

An overview of Serbian autochthonous genotype selection in *Prunus* genus

Nebojša Milošević^{1*}, Ivana Glišić¹, Sanja Radičević¹, Slađana Marić¹, Milena Đorđević¹, Tomo Milošević², Vera Rakonjac³, Goran Barać⁴

¹Fruit Research Institute, Čačak, Kralja Petra I/9, 32000 Čačak, Republic of Serbia

*E-mail: nmilosevic@institut-cacak.org

²University of Kragujevac, Faculty of Agronomy in Čačak, Cara Dušana 34, 32000 Čačak, Republic of Serbia

³University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade - Zemun, Republic of Serbia

⁴University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Republic of Serbia

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Abstract. Fruit species of the *Prunus* genus are among the most represented worldwide. According to harvested area and production volume, plum and sour cherry are beside apple and raspberry the most valuable species in the Republic of Serbia. Also, peach, apricot and sweet cherry are of high importance. Germplasms of all aforementioned *Prunus* species in the Republic of Serbia are very heterogeneous. Numerous genotypes are characterized with high fruit quality and tolerance/resistance to causal agents of the most important diseases and therefore, some of them such as plum ‘Crvena Ranka’, sour cherry ‘Oblačinska’ and apricots ‘NS-4’ and ‘NS-6’ have a major impact on commercial production. On the other hand, due to these properties, as well as others, a number of autochthonous genotypes have been used in breeding work as one of the parents in planned hybridization. Selection of genotypes with better characteristics have been carried out over a long time period in the Republic of Serbia and some of them, upon evaluation under the recognition procedure, were named and released as new cultivars. Also, clonal selection of the autochthonous genotypes and well-known landraces are a very useful tool for improvement of assortment structure. Therefore, selected clones with better characteristics might be used in production and further breeding work. Until these days, 11 apricot (‘Čačanska Pljosnata’, ‘Čačansko Zlato’, ‘Aleksandar’, ‘Biljana’, ‘Vera’, ‘NS4’, ‘NS6’, ‘Novosadska Rodna’, ‘Novosadska Kasnocvetna’ ‘Buda’, ‘Ruža’), two peach (‘Maša’ and ‘Lela’), two sour cherry (‘Lenka’ and ‘Prima’) and one sweet cherry (‘Canetova’) genotypes have been named and released as new cultivars. In addition, one plum, one sweet cherry and two sour cherry genotypes are under the recognition procedure for new cultivars.

Key words: *Prunus* genus, autochthonous genotypes, germplasm, selection, new cultivars

Introduction

The genus *Prunus* belongs to the Rosaceae family, Amygdaloideae subfamily and is divided into the five subgenera: *Prunophora* (plums and apricots), *Amygdalus* (almonds and peaches), *Cerasus* (sweet

and sour cherries), *Laurocerasus* (baycherries) and *Padus* (bird cherries) (Potter et al., 2007). It includes about 430 species of deciduous or evergreen trees and shrubs (Natić et al., 2020). Species belonging to *Prunus* genus have been cultivated in temperate areas worldwide (Europe, North Africa, the Near and Far

East, South Australia, New Zealand and parts of North and South America) (Mariette *et al.*, 2010). The most important species in this genus are stone fruits: peach and nectarine (*Prunus persica* L. and *P. persica* var. *nectarina* Ait.), European plum (*P. domestica* L.), apricot (*P. armeniaca* L.), sweet cherry (*P. avium* L.) and sour cherry (*P. cerasus* L.). In the period 2016–2020, among stone fruits, the highest average production on a global level was recorded in peaches and nectarines (24.2 million tons), followed by plums (12.1 million tons), apricots (4.1 million tons), sweet cherries (2.5 million tons) and sour cherries (1.4 million tons) (Faostat, 2022).

