

## RESEARCH ON THE EVOLUTION OF TOMATO VARIETIES AND HYBRIDS CULTIVATED IN ROMANIA

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### *Abstract*

*The study was carried out at USAMV Bucharest and aimed to identify the assortment of tomato varieties and hybrids grown in protected spaces and open fields in Romania. Tomatoes are traditional vegetables, rich in carbohydrates, vitamins, lycopene and carotene. Currently, in our country, imported F1 hybrids, extra-early and early, are cultivated in a smaller proportion and in a larger proportion Romanian or imported varieties. F1 hybrids are preferred, because show the phenomenon of heterosis which gives crops resistance/tolerance to diseases, pests, drought, a higher production yield and a very good quality of fruit production. F1 tomato hybrid seeds are procured from vegetable growers from authorized stores that import them to production companies from the Netherlands, Italy, France, Israel. The Romanian tomato seeds come from research stations in Buzău, Bacău, Vidra, etc.*

*This study aims to highlight the large number of varieties adapted and used in the different cultivation areas in Romania, varieties that are recommended for both conventional and organic crops in the different cropping systems.*

**Key words:** *Solanum lycopersicon, genotypes, productions.*

### INTRODUCTION

Tomatoes are considered to be the specie with the largest number of genotypes that are grown on the largest areas, both in protected spaces, and in the field. Ensuring quality tomatoes throughout the year is the essential priority of the Romanian market. Their fruits have a high vitamin, mineral salts and oligoelements content, as a good human health support. Can be consumed as fresh products or processed as juice, sauce or ketchup. Due to these properties, the way their harvests are obtained have to be managed properly (Popescu and Dinu., 2019).

Modern methods have been introduced into tomato culture with the aim of increasing tomato production and quality. The use of high-quality hybrids, grafting methods which reduce the number of chemical treatments and other technological methods represent viable alternatives for sustainable agriculture. Tomato production is influenced by many factors, including temperature, humidity, fertilisation, pests and diseases, etc (Soare, Dinu and Băbeanu, 2018). Since they must be provided throughout the year, their culture is mainly done

in classic greenhouses, hydroponic greenhouses and tunnels.

The cropping systems are varied depending on the possibilities of the farmers, the crops being able to be practiced in a conventional system on the ground but also in a non-conventional system on different culture substrates.

The advantage of the non-conventional system is that, the crop cycle can be throughout the whole year, compared to the conventional system, unheated greenhouses, where 2 crop cycles can be planted, one from spring to summer for early crops and from summer to autumn for successive crops with production assurance until November.

The disadvantage of the non-conventional culture, in the II cycle but also in the I cycle, is that the temperatures in the autumn during the ripening period of the fruits are ensured with great difficulty, and for the spring crops in the first part of the growth and development of the plants, the temperatures can also be very low, thus influencing the period of early tomato harvest (Garofalo and Rinaldi, 2015).

Another aspect to take into account is that of ensuring pollination both during the autumn

period in the second cycle and the spring period in the first cycle.

Choosing the tomato variety is a priority for any farmer. The great diversity of the assortment leads to a more careful analysis of it with the aim of obtaining the highest possible production performance but also for the constant assurance of the market.

Schouten et al. (2019) in the study mentioned that, until 1960 genetic diversity was very low, and concerns regarding the improvement of fruit quality as well as resistance to diseases and pests began to take shape after 1970.

Lake (1966) and Mut Català (1972) mention the production is influenced by the place of culture as well as Heinonen et al. (1979) that high temperatures can influence the rate of physiological maturity.

The performance of tomato crops is influenced by the management of the plantation, which should promote the efficient development of the plants, as well as both the quantitative and qualitative production of fruit (Jerca et al., 2021; Arshad et al., 2023; Dinu et al., 2023).

The main concerns regarding the selection of genotypes concerned resistance to diseases and pests but also the productivity and quality of tomato fruits (Erba et al., 2013; Lin et al., 2014; Mayer et al., 2008; Garcia et al., 2013).

According to the Food and Agriculture Organization of the United Nations (FAO), in 2019, the global tomato production was about 1808 million tons. The countries with the highest production in the same year were China (628 million tons), India (190 million tons) and Turkey (128 million tons) (FAO, 2020). In addition, in 2019, the organic farming in general increased by 2.9% compared to the previous year, and for the following years a considerable increase in trade with organic products is expected (IFOAM-Organics International, 2020), tomatoes being the most relevant species of this type of unconventional agriculture (Dinu et al., 2023).

