

## NEW VARIETY OF *SOLANUM SISYMBRIIFOLIUM* OBTAINED AT BRGV BUZĂU, ROMANIA

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### Abstract

*In addition to the classic tomato species of Solanum lycopersicum, the main relict genetic resources with a wild character preserved in the germplasm collection of BRGV Buzău are part of the following subspecies: Solanum torvum, Solanum caripense, Solanum melanoceasum, Solanumquitoense, Solanum mamossu, Solanum sisymbriifolium, Solanum nigrum. Of these, Solanum sisymbriifolium is the genotype that clearly expresses the authenticity of a wild tomato, in its ancestral form, as it was known since ancient times. The species was phenotypical, qualitative, and quantitative evaluated at the BRGV Buzău, obtaining a new variety being under approval and named Matilda. The plant has yellow-brown aggressive thorns with an average height of 14.5-15.4 mm on the entire vegetative part, both on the stem, as well as on the shoots, leaves, inflorescence. The berry-type fruit, with an average weight of 7.6 g, is encapsulated in a persistent calyx ornamented with thorns. It is used in intraspecific and interspecific hybridizations, using the rusticity of the species, noting that it grows and fruits well in extreme temperature conditions, having a high capacity to adapt to thermo-hydric stress.*

**Key words:** biodiversity, conservation, cultivar, litchi, rusticity.

### INTRODUCTION

*Solanum sisymbriifolium*, originates from warm, temperate South America, is an annual or perennial erect, rhizomatous, shrubby weed with an extensive root system and spiny leaves, currently distributed throughout the world and invasive in some countries (Perpétuo et al., 2021).

It grows in ruderal locations and wild, along roadsides and in waste places, landfills and plowed fields. It is naturally pollinated by insects and widely propagated by seeds, although vegetative propagation by rhizomes is also possible. Due to its vast dispersion and rapid growth, it is also considered an invasive weed (Di Ciaccio, 2021).

The rapid spread of this species within a short span of about two years indicates the potential for this perennial shrub as a harsh invader of upland sites of the region (Shukla, 2015).

The beginnings of tomato breeding begin with Luther Burbank (1849-1926), botanist, horticulturist and the pioneer of raising

breeding to the rank of science. Among his many creations, we also find wild Brazilian tomatoes, described in one of his volumes, "His Methods and Discoveries- Their practical application" (Figure 1). He tried to improve the Brazilian wild tomatoes, describing them as "relatives of the potato and tomato, with fruits similar to tomatoes" (Burbank, 1914) The fruit presented is in the transition phase, after Mr. Burbank worked on its improvement through selection for several generations, but failing to polish it. The fruit, however, increased in size and became much more aromatic. Other experiments carried out by Mr. Burbank aimed at mutual hybridization between tomato varieties producing a larger quantity of seeds. The F1 generation showed individuals with intermediate characteristics. The fruits obtained were bigger than those of the parents. Burbank then selected the most attractive plants for 6 years, obtaining the first variety that he entered in the Catalog of New Plants in 1893. The variety was described as having small, round

fruit, fruiting in clusters, bright red color and pleasant, sweet aroma.

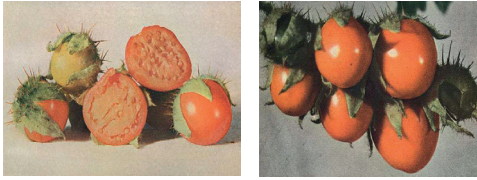


Figure 1. Original pictures with wild Brazilian tomatoes used for Luther Burbank research  
\*(Sursa/Source: Burbank, 1914)

*Solanum sisymbriifolium* has the popular names litchi tomato, spiny horseradish, etc.

On the African continent, more precisely in South Africa, *Solanum sisymbriifolium* is considered and declared a level 1b invasive plant in the national legislation regarding the management of biodiversity and the environment. This fact limits and even prohibits the activities related to the culture of this species.

Plants of this species were used as a protective curtain for the potato culture against the potato cyst nematode (Dias et al., 2012).

*Solanum sisymbriifolium* is also known to be a source of resistance, or partial resistance, to some diseases and plant pests, including fungi, bacteria, nematodes, and insects (Collonnier, 2001).

*Solanum sisymbriifolium* L. am. also known as “wild tomato” is a traditional medicine used by indigenous people of Central and South America, to treat both veterinary and human diseases. Various parts of the wild tomato have been widely used in prevention and treatment of numerous diseases including hypertension, diarrhoea, and respiratory and urinary tracts infections (More, 2019).