These species are of very high importance in the Republic of Serbia. In support of that, plum and sour cherry are beside raspberry and apple the most important fruit species in terms of harvested area, production volume and economic value. In addition to these most important species, some others have a certain importance, mainly as rootstocks [myrobalan (*P. cerasifera* Ehrh.), sloe (*P. spinosa* L.), mahaleb cherry (*P. mahaleb* L.) etc.]. In the Republic of Serbia, germplasm of all aforementioned *Prunus* species is very heterogeneous. There are numerous genotypes which are distinguished by high fruit quality and tolerance/resistance to causal agents of the most important diseases. Some of these genotypes such as plum ‘Crvena Ranka’, sour cherry ‘Oblačinska’ and apricots ‘NS-4’ and ‘NS-6’ are significantly represented in commercial production (Popović *et al.*, 2015; Rakonjac *et al.*, 2010; Miodragović *et al.*, 2019; Vujović *et al.*, 2020). Thanks to these good properties, as well as others, some of autochthonous genotypes have been used in breeding work as one of the parents in planned hybridization. Selection of genotypes with better characteristics have been carried out over a long time period in the Republic of Serbia and some of them, upon evaluation under the recognition procedure, were named and released as new cultivars.

The aim of this overview is to present the most important genotypes that have been singled out from natural population in *Prunus* genus in the Republic of Serbia after what they are named and released in new cultivars, as well as genotypes which are in this moment under the recognition procedure.

Genotypes which are named and released as new cultivars

Peach

‘*Maša*’ – This cultivar was named and released at the Faculty of Agriculture Novi Sad in 2016. It has medium vigorous tree and very good and regular bearing. Thinning is necessary to obtain high fruit quality. Ripening time is the end of July. It is self-fertile cultivar. The fruit is large (approximately 200 g), roundish and medium firm with cream-white ground colour, mostly over-coloured with intensive red colour. The flesh is cream-white, juicy, aromatic and sweet-acidic in taste. Stone is non adherent to flesh. Transportability and storage capacity are moderate, so growing near markets is required (Ognjanov *et al.*, 2017; 2018).

‘*Lela*’ – The same as cultivar ‘*Maša*’, ‘*Lela*’ was named and released at the Faculty of Agriculture Novi Sad in 2016. The tree is medium vigorous and has large cropping potential. It ripens at the end of the second decade of August. It is self-fertile cultivar. The fruit is large (approximately 200 g) round in shape, with cream-white ground colour which is 60% covered with medium red over colour. The flesh is of cream-white colour, juicy, aromatic, sweet-acidic in taste and medium firm. Stone is non adherent to flesh. This cultivar is susceptible to Peach leaf curl (*Taphrina deformans* (Berk.) Tul.) and tolerant to other fungal diseases (Ognjanov *et al.*, 2017; 2018).

Apricot

‘*Čačansko Pljosnata*’ – It was named and released at the Fruit Research Institut, Čačak in 1975. The tree is medium vigorous with medium bearing capacity. Ripening time is early, at the end of June. It is self-fertile cultivar. The fruit is medium large (approximately 45 g), flat and elongated with the suture dividing fruit into equal halves. The skin is orange-yellow with dark red blush on sunny side. The flesh is yellow, dry and aromatic with very good taste. Fruits are suitable for fresh consumption and drying (Lukić *et al.*, 2016).

‘*Čačansko Zlato*’ – The same as cultivar ‘*Čačanska Pljosnata*’, ‘*Čačansko Zlato*’ was named and released at the Fruit Research Institut, Čačak in 1975. It is medium vigorous to vigorous cultivar with high bearing potential. Ripening time is at the end of the se-

cond decade of July. It is self-fertile cultivar. Fruit is oval, medium large (approximately 55 g). The skin is orange-yellow with red blush on sunny side. The flesh is golden yellow, aromatic with excellent taste. Fruits can be used for fresh consumption and all types of processing (Lukić *et al.*, 2016).