Data presented in this study on tomato production were collected from the Ministry of Agriculture and Rural Development and from

the FAO, were analyzed, processed and interpreted statistically in order to highlight the large number of varieties adapted and used in the different cultivation areas in Romania.

## **MATERIALS AND METHODS**

Tomato production in Romania from 1965 to the present was analyzed based on the data recorded in the FAO Statistical Annals.

Also, the data on the varieties cultivated in Romania were taken from the official list of varieties and hybrids from 1965 to the present.

Tomato production data were collected from the Ministry of Agriculture and Rural Development and analyzed, processed, and interpreted.

The present study refers to tomato production in Romania from 1965 until now, and the processed data are collected from the FAO Statistical Yearbooks and from the Ministry of Agriculture and Rural Development and analyzed, processed and interpreted. Also, the data on the varieties grown in Romania were taken from the official list of varieties and hybrids from 1965 to the present.

## **RESULTS AND DISCUSSIONS**

Analyzing the data on the production made in the period 1965-1989, we could find that the lowest productions were obtained in 1969 and 1970 respectively, which were 119,619.0 tons and 120,636.0 tons respectively, and the highest productions were obtained in 1984 of 280,872 tons followed by year 1985 with 272,682 tons. On average over the period 1965 - 1989, the total tomato production recorded was 186,778.08 tons, production covering both domestic consumption and export of tomatoes.

It should be noted that before 1989 tomato export was a priority, and tomato imports were almost non-existent. Practically, domestic production covered the entire consumption of tomatoes in Romania. At the same time, it should be noted that 99% of the assortment of varieties was represented by non-assortment created in Romania (Figure 1).

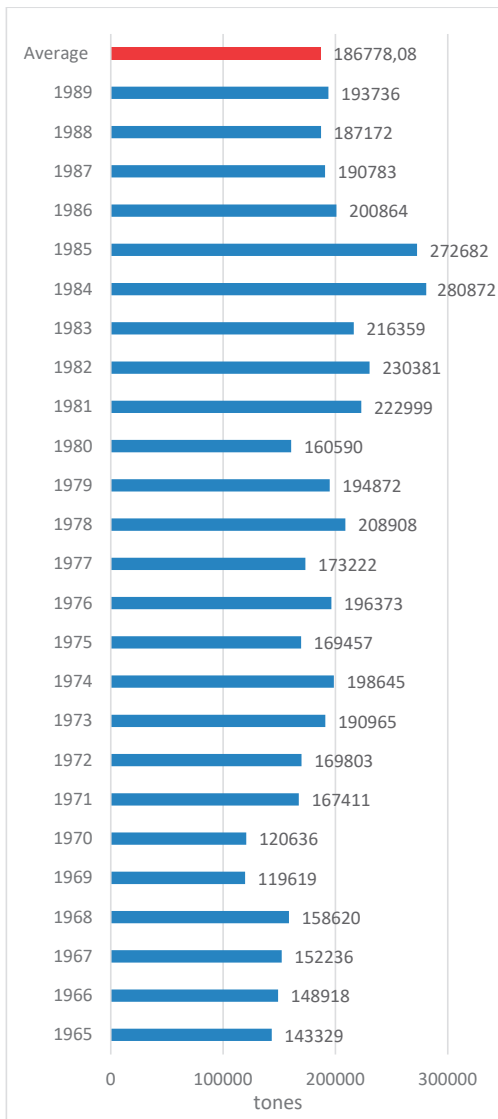


Figure 1. Tomato production during the period 1965-1989 in Romania

Analyzing the data from the period 1990-2020, it was found that the lowest tomato production recorded was 107,918 tons, in 1997, while the highest production was recorded in 2020, reaching 282,610 tons. The average production recorded during this period was 164,606.4 tons of tomatoes (see Figure 2), which is lower than the assessment for the period 1965-1989.

The research stations created the varieties according to the climate zone as follows: The Research and Development Station for Vegetable Culture from Bacău recently created

the Tombac variety, a variety with a very high productivity of up to 150 tons per hectare, under protected conditions. It has an indeterminate growth and is a semi-early variety with a vegetation period of 98-102 days until harvest. The fruits show a very good firmness with an average of 200 g per fruit.