## MATERIALS AND METHODS

The relict genetic resources with a wild character within the *Solanum* species come from the areas of origin of the tomato, Peru, Bolivia, and Chile. Among these, *Solanum sisymbriifolium* is the genotype that clearly expresses the authenticity of a wild tomato, in its ancestral form, as it was known since ancient times by the native populations of North America.

The germplasm collection owned by BRGV Buzau for the *Solanum* species sums up a total of 4500 lines.

Depending on the variety, the following varieties were identified: most of them belonging to the species *Solanum lycopersicum* var. *lycopersicum*, the classic tomato, registering a percentage of 57.1%, *S. lycopersicum* var. *cerasiformae* a percentage of 18.9% of the total, *S. lycopersicum* var. *pimpinelifolium* represents 8.4% of the total. From the species *Solanum cheesmanie*, 186 lines were identified and 137 lines from *Lycopersicum hirsutum*. From the species belonging to *S. peruvianum*, there are 95 lines in the collection, registering a percentage of 3.1% of the total. *Solanum spontaneum* totals 55 lines, representing 1.8% of the total and a percentage of 0.2% of the total belongs to the species *S. sisymbriifolium* with a number of 7 lines (Figure 2). Statistical analysis was performed using SPSS. Evaluation of the germplasm core collection was carried out by performing biometric measurements for the main characters based on the international UPOV and IPGRI descriptors.

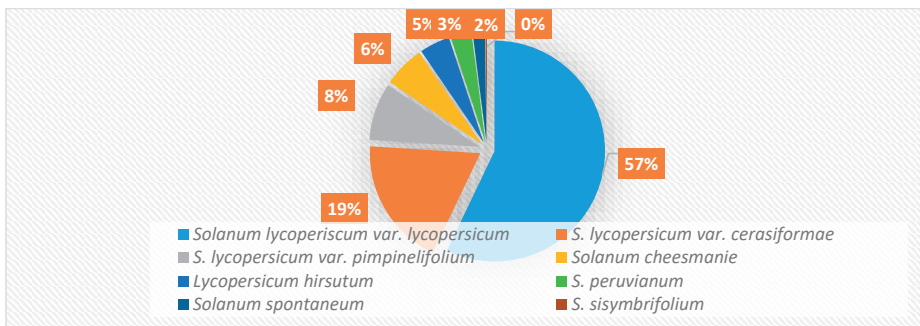


Figure 2. Germplasm collection by variety

The crop technology of *Solanum sisymbriifolium* species is similar to the classic tomato crop technology.

Through repeated individual selection works, the genetic stabilization of *Solanum sisymbriifolium* variety was succeeded, so that it was proposed for homologation and patenting. The tomato crop was planted by seedlings. Seedlings were produced in the heated greenhouse. Seedling production was carried out on 70 holes pallets using peat as substrate. Seedlings were planted 45 days after sowing. Throughout the seedling production period, purification was carried out by

eliminating atypical, diseased, or non-proliferating plants. Treatments were applied to prevent seedling drop (*Pythium* spp.). Field planting was carried out in the first decade of March.

For this crop it was not necessary palisade system because the stem of the plants are strong enough to stand alone. The crop planting plan was 180 cm between strips, 60 cm between rows and 35 cm between plants per row. This crop establishment scheme allowed easy, mechanized maintenance of the strip spacing (Figures 3 and 4).

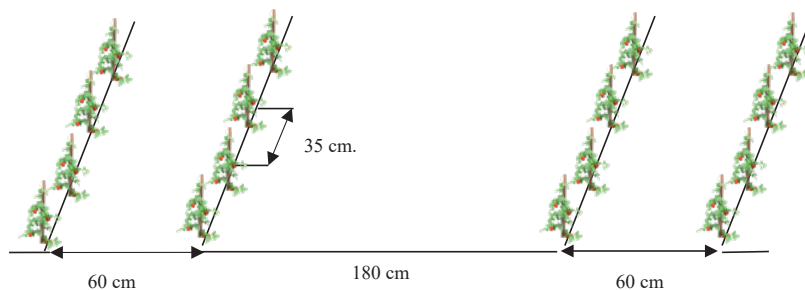


Figure 3. Crop planting plan



Figure 4. *Solanum sisymbriifolium* crop

## RESULTS AND DISCUSSIONS

BRGV Buzau specialists studied this species, making qualitative

and quantitative determinations. Thus, a phenotypic description of the species was made (Table 1).

The species is perennial in the area of origin, but in the temperate continental climate of our country, it behaves like an annual plant. The plants have an erect, semi-determinate habit, with a height that can reach up to 140 cm on average in the conditions of our country.

The stems do not show anthocyanin coloration and are characterized by rare pubescence. The length of the stem internodes is between 8-10 cm on average.

