

NEW POTATO VARIETIES OBTAINED AT NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT FOR POTATO AND SUGAR BEET BRAȘOV

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Abstract

Potato is a plant with great ecological plasticity, nutritious, tasty and inexpensive, which is the staple food of many peoples. Potato use efficiently use the modern technologies and provides the greatest amount of food per unit of area. In terms of energy is of great importance for human consumption in a variety of ways of preparation and industrialization. National Institute of Research and Development for Potato and Sugar Beet Brasov is working constantly to create new potato varieties adapted to changing climatic conditions, with high yield, suitable for the processing industry, to satisfy the both quantitative and qualitative needs of consumers. Regarding the genetic complex structure of potato ($2n = 4x = 48$ chromosomes) and the segregation of the desired character in the offspring produced by sexual hybridisation, creating new varieties of potato requires a long period (10-12 years) and a large volume of activity (chance for registration of a new variety is 1 to over 100.000 seedlings). The key objective was to select varieties immune to wart disease, with high resistance to other diseases (mainly potato late blight), with good agronomic and cooking qualities. As the result of breeding work three new varieties were produced: Azaria, Darilena and Asinaria. The varieties are conceived for autumn-winter consumption, being suitable for most culinary preparations, from salad, pommes frites to mash potatoes. The potato varieties were breed using the hybrid cross method followed by individual clonal selection, according to the classical scheme of potato breeding. The best potato clone was selected from many others. The resistance to wart disease was tested at Pojorâta Station (Suceava) and the resistance to late blight and viruses were determined in the fields and laboratories of NIRDPSB Brasov. Also to NIRDPSB Brasov it has been determined the culinary quality of potato tubers by assesing their behavior to boiling. The yield capacity in different environmental conditions and also the ecological plasticity of the varieties were tested in State Institute for Variety Testing and Registration network.

Key words: potato, breeding, cultivar description, yield capacity, culinary quality

Potato produce nutritious food quickly, on limited land, in harsh climatic conditions than other major crops and 85% of plant is edible compared with 50% in the case of cereals. Plant is rich in carbohydrate, protein and digestible amino acid combination adapted to human needs (Hermeziu, 2017).

The potato is grown in more than 150 countries with an average of 16 t / ha. Yield in some European countries and the US can reach up to 40 t / ha and even 70 - 80 t / ha under experimental conditions, while in developing countries the average ranges from 10 to 20 t / ha. This shows that there is a big gap between countries in terms of performance, even when using the same variety (Wang, 2008). Consumer behavior is guided by convenience, health, pleasure and value. It is a challenge to combine these trends to get potatoes and processed potato products which ultimately aim at health and food safety (Van Gijssel, 2005).

Potato is a living organism that multiply vegetative and has his own evolution and after a period of constant declines, caused by virotic degeneration and climate conditions. Evolving needs of consumers and the avalanche of new varieties make a range of existing crop varieties to be replaced with others that respond better to requests (Hermeziu and Bozesan, 1994).

The climatic conditions of Romania are not always suitable for potato multiplying. It were years very dry in the flowering period, during the maximum accumulation of production and because of shortage of humidity have been registred significant yield losses.

The diseases are another factor which decreases the production. Not all the farmers have resources for effective control, with top products, which are generally more expensive. Therefore, the cultivation of some varieties with good resistance to disease represents a solution to improve the crop, but also to have a healthier

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potato from the point of view of pesticide residues (Hermeziu and Moise, 2012).

MATERIAL AND METHOD

According to the classical breeding scheme used in the potato (Chiru *et al*, 1992; Bozesan, 2002), all varieties were obtained by sexual hybridization followed by individual clonal selection.

The main steps of the method are:

- determining the parents having in attention the physiological and technological qualities
- hybridization including seedlings, vegetative populations, descendants, yield trials (3 years network testing to the State Institute for Testing and Registration of Varieties - ISTIS);
- patent and national registration in the official catalog of varieties (Hermeziu *et al*, 2015).

