Fruit Growing Research, Vol. XXXX, 2024 DOI 10.33045/fgr.v40.2024.02
https://publications.icdp.ro/index.php

SOIURI NOI DE PĂR OBȚINUTE LA SCDP VOINEȘTI
NEW PEAR VARIETIES OBTAINED AT SCDP VOINEȘTI

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Abstract

Pear breeding at Research Station for Fruit Growing Voinești, Romania, started from 1950. If in the first stage, between 1950s and 1960s, the breeding objectives were focused towards cultivars with high production potential and fruit quality, after 1960, resistance to main diseases and pests was introduced as new objective. For that, the gene source was represented by some cultivated biotypes originated from *Pyrus serotina.* Over the years, extensive biological material for selection was obtained through breeding work, which led to the selection and registered of 13 pear cultivars, with different harvest time. After the first stage of crossing, four pear cultivars were registered: 'Timpurii de Dâmbovița' (1967), 'Republica' (1973), 'Aniversarea' (1974) and 'Euras' (1994). Later, other nine pear cultivars were registered, the most recently, between 2021 – 2023, being 'Aroma', 'Andrei', 'Silvia' and 'Nicolas'. These new cultivars stand out for their superior quality fruit, demonstrating good behaviour against the specific diseases and pests. It is recommended to be used them as genitors farther more and to be spread in all areas favorable to pear culture.

Cuvinte cheie: *Pyrus communis,* hibridare, soiuri noi, rezistență la boli și dăunători, calitate fruct.
Key words: *Pyrus communis,* crossing, new cultivars, resistance to diseases and pests, fruit quality.

1. Introduction

Improving the pear assortment for Voinesti county with new adapted cultivars, has represented one of the most important work for the local research station. Also, the new cultivars have to be resistant or tolerant to specific diseases and pests that have limited the establishment of new plantations, respectively: *Erwinia amylovora* (fire blight), *Venturia pirina* (pear scab), *Psylla piri L.* (pear sucker). Other important objectives are the general appearance, fruit taste, high bearing potential, late ripening, low vigour and good affinity with quince rootstock.

Over the years, through the breeding works carried out at SCDP Voinești, a valuable biological material has been obtained, from which 13 pear cultivars were selected and registered, with different ripening time, adapted to the local pedoclimatic conditions.

During 1967-1995 periods, four pear cultivars were registered and spread: 'Timpurii de Dâmbovița' (1967, winter cultivar), 'Republica' (1973, winter cultivar), 'Aniversarea' (1974, autumn cultivar), and 'Euras' (1994, first interspecific, with winter maturation) (Andreieș, 1983, 2000).

Between 2000-2010, other five pear cultivars were registered: 'Corina' (2004), 'Orizont' (2004), 'Tudor' (2007), 'Cristal' (2009), 'Romcor' (2009) (Andreieș and Erculescu, 2011).

Since 2020, 'Aroma', 'Andrei', 'Silvia' and 'Nicolas' were issued (Andreieș and Erculescu, 2013).

The paper describes the latest results of local breeding program, which are under transfer process to the farmers.

2. Material and methods

The research was carried out in the period 2021 - 2023 in a demo plot orchard established in 2015 with trees planted at 3.5 x 2 m, from cultivars 'Aroma', 'Andrei', 'Silvia', 'Nicolas' and 'Euras' (control).

In order to achieve the proposed objectives, the following observations and determinations were carried out: trees vigour, flowering and ripening phenophases, production potential, fruit quality, as well as the resistance to diseases and pests.

The trunk diameter was determined by measuring the trunk at 30 cm from the ground level with the caliber; the phenophases of flowering and ripening were appreciated by noting the opening of first flowers (beginning of flowering), the falling of flowers (end of flowering) and the harvest the fruits; the production capacity by weighing (kg/tree, respectively t/ha); the fruit mass was determined by weighing (g) and soluble solids content of fruit was determinate with refractometer (% Brix). In order to appreciate the resistance to diseases (scab and fire blight) and pest (pear sucker), observations were made in the field after a scoring scale used in the laboratory (1 – sensitive; 2 – tolerant; 3 – resistant).

The differences between the evaluated cultivars were assessed using analysis of variance, general linear model procedure (One way ANOVA and Duncan test at $p \leq 0.05$). The cultivars were compared with the control cultivar.

3. Results and discussions

Tree vigour

The vigour of growth (in the 9th year after planting), expressed by the trunk diameter (mm), showed significant differences between cultivars, the value of average trunk diameter being between 72.01 mm (‘Aroma’ cv.) and 89.23 mm (‘Silvia’ cv). ‘Aroma’ and ‘Nicolas’ shown smaller vigour, while ‘Andrei’ and ‘Silvia’ more vigour than ‘Euras’ (Table 1).

Flowering phenology

Flowering was triggered after the accumulation of a certain amount of biologically active temperatures, the beginning of flowering being registered in the 2nd and 3rd decade of April, with a difference of 1-2 days between the four new pear cultivars, at a delay difference of up to 10 days at the 'Euras' cv. The end of flowering took place in the last days of April and in the first decade of May. 'Euras' cv. extends its end of flowering, until the date of May, 13 (Table 2).

