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# RESULTS OBTAINED FROM SWEET CHERRY BREEDING IN IAŞI, ROMANIA

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**ABSTRACT**. From 1994 - 2016, the Research Station for Fruit Growing (RSFG) Iaşi approved 28 cherry cultivars, of which three were early cultivars (Cetăţuia, Cătălina and Amaris), 20 were middle maturation cultivars (Maria, Golia, Ştefan, Bucium, Iaşirom, Tereza, Lucia, Radu, Oana, Alexus, Andreiaş, Ludovan, Cociuvaş, Iosifan, Paulică, Mihailis, Muşatini, Elaiaşi, Amar Maxut, and Amar Galata), and five had late maturation (Andante, Marina, Croma, Margonia, and George). Van, as the most widespread cultivar in Romanian orchards, was used as a control. The sweet cherry cultivars were created through direct hybridisation or free pollination. Maria Cultivar is the first Romanian self-fertile cultivar. The locally approved bitter cherry biotypes are Amar Maxut with black fruit, Amar Galata with double-coloured fruit, and Amaris with dark red fruit. Regarding the tree's vigour, cultivars Amaris, Tereza, Ştefan, and Golia recorded weak vigour, in comparison with the other cultivars, which had medium vigour. Bitter-tasting cherry cultivars have semi-firm pulp with semi-adherence to the stone, and the fruit weight was under 7 g. All 28 cultivars presented high precocity, productivity, fruit quality, and resistance to frost, drought, and diseases.

**Keywords:** cultivars; fruit; hybridisation; maturation stages; traits.

## INTRODUCTION

In 1981, the Research Station for Fruit Growing (RSFG) Iaşi started collecting, preserving and studying cherry germplasm to use as initial material for cultivar registration. The Romanian bank of genes, represented by the national cherry collection, has 555 native and international genotypes, with old and new cultivars, local cherry biotypes, hybrids, and clones (Branişte *et al.,* 2007). The international objectives of the breeding programme were to improve the assortment of cherry cultivars with attractive qualities and genetic resistance to diseases, pests, and stressors (drought, frost) (Sansavini and Lugli, 2008), that reduce the vigour of trees and fruit of superior quality commercially, technologically, and in chemical traits, with ripening periods situated at the extremities of the cherry maturation season (Budan *et al.,* 1993; Budan and Grădinariu, 2000; Cociu,

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1990; Quero-García *et al.,* 2017). In the last 20 years, the growers have established new and modern orchards with different cultivars with good fruits quality, low vigour for higher density of trees and suitable for climate conditions from the area (Sansavini and Lugli, 2008; Asănică *et al.,* 2013).

From 1994 - 2016, RSFG Iaşi registered 28 cherry cultivars in the catalogue of the State Institute for Testing and Registration of Cultivars, of which 19 represent 66% of the cultivars that get to remain in the assortment (Popescu *et al.,* 2015). Traditional methods were used to generate the new cultivars, namely hybridisation or free pollination, followed by harvesting of the hybrid stones, obtaining saplings, and selecting and testing the elite hybrids (Cociu and Oprea, 1989). It takes 15 - 23 years for a cultivar to go from hybridisation to registration due to the biological particularities of the species, including weak germination of the stones, weak viability of the saplings in the first years after being planted or transplanted, and late fruit entry. This paper presents the valuable features of the cherry cultivars created in RSFG Iaşi, that improve the native assortment and cultivars that have different ages of fruit maturation spread across the entire cherry maturation season.

## MATERIALS AND METHODS

**Soil and climate conditions**

The natural environment where the research took place is located in the forest steppe of Moldova, where lands are slightly tilted from the northwest to the southeast, with an average slope of 5% and an altitude of 165 m. The soil is leached chernozem, weakly eroded by loess deposits and clay, with a clay and sandy clay texture, a humus content between 2.5 and 3.5%, a pH of 5.8 - 6.8, a total average nitrogen content of 0.143 - 0.170, mobile phosphorus content of 20 - 82 ppm, and mobile potassium content of 188 - 360 K ppm. The annual average temperature (the average of the last 3 years) varies between 9.8 and 10.1°C. The highest monthly average temperature (21.5 - 21.8°C) is recorded in July, while January has the lowest temperature records. The average rainfall quantity recorded over a year varies between 520.8 and 603.5 mm, and the average atmospheric humidity is 70.2% (Corneanu *et al*., 2007).