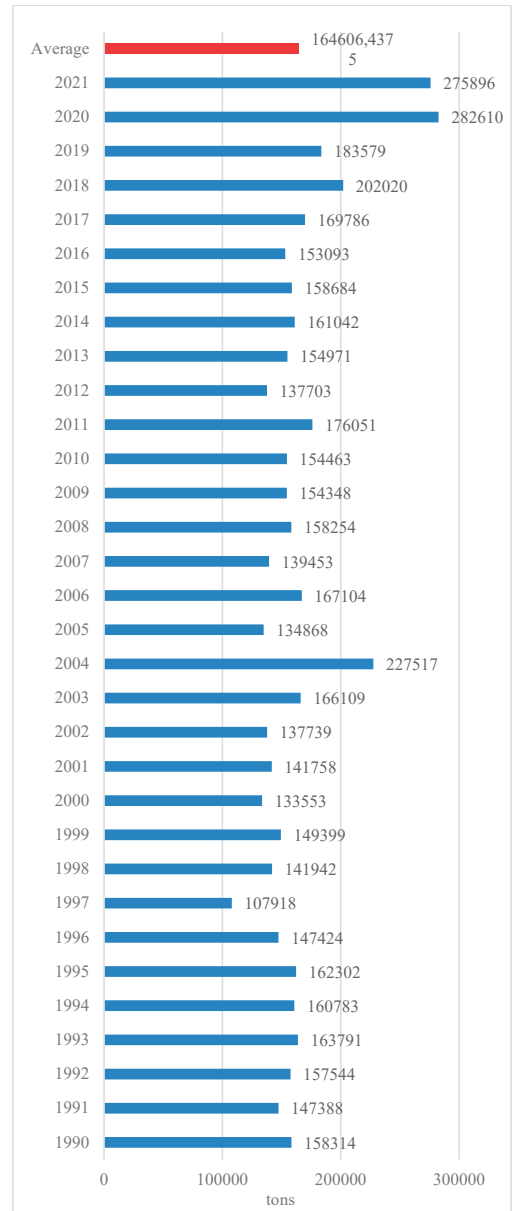


Figure 2. Tomato production realized in the period 1991-2021 in Romania

Another variety created at SCDL Bacău was the Unibac variety with fruits weighing 70-90 g and a production of up to 110 t/kg.

At the Vegetable Research Station in Buzău, more than 20 varieties of tomato were approved, including the varieties Buzău 1600, Siriana and Inimă de Bou. The appearance of the varieties Buzău 47, Buzău 1600 and Inimă de Bou are shown in the Figure 3.



a. Buzău 47



b. Buzău 1600



c. Inimă de Bou

Figure 3. The appearance of the varieties Buzău 47 (a); Buzău 1600 (b) and Inimă de Bou (c)

Among the cherry varieties with indeterminate growth, the Flaviola variety, created at SCDL Buzău, is cultivated with very good results. This variety lends itself to cultivation both in non-conventional soil culture and in non-

conventional culture on nutrient substrates (Figure 4).



Figure 4. The appearance of the tomato culture, variety Flaviola, on the substrate, in an unconventional system

Analyzing the variety of cultivars cultivated between 1961 and 1989 as well as from 1990 to the present, it was found that before 1989 most cultivars were created in the country, but after 1990, cultivars, and performing hybrids were introduced to Romania. Knowing the properties and characters of different varieties is also necessary in the process of producing seeds for valuable varieties in order to establish their authenticity.

The adaptability of tomato plants to certain environmental conditions sometimes lead to compromising the harvest. Both varieties and hybrids created for a certain way of use give the maximum yield if they are grown in the conditions and for the purpose for which they were created. Studies have shown that if they are given another use, if they are grown in the most indicated areas or if they are applied with an inappropriate technology, they do not give the expected results in terms of production.

Recently, cultivars have been created with a high ecological plasticity regarding the influence of the environmental conditions in which they develop. Varieties created for a certain area retain their valuable properties and therefore it is recommended to cultivate them for the recommended conditions.

In 1971 hybrids were cultivated in Romania: N1 10xBison of Bulgarian origin, the fruits being

about 50-70 g and being recommended for fresh consumption and especially for export.

