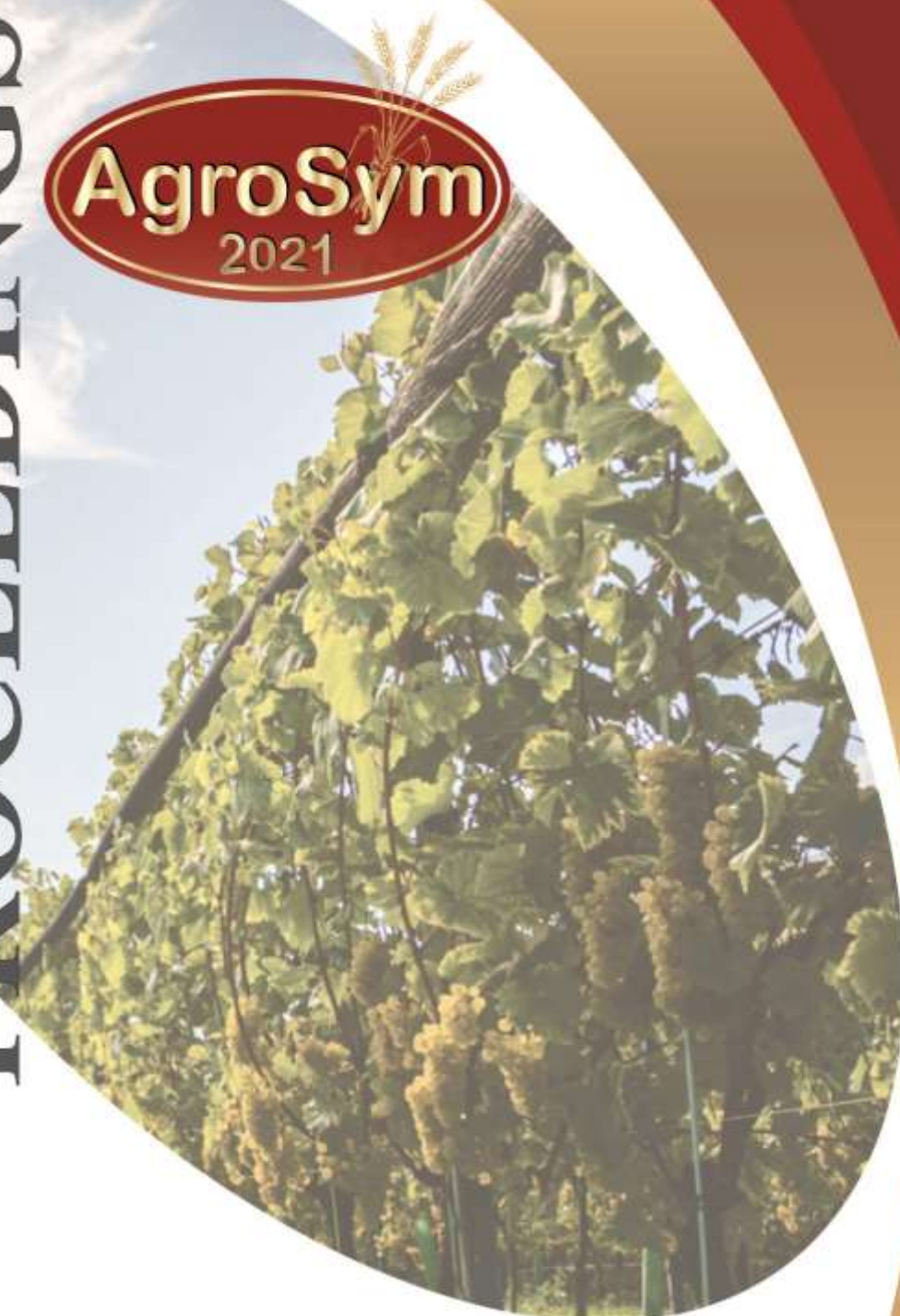


# BOOK OF PROCEEDINGS



***XII International Scientific  
Agriculture Symposium  
"AGROSYM 2021"  
October 7-10, 2021***

# **BOOK OF PROCEEDINGS**

**XII International Scientific Agriculture Symposium  
“AGROSYM 2021”**



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## **'LEDA' A NEW SOUR CHERRY CULTIVAR**