**Plant material**

The study took place between 2011 and 2016 and comprised 29 sweet cherry cultivars, of which 28 were approved at RSFG Iaşi (three bitter cherry cultivars and 25 sweet cherry cultivars), and Van was used as the control cultivar. The genotypes approved at RSFG Iaşi have the following genitors: Cetăţuia (Van × Boambe de Cotnari); Cătălina (Van × Boambe de Cotnari); Alexus (Lijana OP); Andreiaş (HC 24/4 × Boambe de Cotnari); Ludovan (Van × Boambe de Cotnari), Lucia (Van × Muncheberge fruhe); Cociuvaş (Van × Bigarreau Moreau); Iosifan (Van × Lapins); Bucium (Van × Boambe de Cotnari); Maria (Van × Stella); Paulică (Bigarreau Drogan × Fromm); Ştefan (Van × Boambe de Cotnari); Tereza (Van × Ebony); Golia (Van × Boambe de Cotnari); Oana (Van × Boambe de Cotnari); Mihailis (Pietroase Geoagiu × New York 9801); Iaşirom (Van × Boambe de Cotnari); Elaiaşi (Boambe de Cotnari × HC 21/1); Muşatini (Bigarreau Drogan OP); Radu (Van × Boambe de Cotnari); Andante (Lijana OP); Marina (Boambe de Cotnari × HC 23/31); Croma (Bigarreau Drogan × Van); Margonia (Van OP); and George (Ciliegia di Ottobre × Fromm). The capitalisation of the biological fund of existing genotypes in the spontaneous and cultivated flora in the Iaşi area was aided by

positive selection of the valuable bitter cherry genotypes. Three genotypes of bitter cherry were selected and planted in the national collection and in the trial field 5 × 4 within RSFG Iaşi, two of which were approved as new varieties in 1994 under the names Amar Maxut and Amar Galata and one genotype that was approved in 2016 with the name Amaris. Bitter cherry genotypes have different ripening times: early (Amaris), middle (Amar Maxut), and late (Amar Galata). We evaluated nine trees (three trees in three repetitions) grafted on *Prunus mahaleb* L. in experimental plots and planted at m, with the crown guided as the free flattened palmette in the direction of the row with trees, without supporting and irrigation systems. On the row of trees, the soil was prepared with a rotary orchard tiller, and between the rows, the soil was grassed. Diseases and pests were controlled using phytosanitary treatments in accordance with the warnings received.

**Determinations and analyses**

To estimate resistance to anthracnosis (*Coccomyces hiemalis* Higg.), 300 leaves were observed, determining the frequency of the attack (F% = number of attacked leaves from the total observed leaves), the intensity of the attack (I% = percentage of attacked leaves of the total observed leaves: I% = (i × f)/n, where i = %, and the leaf is attacked according to the mark in percentage; f = number of attacked leaves for each percentage from each mark, n = total number of attacked leaves), and the attack degree (GA), that represents the leaf attack, GA% = F × I/100 (Roşca *et al.*, 2011). To assess winter frost resistance, the viability of 100 flower buds from each third of the crown, for each variety, was analysed (Larsen, 2010). The phenophases of bloom and fructification were determined using BBCH monography as follows: 61 - beginning of flowering: about 10% of flowers open; 87 - fruit ripe for picking (Meier, 2001). The physical traits fruit and stone weight (g) were measured by weighing 10 fruit/stones three times with the Radwag electronic scale with 0.01 g precision. The equatorial diameter of the fruit (mm) was determined using Luumytools digital calipers in 10 fruit three times. The soluble dry substance (SDS) was determined by measuring the refractive index with a Zeiss refractometer. Pulp firmness, fruit shape, and stone adherence to pulp were determined according to the UPOV TG/35/7 questionnaire for sweet cherry (UPOV, 2006). The fruit's resistance to cracking was determined using the Cristensen method, counting the number of cracked fruit after immersion in distilled water for six hours at 20°C (Webster and Looney, 1996).