‘Aleksandar’ – This cultivar was named and released at the Faculty of Agronomy in Čačak in 1995. It has medium vigour tree with large cropping potential. Ripening time is during the second decade of July. It is self-fertile cultivar. The fruit is medium large to large (approximately 55–60 g), roundish, orange-yellow with red blush on sunny side (Fig. 1a). The flesh is orange, firm, aromatic and very good in taste (Milošević *et al.*, 2012; Milošević *et al.*, 2013). This cultivar is suitable for fresh consumption and processing in different types of products.

‘Biljana’ – It was named and released at the Faculty of Agronomy in Čačak in 1995. The tree is medium vigour and has large bearing capacity. It ripens at the end of the second decade of July. It is self-fertile cultivar. The fruit is medium large (approximately 50 g) and elongated (Milošević *et al.*, 2012; Milošević *et al.*, 2013). Skin colour is orange-yellow with red blush on sunny side. The flesh is orange, firm, not adherent to stone and very good in quality. The fruits are intended for fresh market and processing.

‘Vera’ – The same as cultivars *‘Aleksandar’* and *‘Biljana’*, this cultivar was named and released at the Faculty of Agronomy in Čačak in 1995. It has medium vigour tree with large cropping capacity. Ripening time of this cultivar is during the second decade of July. It is self-fertile cultivar. The fruit is medium large to large (approximately 55–60 g), roundish, orange-yellow covered with dark red colour on the sunny side (Fig. 1b) (Milošević *et al.*, 2012; Milošević *et al.*, 2013). The flesh is orange, tasty, aromatic and of excellent quality. The fruits are suitable for fresh consumption and different types of processing.

‘NS-4’ – It was named and released at the Faculty of Agriculture Novi Sad in 2004. This cultivar has medium vigour tree and moderate to large cropping capacity. It ripens at the end of the second decade of July. The fruit is large (approximately 70–75 g), ovate and firm (Fig. 1d). The skin colour is orange with dark red blush on sunny side. The flesh is orange, juicy, aromatic and very testy. This cultivar is mainly intended for fresh consumption (Đurić *et al.*, 2005; Miodragović *et al.*, 2019).

‘NS-6’ – This cultivar was named and released at the Faculty of Agriculture Novi Sad in 2004. It has medium-strong vigour tree with high bearing capacity. Ripening time is at the end of the second decade of July. The fruit is medium large to large (approximately 55–70 g) roundish and flattened from the lateral side (Fig. 1c). The skin colour is light orange with red blush on sunny side. It has light orange, firm, aromatic and very quality flesh. Fruits are mainly suitable for fresh consumption (Đurić *et al.*, 2005; Miodragović *et al.*, 2019).

‘Novosadska Rodna’ – It was named and released at the Faculty of Agriculture Novi Sad in 2004. This cultivar has medium vigour tree. It tends to overbearing and requires adequate pruning and thinning. Ripening time is the end of the second decade of July. The fruit is medium large (approximately 55–60 g), ovate and flattened from the lateral side. Skin colour is light orange with red blush from the sunny side. The flesh is orange, firm, tasty and of very good quality. It is suitable for fresh consumption and processing (Đurić *et al.*, 2005; Miodragović *et al.*, 2019).

‘Novosadska Kasnocvetna’ – This cultivar was named and released at the Faculty of Agriculture Novi Sad in 2004. The tree is medium vigour and has very large cropping potential. It ripens at the beginning of the third decade of July. The fruit is medium large (approximately 50–60 g), ovate, light orange with very small amount of additional red colour on the sunny side. It has light orange, firm and tasty mesocarp. This cultivar is intended for fresh consumption and processing in different types of products (Đurić *et al.*, 2005; Miodragović *et al.*, 2019).

‘Buda’ – This cultivar was named and released at the Faculty of Agriculture Novi Sad in 2016. It has medium vigour to vigour tree with large cropping potential. Ripening time is the end of June and beginning of July. It is self-sterile cultivar and good pollenisers are cultivars *‘NS-4’*, *‘Novosadska Kasnocvetna’* and *‘Roxana’*. This cultivar has large fruit (approximately 60–70 g) of roundish shape (Miodragović *et al.*, 2019). The skin colour is light orange with very small amount of additional red blush. Mesocarp is orange, medium firm and has very good taste and quality. Fruits are suitable for fresh consumption and different types of processing, including drying.

