better tolerance to biotic and abiotic stresses and increased sensory and health value of the fruit) require a good comprehension and management of tomato genetic resources diversity (Guillaume Bauchet, 2012). V.R.D.S. Buzau was interested in breeding this species since its establishment in 1957. There were obtained well known and appreciated varieties by both consumers and growers. Since 1996 the research was focused on enriching the Official Crop Plants List of Romania with new tomato varieties.

MATERIALS AND METHODS

Research started with collecting and assessing the tomato germplasm and breeding the

valuable genotypes. Now the germplasm collection contains over 1500 genotypes in different breeding phases. The genotypes assessing and organizing was made on the following criteria: type of growth and progeny genetic stability (Figure 1).

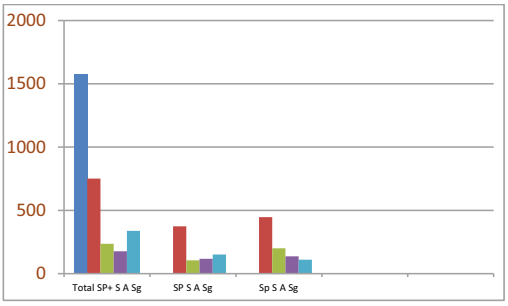

Figure 1. Tomato germplasm grouped on: SP+ (indeterminate) - 751 from which: S (Stable) 236, A (advanced) - 177, Sg (segregant) - 338; SP (semi-determinate) - 374 from which: S 105, A 118, Sg-151; Sp-(determinate) - 447 from which: S 200, A - 137 and Sg 110

Due to the large number of collected and assessed genotypes, new selection and breeding methods were implemented.

Our study was focused on individual repeated selection. Beside this, there were used hybridization, segregation, mutations and controlled genetic drift.

RESULTS AND DISCUSSIONS

Following the germplasm assessing there were retained 12 accessions that correspond to the main breeding proposed objectives (Table 1). Concerning the main plant features, accession (A) 532 has semi-determinate type of growth and the rest of the accessions have indeterminate growth.

Concerning the plant height, A 80 reached the highest value of 291 cm. A 631 has the richest foliage, this feature protects the fruits against solar burns.

Maximum number of trusses per plant was scored by A 709 with 11 trusses.

Concerning the fruits features, there were selected accessions with distinct traits which demonstrates the diversity of this species.

Thereby A 631 presents yellow lemon shaped fruits, productive plant and the fruit weights 83.3 g on the average. A 312 has cherry striped fruits, dark brown with red stripes and dark red pulp. The fruit weights 26.3 g on the average and has good firmness. A 524 has bell pepper shaped fruits, red coloured at maturity that weights 233.6 g. The fruits have large interior spaces and can be used to prepare some dishes like stuffed peppers.

A 522 has light yellow big fruits with red pulp, with 252.3 g average weight. A 308 has red with yellow stripes bell pepper fruit shaped and very productive plants. A 306 has very tasty cherry black fruits that weights 18.4 g on the average. A 532 has banana intense yellow shaped fruits that lengths 7.2 cm and A 709 is the most tasty accession due to sugar content of 12-16%. A 724 is a different accession with dark black fruits and uniparous raceme.

The pulp is dark red coloured. A 2000 has low productive plants but very big tasty heart shaped fruits. This accession comes from the Ox heart heirloom (Table 2) (Figure 2)

From these accessions, A 80, A 28 and A 2000 were selected as the most interesting and genetic stable genotypes that correspond to the consumers and growers requirements.

These accessions were registered for patenting since 2016 at ISTIS Bucharest.

Table 1. The main plant features

Studied feature / Accesion	631	312	524	522	28	308	306	532	709	80	724	2000
Growth type	SP+	SP+	SP+	SP+	SP+	SP+	SP+	SP	SP+	SP+	SP+	SP+
Plant height (cm)	271	281	268	272	263	288	268	165	258	291	263	250
Lateral shoots	12	13	11	13	13	10	11	9	12	14	13	18
Leaves/plant	36	30	27	21	23	31	26	17	32	26	28	35
Leaf length (cm)	36	35	52	38	40	42	40	33	32	43	36	49
Trusses/plant	9	8	6	5	5	5	8	5	11	10	7	5
Distance between trusses (cm)	22	24	34	27	28	31	36	28	35	20	21	28

Table 2. The main fruit features

The main studied feature	Fruit weight (g)	Fruit height (cm)	Fruit diameter (cm)	Seminal lodges	Pulp thickness (mm)	Main distinct feature	Sugar content (%)
A 631	83,3	6,7	4,6	3	50	Lemon shaped fruit	5.3
A 312	26.3	3.7	3.2	2	50	Cherry striped fruit	11.8
A 524	233.6	8.9	7.4	4	70	Bell pepper fruit	6
A 522	252.3	5.5	9	16	50	Pineapple coloured fruit	4.3
A 28	111.9	12	3.5	2	50	Long pepper shaped	5.7
A 308	178.9	5.5	8.5	5	90	Bell pepper striped fruit	3.8
A 306	18.4	2.5	2.5	3	30	Black cherry fruit	7
A 532	75.6	7.2	3.9	3	50	Banana shaped fruit	7
A 709	11,1	4	2	2	30	Pear shaped fruit	12-16
A 80	12.1	3.6	2.1	2	40	Ovoid cherry fruit	11.2
A 724	42,8	4,7	3,9	3	70	Black fruits	5.8
A 2000	560	9,5	10,3	20	70	heart shaped big tasty fruits	5.4

A 522 A 308 A 709

A 631 A 524 A 724

Figure 2. Studied accesions

Accession 80 presents indeterminate growth and can be cultivated both for fresh consumption and processing, can be cultivated both in open field and greenhouse, in trailing system. The accession has ovoid fruits that weights 16-20 g and a reduced number of seeds, < 20 seeds/fruit. The fruits have a high content of sugar, 11.2%.

The main feature of this accession is its distinct taste and flavor. The fruits tastings showed that this accession is superior in what concerns taste quality in comparison with the other accessions from the germplasm collection (Figure 3).

A 28 has indeterminate growth and can be cultivated both in open field and greenhouses, in trailing system, both for fresh consumption and for processing.

Figure 3. Crop detail of A 80

The accession has big fruits, long pepper shaped ranged in 100-150 g weight with high content of dry matter.

The main feature of this accession is the shape of the fruit. These are big in length slightly pointed (Figure 4).

Figure 4. Crop detail of A 28

A 2000 has indeterminate growth and can be cultivated in trailing system, in open field.

The genetic material comes from the Ox heart heirloom.

This accession has big fruits that ranged 300-950 g weight/fruit, heart shaped with green shoulder at the physiological maturity.

The accession is different due to specific taste and flavour of traditional Romanian tomato (Figure 5).

Figure 5. Crop detail of A 2000

CONCLUSIONS

The research undertaken until now ended with collection and assessing the germplasm collection and organizing it according to genetic stability and type of growth.

We obtained 12 genotypes with distinct features which correspond to the main breeding aims.

A 80 patented under the name of Estera, A 28 patented as Hera and A 2000, Bizon, were registered for approval and patenting.

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