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### **Abstract**

Sour cherry is one of the most economically important temperate fruit species worldwide, which is widely used both fresh and processed. Due to the consumer demand for antioxidant-rich products, the development of new tart cherry selections with desirable quality characteristics is critical for the sustainability of cherry producers and processors. 'Leda' is a new sour cherry cultivar released from the sour cherry breeding program at the Institute PKB Agroekonomik. It was selected in mixed sour cherry orchard, from spontaneous seedlings population, and was recognized as cultivar in 2018 by the Serbian Ministry of Agriculture, Forestry and Water Management. The evaluation of this cultivar was done in comparison with the control cultivar 'Oblačinska' during a two-year period (2015 and 2017). Averagely, it bloomed a day or two after the control cultivar, while the ripening time was a day earlier than 'Oblačinska'. The productivity is higher than the standard cultivar. The attractive bright red coloured fruits are larger (3.8 g), compared to 'Oblačinska' (3.3 g), with shorter fruit stalk length (2.9 and 3.4 cm, respectively). It has rich, mild flavour, sweet-acidic and harmonic taste, having slightly higher value of soluble solids/total acidity ratio (10.4) compared to the standard cultivar (9.5). 'Leda' is highly resistant to economically important diseases and pests (*Monilinia laxa*, *Monilinia fructigena*, *Blumeriella jaapii*, *Wilsonomyces carpophilus* and *Rhagoletis cerasi*). This cultivar could be used both for processing and fresh consumption.

**Keywords:** *Prunus cerasus*, new realised cultivar, light red colour.

### **Introduction**

Sour cherry (*Prunus cerasus* L.), originated from around the Caspian Sea, is one of the most economically important temperate fruit species worldwide. It is one of the most popular fruits, which is widely used both fresh and processed. Sour cherries are excellent functional foods due to their high antioxidant capacity (Ferretti et al., 2010). Health benefits of cherries and their polyphenols against human diseases such as heart disease, cancers, diabetes are reviewed by Farretti et al. (2010). Also, there has been a great interest in sour cherry by-products due to the increasing production rate of sour cherry worldwide and the increasing efforts on seeking bioactive compounds from natural sources as functional food (Yilmaz et al., 2019).

Molecular analysis such as isozyme analysis, genomic in situ hybridization and karyotyping strongly suggests that *P. cerasus* is segmental allotetraploid obtained from natural hybridization

between ground cherry (*Prunus fruticosa* L.) and sweet cherry (*Prunus avium* L.). (Hancock and Iezzoni, 1987; Santi and Lemoine, 1990; Beaver and Iezzoni, 1993; Schuster and Schreiber, 2000). Furthermore, it has also been established that majority of the chloroplast genome of sour cherry is likely inherited maternally from ground cherry, thus validating an inter-specific origin for sour cherry (Brettin et al., 2000). It is a small tree, or more often a deciduous bush, which suckers profusely from the root (Dirlewanger et al., 2007). Sour cherry growing is limited to a very small number of cultivars, mostly regional. In Central Europe the main sour cherry cultivar is the 'Schattenmorelle', a self-compatible and highly productive cultivar with dark red fruits and juice. In North America, 'Montmorency' – a self-compatible variety with bright red fruits and clear juice is the cultivar of choice. Among the other notable varieties, 'Pandy' (and its derivatives) are popular in Hungary and Romania, although it is self-sterile. In the structure of fruit growing in Republic of Serbia, sour cherry has an important place with 19,114 ha and the production of 101,568 tonnes (average for the period 2010-2019; FAOSTAT database, 2019). Together with raspberry, sour cherry represents the country's most important exporting fruit (Radičević et al., 2016). In assortment structure, different clones of 'Oblačinska' are predominant, accounting for 85% of the total crop along with spontaneously spread 'Cigančica' (Cerović and Radičević, 2008), while the rest make large fruit sour cherries, i.e. 'Rexelle', 'Heimanns Konservenweichsel', 'Kelleriis 14' and 'Šumadinka' (Milatović et al., 2015). Regular yields and superior fruit quality are the two main objectives in sour cherry breeding programs. Besides that, improvement priorities include suitability for mechanical harvesting and processing, late flowering to avoid spring frost damage, round and small pit, resistance to *Blumeriella jaapii* and *Monilinia laxa*, self-compatibility, and a wide range of ripening dates (Iezzoni, 2008). Since the variability in sour cherry germplasm presents a wealthy source of diversity for breeders (Radičević et al., 2012), the vast majority of sour cherry breeding programs are in Europe. According to some estimates, there is about 500 sour cherry cultivars in the world. Sour cherries assortment is less dynamic compared to most other fruit species. Also the number of new cultivars that are developed worldwide is relatively small. In the last 30 years more than 200 new sour cherry cultivars have been released. About half of those were bred in Russia, followed by Ukraine, Poland, Romania, Hungary and Germany (Milatović and Nikolić, 2011). Breeding programs in Serbia so far have released ten sour cherry cultivars. 'Čačanski Rubin' ('Shasse Morello' × 'Köröser Weichsel') and 'Šumadinka' ('Köröser Weichsel' × 'Heimanns Konservenweichsel'), both from the Fruit Research Institute, Čačak, which were recognized in 1973 and 1984, respectively; 'Lara' ('Kelleriis 14' × 'Rexelle'), from Institute PKB Agroekonomik, Belgrade, which was recognized in 1993. 'Prima', selection from domesticated regional landrace of sour cherry, locally called 'Feketička' was released in 2013; 'Lenka' is the first sour cherry cultivar from the breeding program at the Faculty of Agriculture, released in 2014. Cultivars 'Nevena' ('Köröser Weichsel' × 'Heimanns Konservenweichsel'), 'Iskra' ('Köröser Weichsel' × 'Heimanns Rubin') and 'Sofija' ('Čačanski rubin' × 'Heimanns Konservenweichsel') were released in 2015 from the sour cherry breeding program in the Fruit Research Institute, Čačak. 'Ivo 45' (clone of 'Oblačinska') released by Superior doo, and 'Leda' (spontaneous seedling) developed in the Institute PKB Agroekonomik were released in 2018. The main objective of sour cherry breeding program was to obtain new genotypes which would be well adapted to agro-ecological conditions of the Republic of Serbia., and which would produce typical dessert fruit or fruit for use by the food processing and frozen-food industries. The aim of this study was to provide most important information on the new sour cherry cultivar 'Leda' developed in the Institute PKB Agroekonomik and to compare it with the control cultivar