The experimental data were statistically interpreted by XLSTAT 2021.5 software using the multiple comparisons method (Duncan test, with P 5%).

## RESULTS AND DISCUSSION

### Tree vigour, phenology and resistance of cherry cultivars

Cultivars with late fruit maturation were obtained using the following cultivars as genitors: Boambe de Cotnari (clones), Van, Fromm, Lijana, Bigarreau Drogan, and Ciliegia di Ottobre.

The breeding programme was continued to date, with the objectives being respected during development. Thus, cultivars with a ripening stage at the extremities of the cherry maturation season were obtained as early (Cetăţuia, Cătălina, and Amaris) and late fruit maturation cultivars (Andante, Marina, Croma, Margonia, and George). The cherry cultivars are described in terms of vigour, bloom period, maturation age, qualitative traits of the fruit, and resistance to anthracnosis (*Coccomyces hiemalis* Higg.) and winter frost in

*Tables 1* and *2*. Regarding the tree's vigour, cultivars Amaris, Tereza, Ştefan, and Golia had weak vigour in comparison with the other cultivars, which had medium vigour.

**Table 1 – Observations and measurements of 29 cherry cultivars (RSFG Iaşi, 2011 - 2016, n = 6)**

| Cultivar | Tree vigour[1] | Limit data (from earliest to latest/6 years): | | Flower bud damage[3] (%) | Resistance to anthracnosis (*Coccomyces hiemalis* Higg.) | | |
|---|---|---|---|---|---|---|---|
| | | Start bloom (61; data)[2] | Ripening time (87; data) | | Frequency of attack (%) | Attack intensity (%)[4] | Attack degree (%) |
| Cetăţuia | 5 | 03.04 - 20.04 | 11.05 - 30.05 | 6.0$^{cde}$ | 2.6 | 5 | 0.13 |
| Amaris | 3 | 06.04 - 19.04 | 23.05 - 04.06 | 9.0$^{c}$ | 3.0 | 4 | 0.12 |
| Cătălina | 5 | 05.04 - 21.04 | 17.05 - 04.06 | 8.0$^{cd}$ | 3.2 | 4 | 0.13 |
| Alexus | 5 | 14.04 - 24.04 | 10.06 - 23.06 | 28.0$^{a}$ | 3.7 | 4 | 0.15 |
| Andreiaş | 5 | 06.04 - 23.04 | 06.06 - 20.06 | 1.0$^{f}$ | 3.5 | 3 | 0.11 |
| Ludovan | 5 | 06.04 - 23.04 | 10.06 - 22.06 | 2.0$^{ef}$ | 2.9 | 4 | 0.12 |
| Lucia | 5 | 08.04 - 24.04 | 06.06 - 19.06 | 16.0$^{bc}$ | 3.1 | 4 | 0.12 |
| Cociuvaş | 5 | 05.04 - 23.04 | 09.06 - 20.06 | 2.0$^{ef}$ | 3.4 | 4 | 0.14 |
| Iosifan | 5 | 07.04 - 23.04 | 11.06 - 18.06 | 4.0$^{def}$ | 3.0 | 4 | 0.12 |
| Bucium | 5 | 06.04 - 23.04 | 07.06 - 18.06 | 6.0$^{cde}$ | 2.5 | 4 | 0.10 |
| Maria | 5 | 04.04 - 21.04 | 06.06 - 20.06 | 2.0$^{ef}$ | 3.1 | 4 | 0.12 |
| Van | 5 | 04.04 - 22.04 | 11.06 - 20.06 | 20.7$^{ab}$ | 2.5 | 5 | 0.13 |
| Paulică | 5 | 03.04 - 20.04 | 15.06 - 19.06 | 8.0$^{cd}$ | 2.9 | 3 | 0.10 |
| Ştefan | 3 | 07.04 - 25.04 | 06.06 - 17.06 | 2.0$^{ef}$ | 3.4 | 4 | 0.14 |
| Tereza | 3 | 05.04 - 24.04 | 09.06 - 17.06 | 2.0$^{ef}$ | 3.2 | 4 | 0.13 |
| Golia | 3 | 05.04 - 22.04 | 06.06 - 8.06 | 2.0$^{ef}$ | 3.9 | 4 | 0.16 |
| Oana | 5 | 02.04 - 21.04 | 05.06 - 19.06 | 4.0$^{def}$ | 3.7 | 4 | 0.15 |
| Mihailis | 5 | 05.04 - 23.04 | 05.06 - 16.06 | 2.0$^{ef}$ | 3.9 | 4 | 0.16 |
| Iaşirom | 5 | 05.04 - 22.04 | 06.06 - 18.06 | 6.0$^{cde}$ | 2.9 | 4 | 0.12 |
| Elaiaşi | 5 | 05.04 - 22.04 | 13.06 - 20.06 | 0.0$^{f}$ | 3.6 | 4 | 0.14 |
| Muşatini | 5 | 08.04 - 23.04 | 08.06 - 20.06 | 2.0$^{ef}$ | 3.3 | 4 | 0.13 |
| Amar Maxut | 5 | 05.04 - 25.04 | 10.06 - 17.06 | 2.0$^{ef}$ | 2.9 | 4 | 0.12 |
| Radu | 5 | 02.04 - 20.04 | 05.06 - 16.06 | 8.0$^{cd}$ | 3.7 | 4 | 0.15 |
| Amar Galata | 5 | 05.04 - 25.04 | 10.06 - 23.06 | 1.0$^{f}$ | 2.7 | 4 | 0.11 |
| Andante | 5 | 07.04 - 24.04 | 18.06 - 06.07 | 4.0$^{def}$ | 3.4 | 4 | 0.14 |
| Marina | 5 | 04.04 - 23.04 | 17.06 - 06.07 | 24.0$^{ab}$ | 3.1 | 4 | 0.12 |
| Croma | 5 | 03.04 - 24.04 | 14.06 - 04.07 | 8.0$^{cd}$ | 3.0 | 4 | 0.12 |
| Margonia | 5 | 09.04 - 26.04 | 18.06 - 06.07 | 1.0f | 3.1 | 4 | 0.12 |
| George | 5 | 07.04 - 23.04 | 02.07 - 10.07 | 1.0$^{f}$ | 2.9 | 3 | 0.10 |