‘Ruža’ – It was named and released at the Faculty of Agriculture Belgrade in 2014. The tree is medium vi-



Fig. 1. Apricot cultivars: 'Aleksandar' (A) and 'Vera' (B) (Source: T. Milošević), 'NS-6' (C) and 'NS-4' (D) (Source: Faculty of Agriculture Novi Sad)

Sl. 1. Sorte kajsije: Aleksandar (A) i Vera (B) (izvor: T. Milošević), NS-6 (C) i NS-4 (D) (izvor: Poljoprivredni fakultet Novi Sad)

gour with high bearing capacity. It is self-fertile cultivar. Ripening time is the end of the first decade of July. The fruit is medium large (approximately 60 g) and elliptical in shape. The ground colour is orange with intensive red blush on sunny side. It has orange, firm, juicy, aromatic and sweet-acidic mesocarp. The stone is non adherent to mesocarp. This cultivar is characterized with very good storability. Fruits are intended for fresh consumption and any type of processing (Milatović et al., 2018).

Sweet Cherry

'Canetova' – This cultivar was named and released at the Faculty of Agriculture Belgrade in 2014. It is characterized with medium vigour to vigour tree with slightly lower yields compared to standard cultivar 'Burlat'. Ripening time is very early, few days before

'Burlat'. It is self-sterile cultivar and good pollenisers are 'Burlat', 'Early Lory', 'Early Bigi' and 'Lapins'. The fruit is large (approximately 8–9 g), flat-round and medium firm. The skin colour is light red (Fig. 2a). The flesh is yellow, juicy, sweet and very good in quality regarding to very early ripening time (Fotirić-Akšić et al., 2016b). This is very interesting cultivar for new orchards due to its ripening time and large quality fruits.

Sour Cherry

'Lenka' – It was named and released at the Faculty of Agriculture Belgrade in 2014. The tree is medium vigour. Ripening time is early, similar to standard cultivar 'Meteor Korai'. It is self-fertile cultivar. The fruit is medium large (approximately 7.5 g) flat-round in shape and medium firm (Fig. 3a). The skin colour is



Fig. 2. Sweet cherry cultivar 'Canetova' (A) (Source: A. Korićanac) and genotype 'G-2' (B) (Source: Faculty of Agriculture Belgrade)
 Sl. 2. Sorta trešnje Canetova (A) (izvor: A. Korićanac) i genotip G-2 (B) (izvor: Poljoprivredni fakultet Beograd)

intensive red. It has juicy, sweet-acidic and quality fruit (Fotirić-Akšić *et al.*, 2016a). It has long stem. Regarding large fruit and pleasant taste, this cultivar could be used both for processing and fresh consumption. This cultivar is tolerant to the most important diseases.

'Prima' – This cultivar was selected from domesticated regional landrace of sour cherry, locally called 'Feketička', traditionally grown in area of villages Feketić and Mali Iđoš (central part of Vojvodina, northern Serbia). It was named and released by Farmers Association 'Gazdeker' from Feketić in 2013. The tree is

medium vigour and compact. Ripening time is mid-June. 'Prima' is not self-fertile cultivar and 'Čačanski Rubin' and 'Oblačinska' sour cherry are recommended as pollinating cultivars. It has medium large fruit (approximately 7.5 g), roundish in shape and medium firm. The fruit skin is dark purple red in color. The flesh is juicy, sweet-acidic and of excellent quality. It has long stem. This cultivar is highly tolerant to the most important fungal diseases such as brown rot (*Monilinia spp.*) and cherry leaf spot (*Blumeriella jaapii* (Rehm) Arx.). Fruits can be both eaten fresh and processed in different products (Ognjanov *et al.*, 2016).