‘Oblačinska’, with respect to tree characteristics, productivity, fruit characteristics and quality attributes, so as disease tolerance.

### **Materials and methods**

Study of a new sour cherry cultivar ‘Leda’ was done at the Ljubić facility of the Fruit Research Institute, Čačak (43°53'N, 20°20'E, 220 m a.s.l.) near Čačak city in Serbia. The control cultivar for comparison was ‘Oblačinska’. The experimental plot was planted in 2012. The rootstock was *Prunus avium* L. seedling and the tree spacing was 5×3 m. The experimental design was the randomized block with five trees. Study was carried out over a period of two years (2015 and 2017). The evaluations presented in this paper were carried out according to UPOV (2006). The flowering time of each individual tree was recorded visually, considered as the day when approximately 10-20% of the flowers were open (beginning), and when more than 90% of petals were dropped (end). Ripening time was recorded from date when more than 20% of fruits were for fresh consumption. Yield was determined by weighting all the fruits in the tree and was expressed in kg per tree. Fruit characteristics were measured on fruits harvested in full maturity stage. Fruit length, width and thickness were measured by caliper, while fruit stalk length was measured by a ruler. Fruit and stone weight were measured by scale. Mesocarp ratio was determined as a ratio between flesh weight and fruit weight. Soluble solids content was analyzed by using a digital refractometer Pocket PAL-1 (Atago, Japan). Titratable acidity was measured by neutralization to pH 7.0 with 0.1 N NaOH and expressed as percent of malic acid equivalent. Total and invert sugars contents were determined according to Luff-Schoorl method (Egan et al., 1981). Resistance of several tree organs to low temperatures and to economically important diseases and pests, such as *Monilinia laxa*, *Monilinia fructigena*, *Blumeriella jaapii* and *Rhagoletis cerasi* was done through field observation. For all traits mentioned a nine-score scale (from 1, representing very resistant, up to 9, representing very susceptible) was used.

### **Results and discussion**

#### *Phenological characteristics*

The flowering time of ‘Leda’ was two days after ‘Oblačinska’ and lasted one day longer. Fruits ripen in the first decade of June, one day before a control (Table 1).

Table 1. Comparisons of phonological and tree characteristics, as well as field resistance between ‘Leda’ and ‘Oblačinska’ (average 2015 and 2017).