The resistance to black wart (*Synchytrium endobioticum*) was determined at National Center Test for Resistance to Potato Wart Disease from Pojorâta Suceava. The starch content and the processing quality were determined in the specialized laboratory of NIRDPSB Brasov. Late blight (*Phytophthora infestans*) resistance and viruses resistance were also determined in the fields of NIRDPSB Brasov.

RESULTS AND DISCUSSIONS

Description of **Azaria** variety

Genitors: **Amelia x Kondor**

Growing season: Azaria variety belongs to the group of medium early varieties, with a vegetation period of 100 days.

Morphological characteristics:

Plant: tall high with intermediate semi-upright stems. The leaf is open, contour size small with medium leaflets and green color.

The flower is light pink with a high frequency of flowers and a great size of corolla.

Tubers:

The sprouts have conical shape, with medium anthocyanin coloration of base and medium porosity.

Tubers are oval with shallow eyes, red skin and yellow flesh.

Description of **Darilena** variety

Genitors: **Astral x Bellarosa**

Growing season: Darilena is a high yielding maincrop variety with a vegetation period of 90 days.

Morphological characteristics:

Plant: very tall with semi-upright stems and leaf type foliage structure. The leaf is small size with high number of leaflets, intermediate open and light green color.

The flower is white but with low frequency (usually it doesn't really make flowers), little flower corolla and medium anthocyanin coloration on the innerside.

Tubers:

The sprouts have a conical shape and strong porosity.

Attractive, bright uniform oval tubers with very shallow eyes, yellow skin and light yellow flesh.

Description of **Asinaria** variety

Genitors: **Solara x Victoria**

Growing season: Asinaria is a high yielding maincrop variety (with vegetation period of 80-90 days).

Morphological characteristics:

Plant: semi-erect stems, medium in height with intermediate foliage structure. The leaf is medium with intermediate open and medium green color.

White flower with medium size of corolla.

Tubers:

The sprouts are medium size with spherical shape, medium anthocyanin coloration and weak pubescence of base.

The tubers are long-oval with shallow eyes, yellow skin and cream flesh.

Resistance to pests and diseases:

The breeding program developed at the NIRDPSB Brasov imposed the restrictive condition that all varieties to be resistant to potato wart (*Synchytrium endobioticum*), biotype 1, to control this extremely dangerous pathogen. The resistance to wart disease was tested at Pojorata station (Suceava county). According to that tests the presented varieties are resistant to potato wart.

Azaria variety is resistant to late blight (*Phytophthora infestans*) on foliage and tubers and also medium resistant to PVY and leaf roll viruses.

Darilena variety is middle resistant to late blight on foliage and tubers and also medium resistant to PVY and leaf roll viruses.

Asinaria variety is middle resistant to late blight on foliage and tubers and also medium resistant to PVY and leaf roll viruses (*Table 1*).

From the *Table 1* it can be seen that the resistance of the new varieties to viruses is good and very good similar to the control varieties (Roclas and Rustic) which enables potato seed production without additional difficulties.

Rustic variety shows the highest resistance to late blight on leaves and tubers from all the Romanian varieties and thanks to this characteristics is recommended for growing in organic farms. Azaria variety shows similar

features in terms of resistance in conditions of strong attack as was in 2016. The other two varieties, Darilena and Asinaria shows a similar behaviour like Roclas variety, being medium resistant to late blight on foliage and tubers.

Table 1
Varieties resistance evaluation to leaf roll viruses, PVY and late blight (NIRDPSB Brasov fields)

Variety	PVY	Leaf roll virus	Late blight	
			to leaf	to tuber
Azaria	6	6	8	8
Darilena	6	7	7	6
Asinaria	6	6	6	7
Rustic (control)	7	7	9	8
Roclas (control)	8	7	6	7

Marks: 1- sensitive
9 – very resistant

Culinary qualities:

Culinary quality was assessed in the Technology laboratory of NIRDPSB Brasov.