[1] UPOV test: tree's vigour mark on a scale of 1 - 9: 3 = weak; 5 = average (UPOV, 2006);
[2] BBCH phenological phases: 61-start bloom: about 10% of flowers open; 87-fruit ripe for picking (Meier, 2001);
[3] Different letters correspond with a significant statistical difference at $P \leq 5\%$, Duncan test.
[4] The attack intensity mark (1 - 6 scale): 1 = 1 - 3% attacked surface; 2 = 4 - 10%; 3 = 11 - 25%; 4 = 26 - 50%; 5 = 51 - 75%; 6 = 76 - 100% (Cociu and Oprea, 1989).

In regards to disease resistance, 2013 and 2016 were rainy years (with a surplus of 146.3 mm in 2013 and 128.2 mm in 2016), which is favourable for pathogen development; the cultivars expressed a low sensitivity to *Coccomyces hiemalis* Higg. The attack frequency was between 2.6 and 3.9% (*Table 1*).

Generally, in the six years of the study (2011 - 2016), during the dormancy period, the winters were mild, without extreme temperatures, but on February 12, 2012, - 24.3°C was recorded as the minimum temperature. The winter of 2013 was mild, but between March 15 and 29, the time when the cherry was out of dormancy, minimum temperatures were recorded at - 10.8°C (on March 24). Under these conditions, the flower buds are more sensitive, affecting the pistil inside the flower bud. The prolonged duration of these extremely low temperatures caused some varieties of cherries to suffer, causing some degree of damage to the flower buds, ranging from 0 to 28%, with the highest percentage in Alexus, Cetățuia, and Van (*Table 1*). However, flower bud damage up to 30% does not represent a crop danger (Wenden *et al.,* 2017). Resistance to frost is an important parameter for fruit tree species and varies from one cultivar to another, as well as within trees and the area of the tree (Szabó *et al.,* 1996; Szymajda *et al.,* 2013; Asănică *et al*., 2014). During the six years of the study (2011 - 2016), the start of flowering occurred between April 2$^{nd}$ and 26$^{th}$ (*Table 1*). Harvest time was registered in the first half of May for the early varieties (Cetăţuia, Cătălina and Amaris), in the first 20 days of June for the mid-season varieties (Alexus, Andreiaş, Ludovan, Lucia, Cociuvaş, Iosifan, Bucium, Maria, Paulică, Ştefan, Tereza, Golia, Oana, Mihailis, Iaşirom, Elaiaşi, Muşatini, Radu, Amar Maxut, and Amar Galata) and from the end of June to the beginning of July for the late varieties (Andante, Marina, Croma, Margonia and George) (*Table 1*). Similar studies showed that the phenological periods for the same cherry genotypes were variable depending on the climatic conditions of each year (Darbyshire *et al.,* 2012), but the ranking of cultivars remained the same. Throughout the study period, the earliest ripening time took place May 11$^{th}$ (Cetățuia) and the latest on July 10$^{th}$ (George), providing a period with fresh fruit between 40 and 61 days. Cultivar Maria is the first and only Romanian self-fertile cultivar. The quality of cherry fruit is generally determined by fruit size, skin colour, firmness of the pulp, stone size, and stone adherence to the pulp (Quero-Garcia *et al*., 2017). The new cultivars have different fruit colours, including yellow, bicolour, shiny red, dark red, and black (*Fig. 1*).

**Fruit characteristics**

The fruit weight was between 3.6 (Amar Maxut) and 5.5 g (Amaris) for bitter taste genotypes, but for all sweet cherry genotypes, fruit weight ranged between 5.4 (Cetățuia) and 9.3 g (Andreiaş) (*Table 2*).

Compared with Van, as the control cultivar, which is widespread in Romanian orchards, Alexus, Andreiaş, Ludovan, Lucia, Iosifan, Elaiaşi and Muşatini had greater fruit weights (*Table 2*). The stone weight was not positively correlated with fruit weight in

Andante, which had the largest stones, but medium fruit with significant statistically differences, compared with other genotypes, such as Cociuvaş or Iosifan, which have small stones but large fruit weight.