Ripening season

The period of ripening and consumption of fruits, takes place from the first decade of September ('Aroma' cv.), continues with 'Silvia' cv. in the second and third decades of September, 'Andrei' cv. in the third decade of September until the first decade of October, when the 'Nicolas' cv. is also harvested. The control 'Euras' was harvested at the beginning of October, they reach consumption maturity being till February – March (Table 2).

Production potential

The fruit production, recorded in 2021 – 2023 period, had values between 14.2 kg/tree, respectively 20.28 t/ha (‘Silvia’ cv.) and 17.5 kg/tree respectively 24.99 t/ha (‘Andrei’ cv.) between cultivars being significant differences. The newly studied cultivars had higher productions than the ‘Euras’ cv., except ‘Silvia’ cv. that registered slightly smaller productions (Table 3).

The fruits quality parameters respectively size, flesh texture, juiciness, firmness, taste, presence of sclereids and soluble solids content are presented in the table 4.

The fruit quality is assessed by biometric indicators, but also by biochemical composition according to which the destination of fruit can be directed. If the destination of the fruit is for fresh consumption, in addition to the shape, size, colour, the fruit must have a taste acceptable to the consumers.

The average fruits weight and size are important elements in the assessment of the commercial quality and can be influenced to a greater or lesser extent by the amount of production, the age of the tree, the rootstock, the culture technology applied and the climatic conditions of the year. The average fruit weight, expressed by their biomass, during the period 2021 - 2023, had values between 230 - 300 g, with smaller fruits at 'Aroma' and 'Andrei' cvs., but larger ones for 'Nicolas' and 'Silvia' cvs. At 'Euras' cv. fruit weight was 150 g.

The fruits have a medium texture, with a good juiciness, but with a medium firmness. Also, all cultivars studied contain very few or no sclereids.

Regarding the soluble solids content of fruits at harvest, it shows close values between 14.6% for 'Aroma' cv. and 15.4 - 15.9% for 'Andrei', 'Silvia' and 'Nicolas' cvs.

Resistance to diseases and pest

Behaviour to diseases for all cultivars can be considered as good resistance for against fire blight *(Erwinia amylovora)* and 'Euras' cv. with tolerance.

For *Venturia pirina*, all pear cultivars studied, including the 'Euras' cv., shown resistance.

Regarding the attack of *Psylla sp.,* the pear cultivars studied are tolerant, except 'Nicolas' cv. which tends to be sensitive (Table 2).

Following the results obtained, a description of the four new cultivars, useful to both farmers and researchers, was made.

'Aroma' was by crossing between 'Beurre Hardy' and pollen mixture. The tree vigour is medium, with medium branching and a semi-erect standing; fruiting mainly on short branches. It has good affinity with the quince rootstock, type A; it blooms at about the same time as 'Williams' cv. and earlier than 'Euras' cv. The fruiting potential is good. It is resistant to pear scab (*Venturia pirina*); shows good resistance to fire blight (*Erwinia amylovora*); tolerant to *Psylla* sp. The fruit is large (230 g), the shape is ovoid - elongated, slightly asymmetric, the skin colour is yellow, with small and rare spots of rust, nice appearance. The flesh is creamy, firm, juicy, vinous, very few sclereids (almost absent), sweet-sour taste, pleasantly acidic, refreshing, discreet aroma, and good to very good taste. Maturity for consumption is achieved in the first decade of September.

'Andrei' was by crossing between 'Beurre Hardy' and pollen mixture. The tree vigour is medium, with medium branching and a divergent standing; fruiting mainly on short branches. It has a good affinity with quince rootstock, type A; it blooms approximately at the same time as 'Williams' cv. and earlier than 'Euras' cv. The production potential is high. It is resistant to pear scab (*Venturia pirina*); shows good resistance to fire blight (*Erwinia amylovora*); tolerant to *Psylla* sp. The fruit is large (250 g), short shape-truncated, slightly

asymmetric, yellowish green epidermis colour and rust spots. The flesh is white, juicy, very few sclereids, slightly sour sweet taste, well-balanced, discreet aroma, very good taste. The soluble solids content is 16%. Maturity for consumption is achieved in the 3rd decade of September - the first decade of October.

'Silvia' was obtained by open pollination from '25.I.H.' (selection with American origin). The tree vigour is medium, with medium branching and an erect standing; fruiting mainly on short branches. It is compatible with quince rootstock, type A; the beginning of flowering is medium. Production potential is good (25 – 30 t/ha). It is resistant to pear scab (*Venturia pirina)*; shows good resistance to fire blight (*Erwinia amylovora)*; tolerant to *Psylla sp.* The fruit is very large (300 g), pyriform shape, bevelled towards the peduncle; skin colour yellowish-green with rare spots of rust and faint red on the sunny side. The flesh is creamy, juicy, semi-fine, the flesh firmness is medium, without sclereids, specific aroma, sweet taste, very good. Soluble solids content ranges from 14.5% to over 16%. Maturity for consumption is achieved in the second - third decade of September.