Azaria and Darilena varieties belongs to B category and have a starch content of 18.75% and respectively 17.58 %. Tubers of this class are fairly strong, their surface does not disintegrate or only to some extent. The potatoes are rather firm, slightly humid or rather dry and must be fine or rather fine. Potato varieties of this type are very much demanded by consumers because of many uses and the good taste.

Asinaria variety belongs to an other intermediate category (class B/C) and has a starch content of 16%. Potato of this type borrow from the characteristics of the class B and are suitable for eating boiled, frying, mashing and fresh and conserve potato consumption (table 2).

Table 2
Culinary quality of Azaria, Darilena and Asinaria varieties compared with standard varieties Rustic and Roclas

Character	Azaria	Darilena	Asinaria	Rustic	Roclas	Observations
Aspect	2.9	2.0	2.5	2.2	1.75	1-very showy 4-unshowy
Taste	2.7	3.1	3.0	2.7	1.3	1-excellent 4-less good
Color	3.2	4.2	4.3	4.2	4.5	1-white 6-intense yellow
Disintegration	2.2	2.0	2.5	2.2	1.75	1-remain whole 4-hard crush
Consistency	2.4	1.8	2.4	2.1	2.3	1-firm hearty 4-unhearty
Mealiness	2.6	2.7	2.9	2.8	2.1	1-unmealy 4-very mealy
Moistness	2.1	2.8	2.9	2.3	2.0	1-moist 4-dry
Granulation	2.2	2.7	2.8	2.6	1.75	1-fine 4-very coarse
Cooking type	B	B	B/C	B	A/B	
Starch content	18.75	17.58	16.00	14.33	14.08	

Prior approval the varieties were tested in ISTIS network, evaluation was done in seven centers: Târgu Secuiesc, Sibiu, Satu Mare, Rădăuți, Luduș, Hărman, Bacău.

Comparing yield data obtained in ISTIS network is observed that the new varieties

exceeded control variety Roclas with 7.35% Azaria variety, 6.50% Darilena variety and with 1.54% Asinaria variety (table 3).

Table 3
Yielding capacity in network I.S.T.I.S. (average)

Variety	Yield (kg/ha)/years							Yield average kg/ha	Difference from control	
	Tg. Secuiesc	Sibiu	Satu Mare	Rădăuți	Luduș	Hărman	Bacău		kg/ha	%
Azaria	44801	47115	28918	29229	36068	44401	41242	38825	2659	107.35
Darilena	47742	46837	27730	25776	35987	44979	40574	38518	2352	106.50
Asinaria	44657	40432	29618	31620	26463	51710	32560	36723	557	101.54
Roclas (control)	48168	38737	31109	30743	28830	40904	34669	36166	0,0	100,0

Varieties presents pronounced ecological plasticity, expressing a higher yield potential, to which contributes the high resistance to late blight and viruses also. The data presented shows that average yield of tested varieties in different environmental conditions provided high ecological plasticity and good possibilities of expression in all areas of culture of potato.

CONCLUSIONS

The potato varieties Azaria, Darilena and Asinaria were breed at the National Institute of Research and Development for Potato and Sugar Beet Brasov. All varieties are immune to main quarantine object in Romania – wart disease.

Varieties give good quality yield in different locations. The potato varieties are well adapted to climatic and soil conditions. The varieties are recommended to be cultivated in favorable areas to avoid thermo-hydric stress or to be cultivated applying irrigation to obtain satisfying yield.

The potato breeding program's main research object in the near future will be early varieties, resistant to hydric stress, immune to wart and with high resistance to pests and diseases.

As research products the Romanian potato varieties must be promoted highly using marketing programmes to avoid the competition of foreign varieties. Using Romanian potato varieties the cost of seed is lower and the quality is comparable to that of foreign varieties.

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