Fig. 3. Sour Cherry cultivar 'Lenka' (A) (Source: A. Korićanac) and genotypes 'GV-6' (B) (Source: A. Korićanac) and 'GV-10' (C) (Source: S. Marić)

Sl. 3. Sorta višnje Lenka (A) (izvor: A. Korićanac) i genotipovi GV-6 (B) (izvor: A. Korićanac) i GV-10 (C) (izvor: S. Marić)

Genotypes which are under recognising procedure

Plum

‘*Gardinovačka*’ – This genotype is introduced into the procedure of recognition of new cultivars by the Faculty of Agriculture Novi Sad. It is characterized with medium vigour tree with large cropping capacity. Ripening time is at the end of the first decade of August (approximately 10–12 days after cultivar ‘Čačanska Lepotica’). It is self-sterile cultivar and good pollenizers are ‘Čačanska Rana’, ‘Čačanska Lepotica’ and ‘Stanley’. The fruit is medium large (approximately 40–45 g, with some fruits weighing 60 g), elliptical, firm and dark blue in colour with heavy bloom (Fig. 4). It has yellow-green, juicy and aromatic mesocarp with pleasant taste and very good quality. The stone is completely free of flesh. This genotype is tolerant on sharka virus. The fruits are mainly intended for fresh consumption, but can also be processed (personal communication).



Fig. 4. Plum genotype ‘*Gardinovačka*’ (Source: G. Barać)
Sl. 4. Genotip šljive *Gardinovačka* (izvor: G. Barać)

Sweet Cherry

‘*G-2*’ – This is perspective sweet cherry genotype singled out and introduced into the procedure of recognition of new cultivars at the Faculty of Agriculture Bel-

grade. The tree is vigorous with medium to high bearing capacity. It ripens very early, two weeks before standard cultivar ‘Burlat’. It is self-sterile cultivar and good pollenizers are cultivars ‘Burlat’, ‘Early Lory’, ‘Early Bigi’ and ‘Lapins’. This genotype is characterized with medium large (approximately 6–7 g), round-flat and medium firm fruit (Fig. 2b). The skin colour is intensive red. The flesh is yellow, juicy, sweet and very good in quality considering very early ripening time (personal communication).

Sour Cherry

‘*GV-6*’ – This is perspective sour cherry genotype singled out at Fruit Research Institute, Čačak. At this moment, it is in the process of recognition for a new cultivar. This genotype has medium vigorous to vigorous tree with high cropping potential. It ripens at the end of the second decade of June. It is not self-fertile genotype and good pollenizers are cultivars ‘Sofija’, ‘Šumadinka’ and ‘Erdi Botermo’. The fruit is large (approximately 6–7 g), flat-round, firm and dark red in colour (Fig. 3b). The flesh is red, juicy and of excellent quality. It has long stem. The fruits can be eaten fresh and processed in different types of products. This genotype is tolerant to the most important fungal diseases including brown rot (*Monilinia spp.*) and cherry leaf spot (*Blumeriella jaapii* (Rehm)Arx.) (Radičević *et al.*, 2018).

‘*GV-10*’ – The same as genotype ‘*GV-6*’, this genotype was singled out at Fruit Research Institute, Čačak and at this moment it is in the process of recognition for a new cultivar. The tree is medium vigorous with large bearing capacity. Ripening time of this genotype is at the end of the first decade of June. It is self-sterile genotype. Cultivars ‘Sofija’, ‘Šumadinka’ and ‘Erdi Botermo’ consider as good pollenizers. The fruit is large (approximately 6–7 g), flat-round, firm and intensive red (Fig. 3c). It is characterized with red, juicy, acidic-sweet and very quality mesocarp. The stem is long. Fruits can be both, eaten fresh and processed in different products. This genotype is highly tolerant to the most important fungal diseases such as brown rot (*Monilinia spp.*) and cherry leaf spot (*Blumeriella jaapii* (Rehm)Arx.) (Radičević *et al.*, 2018).