**Table 2 - Physical and organoleptic traits in 29 cherry cultivars (RSFG Iaşi, average 2011 - 2016, n = 6)**

| Cultivar | Fruit weight[1] (g) | Stone weight (g) | Fruit equatorial diameter (mm) | SDS (%)[2] | Cracked fruit (%) | Pulp firm-ness[3] | Pulp adherence to stone[4] | Taste[5] | Epider-mis colour[6] | Fruit shape[7] |
|---|---|---|---|---|---|---|---|---|---|---|
| **Early ripening cherry cultivars** | | | | | | | | | | |
| Cetăţuia | 5.4$^{hi}$ | 0.20$^{he}$ | 21.2$^{ghi}$ | 15.1$^{c}$ | 16.17$^{bc}$ | SF | SA | S | DR | K |
| Amaris | 5.5$^{h}$ | 0.26$^{gh}$ | 20.7$^{hij}$ | 19.0$^{a}$ | 1.22$^{h}$ | SF | NA | B | DR | H |
| Cătălina | 7.2$^{fg}$ | 0.30$^{def}$ | 23.8$^{cdefg}$ | 18.0$^{ab}$ | 9.00$^{de}$ | SF | NA | S | SR | H |
| **Mid-season ripening cherry cultivars** | | | | | | | | | | |
| Alexus | 9.3$^{a}$ | 0.33$^{bcd}$ | 25.8$^{abcd}$ | 17.0$^{bc}$ | 7.33$^{efg}$ | F | NA | S | SR | H |
| Andreiaş | 8.9$^{abc}$ | 0.33$^{bcd}$ | 24.9$^{bcdef}$ | 18.3$^{ab}$ | 8.67$^{def}$ | F | NA | VS | SR | H |
| Ludovan | 9.1$^{ab}$ | 0.33 $^{bcd}$ | 26.5$^{ab}$ | 18.6$^{ab}$ | 2.83$^{gh}$ | F | NA | VS | SR | K |
| Lucia | 8.6$^{abc}$ | 0.33 $^{bcd}$ | 25.4$^{abcde}$ | 19.0$^{ab}$ | 4.67$^{efgh}$ | F | NA | S | SR | H |
| Cociuvaş | 8.3$^{abcde}$ | 0.30$^{def}$ | 25.1$^{bcdef}$ | 18.5$^{ab}$ | 3.17$^{gh}$ | F | NA | VS | SR | K |
| Iosifan | 9.2$^{ab}$ | 0.32$^{cde}$ | 26.2$^{abc}$ | 17.2$^{abc}$ | 4.17$^{efgh}$ | F | NA | VS | SR | K |
| Bucium | 8.0$^{cdefg}$ | 0.30$^{def}$ | 25.0$^{bcdef}$ | 17.8$^{ab}$ | 18.50$^{ab}$ | F | NA | S | SR | H |
| Maria | 7.3$^{efg}$ | 0.28$^{ef}$ | 23.8$^{cdefg}$ | 18.5$^{ab}$ | 8.67$^{def}$ | F | NA | S | SR | H |
| Van | 7.3$^{efg}$ | 0.30$^{cdef}$ | 23.4$^{defgh}$ | 17.5$^{abc}$ | 43.50$^{a}$ | F | NA | S | SR | K |