'Nicolas' obtained by interspecific hybridisation between [(B.C. *Pyrus serotina* x 'Doyanne d'hivers') x 'Passe Crassane'] x 'Red Williams'. The tree vigour is medium, with weak branching and a semi-erect standing; fruiting mainly on short branches. The beginning of flowering is medium; blooms about the same time as 'Williams' cv. and earlier than 'Euras' cv. Production potential is good (25-30 t/ha). It is resistant to pear scab (*Venturia pirina)*; shows good resistance to fire blight (*Erwinia amylovora)*; shows some sensitivity to *Psylla* sp. The fruit is large-very large (285 g), truncated shape; the skin colour is greenish-yellow with rusty lenticels, small and rare spots of rust – at maturity the epidermis becomes straw-yellow with a slight reddish tinge on the sunny side, nice appearance. The flesh is creamy white, juicy, sometimes very juicy, semi-fine, medium firmness, few sclereids, very good taste, and aromatic. The soluble solids content is 14-15%. Maturity for consumption is achieved in the first decade of October - November.

4. Conclusions

As result of pear breeding program, a number of 13 cultivars of pear with different harvesting periods, from the first decade of September to February or March were registered at SCDP Voinești. The new pear cultivars 'Aroma', 'Andrei', 'Silvia', 'Nicolas', had recorded yields between 20.3 and 25 t/ha, large size (200 -300 g) and good behaviour against attack of diseases and pests. Only 'Nicolas' shows some sensitivity to *Psylla sp.*

SCDP Voinești will go on with breeding work focused on pear, these four varieties recently introduced and promoted in the new commercial orchard, being used as parents farther more.

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Tables and Figures

Table 1. Tree vigour of studied pear cultivars

Cultivar	Trunk diameter (mm)*	Difference from the control (mm)	The port of the tree
Aroma	72.01 b	-11.37	semierect
Andrei	87.98 a	4.6	divergent
Silvia	89.23 a	5.85	erect
Nicolas	77.58 b	-5.8	semierect
Euras (Ct.)	83.38 a	-	semierect

**Duncan test: values in columns that do not have common letters differ significantly for one level of assurance 5% statistic*

 DOI 10.33045/fgr.v40.2024.02

Table 2. Flowering and ripening phenophases and behaviour to diseases and pest

Specification		Cultivar				
		Aroma	**Andrei**	**Silvia**	**Nicolas**	**Euras (Ct.)**
Development of the main phenophases	The beginning of flowering	14.04-22.04	13.04 – 22.04	15.04 – 23.04	14.04 – 23.04	22.04 – 29.04
	The end of flowering	27.04 – 05.05	28.04 – 06.05	29.04 – 07.05	01.05 – 08.05	06.06 – 13.05
	Period of ripening and consumption	First decade of September	Third decade of September - First decade of October	Second-third decade of September	First decade of October - November	February - March
Behaviour to diseases	*Erwinia amylovora*	good resistance	good resistance	good resistance	good resistance	tolerant
	Venturia pirina	resistant	resistant	resistant	resistant	resistant
Behaviour to pest	*Psylla* sp.	tolerant	tolerant	tolerant	tolerant to sensitive	tolerant

Table 3. Production potential of studied pear cultivars

Cultivar	Production (kg/tree)			Average production (kg/tree)*	Difference (kg/tree)	Production (t/ha)*
	2021	**2022**	**2023**			
Aroma	15.4	14.5	20.5	16.80 ab	2.04	23.99 a
Andrei	16.0	14.2	22.5	17.50 a	2.74	24.99 a
Silvia	12.8	11.6	18.2	14.20 c	-0.56	20.28 b
Nicolas	14.0	12.5	19.5	15.33 b	0.57	21.89 b
Euras (Ct.)	13.8	12.0	18.5	14.76 bc	-	21.08 b

**Duncan test: values in columns that do not have common letters differ significantly for one level of assurance 5% statistic*

Table 4. Fruit quality parameters

Specification	Cultivar				
	Aroma	**Andrei**	**Silvia**	**Nicolas**	**Euras (Ct)**
Fruit weight (g)*	230 b	250 b	300 a	285 a	150 c
Flesh texture	medium	medium	medium	medium	medium
Juiciness	juicy	juicy	juicy	juicy (sometimes very juicy)	medium juicy
Firmness	medium	medium	medium	medium	firm
Sclereids	a few (almost missing)	a few	without sclereids	a few	without sclereids
Taste	good	very good	very good	very good	good
SSC% *	14.6 b	15.4 a	15.8 a	15.9 a	15.0 ab

**Duncan test: values in columns that do not have common letters differ significantly for one level of assurance 5% statistic*

DOI 10.33045/fgr.v40.2024.02

Fig. 1. 'Aroma' cv.

Fig. 2. 'Andrei' cv.

Fig. 3. 'Nicolas' cv.