The plant has aggressive yellow-brown thorns, with an average height of 14.5-15.4 mm, on the entire vegetative part, both on the stem and on the shoots, leaves, inflorescence and bracts that cover the fruit (Figure 6).

The plants are semi-determinate, branching into 2-3 main shoots that bear approximately 9-10 flowers. The number of leaves under the first inflorescence is 3-4 on average. The number of attached fruits per inflorescence is 6 out of 9 on average (Figure 5).



Figure 5. Leaves details

The semi-pendant leaves are arranged alternately, they are petiolate, ovate-lanceolate with deep incisions, split pinnate and the edge of the limb sinuous, pubescent on the upper

side and slightly pubescent on the lower side, dark green. Both the main rib and the secondary ribs are white and decorated with aggressive spines 13.5-14.4 mm long.



Figure 6. Aggressive thorns

The length of the leaves varies between 27.4 and 42.3 cm. The shape of the leaf is oak type with an average width of 17.7 cm, weak embossing, and low gloss. The leaf has a semi-erect petiole.

The flower is similar to the potato, having a united corolla, white when immature and purple when mature. Inflorescence racem type, linear, presents 8-10 white flowers, on type 5, with a diameter between 3.5-5.8. The style is exsert and does not show pubescence (Figure 7). The fruit is cordate, berry-like and encapsulated in a persistent calyx ornamented with thorns, which opens as the fruit ripens.

Table 1. The main quantitative features

Feature	Stem length (cm)	Plant height (cm)	Leaf length (cm)	Leaf width (cm)	Petals length (mm)	Stamen length (mm)	Peduncle length (mm)	Fruits weight (g)	Fruit height (mm)	Fruit diameter (mm)	pericarp thickness (mm)
Average	17.5	144.2	33.5	17.7	25.3	11.6	21.4	8.7	26.6	25.0	2.8
Standard deviation	3.70	9.67	7.10	4.47	3.45	1.71	1.53	1.79	1.15	1.59	0.51
CV %	21%	7%	21%	25%	14%	15%	7%	21%	4%	6%	18%





Figure 7. Inflorescence details

The fruit has red epidermis and yellow pulp inside. The fruit has a punctate pistillate point with a pointed mucron. It easily detaches from the calyx when it reaches physiological maturity (Figure 8).



Figure 8. Fruits details

In cross-section, the fruit does not show the seminal lobes, the seeds being arranged concentrically on the edge of the pericarp and in two rows that penetrate towards the middle of the fruit. Firmness is weak.

The seeds are reniform, dark yellow, similar to those of the *Solanum melongena* species (eggplant). Flowering is late in the pedoclimatic conditions of our country, in the months of August and September.

The fruits of *Solanum sisymbriifolium* can be consumed both fresh and prepared in various jams, juices, tomato paste. *Solanum sisymbriifolium* plants have an ornamental character both through the spectacular appearance of the thorny bushes and through the white and purple flowers grouped in rich raceme-type inflorescences. Also, the intense red fruits, grouped in linear bunches, enhance the decorative appearance of the *Solanum sisymbriifolium* plant.

The species can be cultivated in an ecological system, being an alternative to countering pathogens, especially soil nematodes, being considered a trap plant. Both its rusticity and its characteristic resistance to the attack of the main pathogens but also to high temperatures, recommend it to be a plant solution in combating climate change.

Regarding breeding works, the species *Solanum sisymbriifolium* can be successfully used as a rootstock for the classic tomato. Interspecific hybridization works can also be carried out with the species of *Solanum torvum*, *Solanum nigrum melanocerasum*, *Solanum melongena* etc. The taste of the fruit is similar to a cherry combined with the classic tomato.

The entire vegetative part, especially the leaves and stems, contain solanine, a toxic alkaloid characteristic of the species of the *Solanum* genus that confers plant resistance against pathogens.

Wild tomato plants, thanks to their characteristic aggressive thorns, can be used as a protective curtain against animals that can cause significant damage to the basic crops.

## CONCLUSIONS

The germplasm collection of BRGV Buzau, as regards the species *Solanum*, has over 4,500 lines, including wild varieties.

The germplasm collection was evaluated and systematized according to varieties. Among these, the species *Solanum sisymbriifolium* attracted the attention of BRGV Buzau specialists.

This paper shows the phenotypic studies and research, the main qualitative and quantitative characters of the species.

The species can be successfully cultivated in the open field, in the pedoclimatic conditions of our country, being very resistant both to the attack of soil nematodes and to the conditions of the attack of pathogens specific to the species *Solanum* spp.

In 2024, BRGV Buzau submitted the homologation and patent documentation of the first Romanian variety of *Solanum sisymbriifolium*, under the name of the Matilda wild tomato variety.

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