| Paulică | 8.0$^{cdefg}$ | 0.32$^{cde}$ | 25.2$^{bcdef}$ | 17.1$^{abc}$ | 2.83$^{gh}$ | F | NA | S | BR | K |
| Ştefan | 8.0$^{cdefg}$ | 0.33$^{bcd}$ | 24.5$^{cdef}$ | 18.4$^{ab}$ | 15.50$^{bc}$ | F | NA | S | SR | H |
| Tereza | 8.2$^{bcdef}$ | 0.32$^{cde}$ | 27.8$^{a}$ | 17.6$^{ab}$ | 5.67$^{efgh}$ | F | NA | S | SR | H |
| Golia | 7.1$^{g}$ | 0.27$^{fgh}$ | 23.8$^{cdefg}$ | 17.1$^{abc}$ | 7.33$^{efg}$ | F | NA | S | SR | H |
| Oana | 7.0$^{g}$ | 0.33$^{bcd}$ | 23.3$^{defgh}$ | 17.0$^{bc}$ | 3.33$^{fgh}$ | F | NA | S | SR | K |
| Mihailis | 7.1$^{g}$ | 0.34$^{bc}$ | 22.3$^{fgh}$ | 17.4$^{abc}$ | 3.00$^{gh}$ | F | NA | S | DR | H |
| Iaşirom | 7.2$^{fg}$ | 0.26$^{gh}$ | 23.7$^{cdefgh}$ | 17.8$^{ab}$ | 1.17$^{h}$ | F | NA | S | SR | H |
| Elaiaşi | 9.0$^{abc}$ | 0.33$^{bcd}$ | 25.5$^{abcde}$ | 18.3$^{ab}$ | 2.28$^{gh}$ | F | NA | VB | SR | H |
| Muşatini | 8.4$^{abc}$ | 0.29$^{def}$ | 24.4$^{cdef}$ | 17.7$^{ab}$ | 3.12$^{gh}$ | F | NA | S | SR | K |
| Amar Maxut | 4.1$^{j}$ | 0.28$^{ef}$ | 18.2$^{j}$ | 19.0$^{ab}$ | 1.45$^{h}$ | SF | SA | VB | B | H |
| Radu | 7.1$^{g}$ | 0.30$^{def}$ | 23.1$^{defgh}$ | 17.0$^{bc}$ | 2.17$^{gh}$ | F | NA | S | SR | K |
| **Late ripening cherry cultivars** | | | | | | | | | | |
| Amar Galata | 4.3$^{ij}$ | 0.34$^{bc}$ | 18.6$^{ij}$ | 18.4$^{ab}$ | 5.97$^{efgh}$ | SF | SA | SB | BR | SE |
| Andante | 8.3$^{abcde}$ | 0.38$^{a}$ | 25.7$^{abcde}$ | 18.5$^{ab}$ | 9.33$^{de}$ | F | NA | S | Y | K |
| Marina | 7.5$^{defg}$ | 0.33$^{bcd}$ | 24.1$^{cdefg}$ | 17.6$^{ab}$ | 12.83$^{cd}$ | F | NA | S | BR | H |
| Croma | 8.2$^{bcdef}$ | 0.33$^{bcd}$ | 24.7$^{cdef}$ | 18.3$^{ab}$ | 18.33$^{b}$ | F | NA | S | SR | K |
| Margonia | 7.1$^{g}$ | 0.36$^{ab}$ | 23.0$^{defgh}$ | 17.0$^{bc}$ | 1.88$^{gh}$ | F | NA | S | Y | H |
| George | 7.0$^{g}$ | 0.33$^{bcd}$ | 22.9$^{efgh}$ | 17.3$^{abc}$ | 3.00$^{gh}$ | F | NA | S | SR | H |