Conclusion

Germplasm of *Prunus* genus in the Republic of Serbia is polymorphic and rich in different species and their characteristics. Relevant scientific institutions work on collection and conservation of germplasm. Genotypes with good characteristics of the tree and fruit as well as with tolerance/resistance to the most important diseases have been singled out and released as new cultivars. Some of these cultivars become very interesting for commercial production. So far, cultivars such as 'Aleksandar', 'NS-4', 'NS-6' and 'Ruža' have been grown in significant amount in orchards in our country. It is expected that in the future period cultivars 'Buda' and 'Lenka' as well as genotypes 'GV-6' and 'GV-10' (after recognition in new cultivars) take place in the commercial orchards due to their good properties. However, all genotypes mentioned in this overview deserve attention and can be grown to a lesser or greater extent in commercial orchards or amateur gardens as well as could be used as material in future breeding work.

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AUTOHTONI GENOTIPOVI IZDVOJENI IZ RODA *Prunus* U REPUBLICI SRBIJI**Nebojša Milošević^{1*}, Ivana Glišić¹, Sanja Radičević¹, Slađana Marić¹, Milena Đorđević¹, Tomo Milošević², Vera Rakonjac³, Goran Barać⁴**¹Institut za voćarstvo, Čačak, Kralja Petra I/9, 32000 Čačak, Republika Srbija

*E-mail: nmilosevic@institut-cacak.org

²Univerzitet u Kragujevcu, Agronomski fakultet u Čačku, Cara Dušana 34, 32000 Čačak, Republika Srbija³Univerzitet u Beogradu, Poljoprivredni fakultet, Nemanjina 6, 11080 Beograd - Zemun, Republika Srbija⁴Univerzitet u Novom Sadu, Poljoprivredni fakultet, Trg Dositeja Obradovića 8, 21000 Novi Sad, Republika Srbija**Rezime**

Vrste voćaka iz roda *Prunus* su među najznačajnijima u svetu. Prema površini na kojoj se gaje i obimu proizvodnje, šljiva i višnja su, uz jabuku i malinu, najznačajnije vrste voćaka u Republici Srbiji. Takođe, breskva, kajsija i trešnja su od izuzetno velikog značaja. Germplazma svih pomenutih vrsta u Republici Srbiji je veoma raznolika i heterogena. Brojni genotipovi različitih vrsta se između ostalog odlikuju izuzetnim kvalitetom ploda i tolerantnošću/otpornošću na najznačajnije bolesti. Zbog svojih pozitivnih karakteristika genotipovi Crvena ranka (šljiva), Oblačinska (višnja), NS-4 i NS-6 (kajsija) su od izuzetnog značaja za komercijalnu proizvodnju. Takođe, ovi genotipovi, kao i brojni drugi imaju veliki značaj i u oplemenjivanju kao roditeljske sorte u planskoj hibridizaciji. Selekcija genotipova boljih proizvodnih osobina iz pri-

rodnih populacija se u Republici Srbiji sprovodi duži vremenski period i u taj proces su uključene sve relevantne naučne institucije. U prethodnom periodu neki genotipovi su izdvojeni i kroz postupak priznavanja kod Komisije za priznavanje sorti pri Ministarstvu poljoprivrede, šumarstva i vodoprivrede Republike Srbije priznati su za nove sorte. Do sada je za nove sorte priznato 11 genotipova kajsije (Čačanska Pljosnata, Čačansko Zlato, Aleksandar, Biljana, Vera, NS-4, NS-6, Novosadska Rodna, Novosadska Kasnocvetna, Buda i Ruža), dva genotipa breskve, (Maša i Lela), dva genotipa višnje (Lenka i Prima) i jedan genotip trešnje (Canetova). Pored toga, u ovom momentu u proceduri priznavanja za nove sorte nalaze se jedan genotip šljive (Gardinovačka), jedan genotip trešnje (G-2) i dva genotipa višnje (GV-6 i GV-10).

Ključne reči: rod *Prunus*, autohtoni genotipovi, germplazma, selekcija, nove sorte