	‘Leda’	‘Oblačinska’
Flowering (start)	Apr-10	Apr-08
Flowering (end)	Apr-18	Apr-17
Flowering (duration)	9	10
Ripening (start)	Jun-09	Jun-10
Ripening (end)	Jun-16	Jun-17
Ripening (duration)	8	8
Tree habit	Spreading	upright
Tree vigor	Low	Low
Disease and pest resistance		

<i>Monilia laxa</i>	Resistant	Resistant
<i>Monilia fructigena</i>	Tolerant	Tolerant
<i>Blumeriella jaapii</i>	Resistant	Resistant
<i>Rhagoletis cerasi</i>	Resistant	Resistant

*Tree, leaf and fruit*

‘Leda’ is characterized by spreading tree habit and weak vigor. One-year-old shoot length of internode is short. Leaf blade color on the upper side is light green. Orange yellow nectaries are present. All fruit dimensions, goes in the favor of ‘Oblačinska’ which showed higher values. Contrary, the average fruit weight of ‘Leda’ was 3.8 g and it was slightly higher than in the control cultivar (Table 2, Figure 1). The data concerning fruit weight is somewhat lower than those reported by Fotirić-Akšić et al. (2016) and Radičević et al. (2010, 2018) for newly sour cherry cultivars originated from Serbia. According to the UPOV descriptor for sour cherry (2006) ‘Leda’ has a circular fruit. Fruit stalk length differs between ‘Leda’ and ‘Oblačinska’. ‘Leda’ had a shorter fruit stalk of 4.53 cm, while in the control cultivar it was 3.63 cm. Altogether they are in the range reported by Perez-Sanchez et al. (2008). The stone was medium sized, with a share of ~7% in the fruit weight. Yield of cultivar ‘Leda’ was a 600 g higher than for the ‘Oblačinska’.

Table 2. Comparisons of fruit characteristics and yield between ‘Leda’ and ‘Oblačinska’ (average 2015 and 2017).

	‘Leda’	‘Oblačinska’
Fruit weight (g)	3.8	3.3
Fruit length (mm)	14.4	14.9
Fruit width (mm)	15.4	16.6
Fruit thickness (mm)	13.8	14.9
Stone weight (g)	0.28	0.33
Mesocarp ratio (%)	92.9	89.7
Stalk length (cm)	2.9	3.4
Fruit cracking (%)	Resistant	Resistant
Tree habit	Spreading	Upright
Tree vigor	Low	Low
Skin colour	Light red	Dark red
Juice colour	Colorless	Dark red
Yield (kg/tree)	3.03	2.43



Figure 1. Fruits of 'Leda' (left) and 'Oblačinska' (right).

#### *Disease and Pest Reaction*

Field examination (Table 1) showed that both 'Leda' and control cultivar exhibited high resistance of economically important fungal diseases and pest (*Monilinia laxa*, *Monilinia fructigena*, *Blumeriella jaapii* and *Rhagoletis cerasi*).

#### *Fruit quality*

Fruits of 'Leda' are characterized with a relatively high content of soluble solids, 16.95% in average (Table 3), which was higher than in 'Oblačinska' (15.55%). Also, 'Leda' showed slightly higher acid content (1.71%) compared to the control. Differences were also determined between soluble solids/total acids ratio, where 'Leda' (10.40) showed higher value than the control cultivar (9.49). The data on the chemical composition of fruits goes in the favor of 'Leda'. These results are lower than those reported in the literature (Fotirić-Akšić et al. 2016; Radičević et al., 2018) probably due to environmental factors.

Table 3. Comparisons of fruit quality between 'Leda' and 'Oblačinska' (average 2015 and 2017).

	'Leda'	'Oblačinska'
Soluble solids	16.95	15.55
Total acids	1.71	1.69
Soluble solids/Total acids	10.40	9.49
Total sugars	10.45	9.92
Inverted sugars	9.80	9.00
Sucrose	0.62	0.87

## Conclusions

New Serbian sour cherry cultivar 'Leda', developed at the Institute PKB Agroekonomik, has attractive bright red coloured fruits with rich, mild flavour, sweet-acidic and harmonic taste, high productivity and resistance to economically important fungal diseases and pests. It surpasses the 'Oblačinska' cultivar in most traits studied. This cultivar could be used both for fresh consumption and processing. Given the consumer demand for antioxidant-rich products, the development of new tart cherry selections with desirable quality characteristics is critical for the sustainability of cherry producers and processors.

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