[1] Different letters correspond with the significant statistical difference for P≤ 5%, Duncan test;
[2] soluble dry solids;
[3] pulp firmness: F = firm; SF = semi-firm;
[4] NA = non-adherent; SA = semi-adherent;
[5] S = sweet; VS = very sweet; B = bitter; SB = slightly bitter;
[6] DR = dark red; SR = shiny red; BR = bicoloured; B = black; Y = yellow;
[7] H = heart-shaped; K = kidney-shaped; SE = spherical elongated.

**Figure 1 – Cherry cultivars obtained in RSFG Iaşi, with different maturation seasons, shapes and fruit skin colours:**
1) Cetățuia; 2) Amar Galata; 3) Cătălina; 4) George; 5) Marina; 6) Andante (original)

For equatorial fruit diameter, the studied cultivars ranged between 18.2 (Amar Maxut) and 27.8 mm (Tereza). Additionally, the Ludovan cultivar had great fruit size with no significant statistical differences from Tereza. Cetăţuia, Amaris, Amar Galata, and Amar Maxut had a small fruit size, but was considered a large fruit (4.1 - 5.5 g) for the early and bitter varieties. Budan (2014) showed that bitter and early varieties are smaller in size (weight and equatorial diameter) than medium or late ripening sweet cherries.

The soluble dry substance was between 15.1 (Cătălina) and 19.0% (Amaris, Ludovan, Amar Maxut). These results are consistent with other studies of cherry cultivars, in which significant variations were found among cultivars (Skrzyński *et al.,* 2016). The percentage of fruit cracking ranged from 1.17 (Iaşirom) to 43.5% (Van). Compared with Van, all other studied cultivars were more resistant to rain-induced fruit cracking (*Table 2*), which is a major physiological problem in sweet cherry cultivars (Michailidis *et al.*, 2020). All varieties had a firm pulp and were not adherent to the stone, except for the early and bitter varieties (Cetăţuia, Cătălina, Amaris, Amar Maxut, and Amar Galata), in which the firmness of the pulp and adherence to the stone were average (*Table 2*).

Three varieties were bitter (Amaris, Amar Galata, Amar Maxut), and the remaining 25 cultivars were sweet. The bitter taste of fruit is an important parameter for producers of traditional products, such as liqueurs or jams (Budan, 2014). Regarding the shape of the fruit, 10 varieties had a kidney shape, namely Cetăţuia, Ludovan, Cociuvaş, Iosifan, Paulică, Oana, Muşatini, Radu, Andante, Croma, and Van. One variety was oblate (Amar Galata), and all other varieties had a heart shape (*Table 2*).

## CONCLUSIONS

The new cultivars approved at RSFG Iaşi can be recommended for early ripening time (Cetăţuia and Cătălina), late flowering (Margonia), special fruit quality and late ripening time (Marina, Andante, Margonia, Croma, and George), and weak tree vigour (Golia, Tereza, and Ştefan). Andreiaş, Amar Galata, and George had good resistance to anthracnose and winter frost.

Alexus, Iosifan, Ludovan, Elaiaşi, Andreiaş, Lucia, Muşatini, Cociuvaş, and Andante have large fruits and high soluble dry solids content, so they are recommended for fresh consumption or processing. The new cherry varieties introduced in the current assortment can guarantee the success of orchards in northeast Romania.

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