Another hybrid cultivated during this period was Delicates F1 obtained by crossing the Bulgarian variety XXTV/13 and Stupike polni rani. Also, Argeş 408 was one of the earliest hybrids, the first fruits being obtained after 90-95 days from emergence and its destination being culture in protected spaces.

The Temnocrasnii cultivar from the USSR (Russia) has a smaller distribution in Romania but is appreciated for its quality fruits weighing 70-90 g.

The Export II hybrid, created at the Nicolae Bălcescu Agronomic Institute - Bucharest (UŞAMV Bucharest), Horticulture faculty, resulted from this variety as part of a breeding work and by crossing with line XXIV/13. This hybrid has been maintained for a long time in cultivation, being highly appreciated in export for its taste qualities but also the size of the fruit of about 70-80 g of the fruits obtained per plant, about 80% were classified as I and extra quality. Another valuable variety was Aurora 100, created at the Ciolpani vegetable experience resort, this one being extra-early, the fruits having between 100 and 120 g, which can be grown both in protected space and in early crops in the field.

Also, for the early crops, another variety with indeterminate growth, but of Dutch origin, was Money Maker, with fruits of 65-70 g, being in the category of first quality and extra in percentage of over 85%. The Money D'or variety, with the same origin as the previous variety, has been successfully cultivated, especially under greenhouse conditions.

In Romania, in 1991, the following cultivars were cultivated in protected spaces, for early crops, according to the official list of varieties and hybrids in Romania from 1991: Export II (S1), H 601 (S1), Ioana, Işalniţa 50, Lucia, Solara. All this assortment being intended for cultivation in greenhouses and solariums for early crops, these being Romanian creations. The Export II hybrid was created and entered into the official list of varieties since 1970.

Analyzing the official catalog of varieties and hybrids in Romania, for the year 2016 as well as for the year 2017, it could be observed that no new tomato hybrids were registered on the list of new tomato varieties for the greenhouse. The

official catalog includes the following variety of tomatoes: Augustina, Bacovia, Buzău 1600, Carisma, Coralina, Doljbrid, Eclipsette, Efrat 70, Ema de Buzău, Ghittia, Işalnita 29, Işalnita 50, Kalina, Kazanova, Llissete. Medeno SRCE, Nectaria, Omer, Parris, Ralisaisa, Rita, Rinoko, Rubystar, Siriana, Smarald, Sony, De Buzău, VP Viva and Yarden.

However, it should be emphasized that in 2017 the following cultivars were also included: Caitlin, Carisma, Corina, Danamari, Edina, MCSU07, which have indeterminate growth and can be recommended for crops in protected spaces.

In 2018, the tomato cultivars Lamonedă, Panda, Silvia, Toprak, Andrada, Flaviola and Fulya were introduced.

In the official catalog of varieties and hybrids for 2019, a new assortment was introduced, mostly of Romanian origin: Dorca, Florelia, Hera, Miruna, Moldoveanu, Oltena, Roliana, Sandybelle, Sorada, USAB29 and Zaira.

We were able to find that in the Official Catalog of Varieties and Hybrids grown in Romania recommended for 2020, a new variety created in 2019 was introduced, which is: Banato, Crina, Emiliana, Florelia and Tomtim. It was found that in 2021 only one Chandona cultivar created in 2020 was entered into the official catalog of varieties and hybrids in Romania.

The cultivar Edanur was entered into the official list of varieties and hybrids in Romania in 2022, and in 2023 two more cultivars Akemi and Oshin were entered, according to the Official Catalog - ISTIS.

## CONCLUSIONS

Research on the evolution of tomato varieties and hybrids grown in Romania is a particularly interesting and relevant subject for agriculture and the food industry in the country. These studies are essential to understand and address the specific needs of the domestic market, as well as to adapt to global demands and trends by utilizing varieties developed in Romania.

When considering the evolution of tomato varieties and hybrids, several factors are considered: adaptability to climate and soil conditions in various regions of Romania, resistance to region-specific diseases and pests, yield, and quality of production concerning



taste, texture, size, and appearance of tomatoes, as well as early maturity and storage and transport potential.

Special emphasis should be placed on promoting varieties and hybrids adapted to sustainable and ecological agricultural practices, which are increasingly crucial for ensuring food safety and environmental protection. Ultimately, research on the evolution of tomato varieties and hybrids in Romania plays a crucial role in ensuring competitive, sustainable agricultural production and meeting the needs of a continuously growing population.

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