



POLJOPRIVREDNI
FAKULTET
UNIVERZITET U
NOVOM SADU
PFNS
DEPARTMAN ZA RATARSTVO I
POVR TARSTVO



UNIVERSITÀ
DEGLI STUDI
FIRENZE
DISPAA
DIPARTIMENTO DI SCIENZE DELLE
PRODUZIONE AGROALIMENTARI
E DELL'AMBIENTE



UNIVERSITÄT FÜR
BODENKULTUR
WIEN
BOKU
DEPARTMENT FÜR WASSER-
ATMOSPHERE-UMWELT



EUROPEAN
COMMISSION
Horizon 2020
EUROPEAN UNION FUNDING
FOR RESEARCH & INNOVATION

**Workshop
2018**

The influence of different cherry rootstocks on sweet cherry properties

Tijana Narandžić



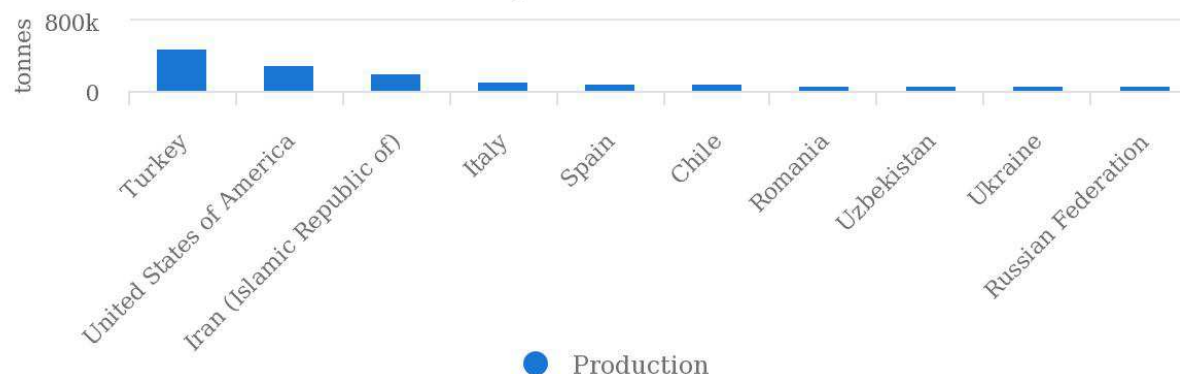
University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia

- Sweet cherry plantation raising – long-term and expensive investment**

Production share
of sweet cherries
by region (2012-2016):
Asia 44.2%,
Europe 34.6%,
America 19.4%

Production of Cherries: top 10 producers

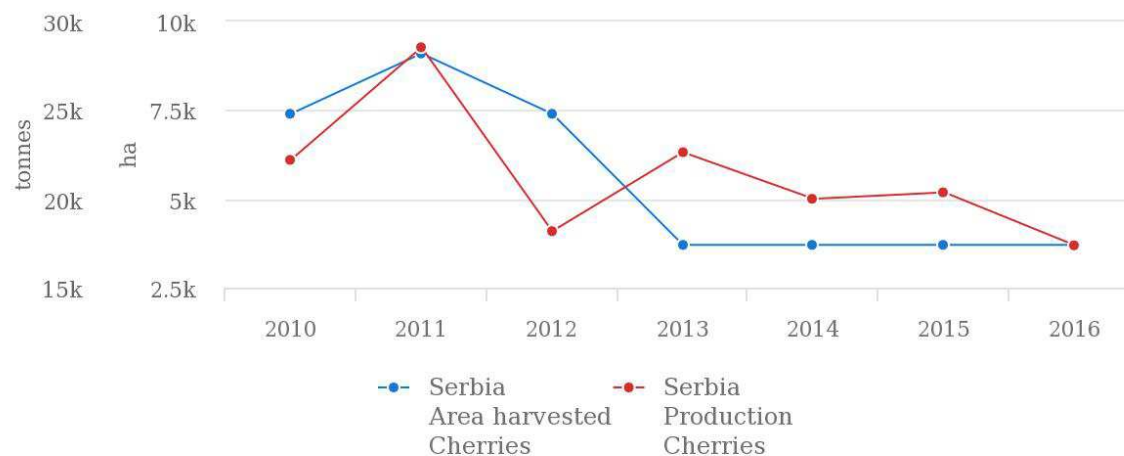
Average 2010 - 2016



Source: FAOSTAT (Jun 22, 2018)

Production/Yield quantities of Cherries in Serbia

2010 - 2016



Source: FAOSTAT (Jun 22, 2018)

Serbia's total yield in 2016:

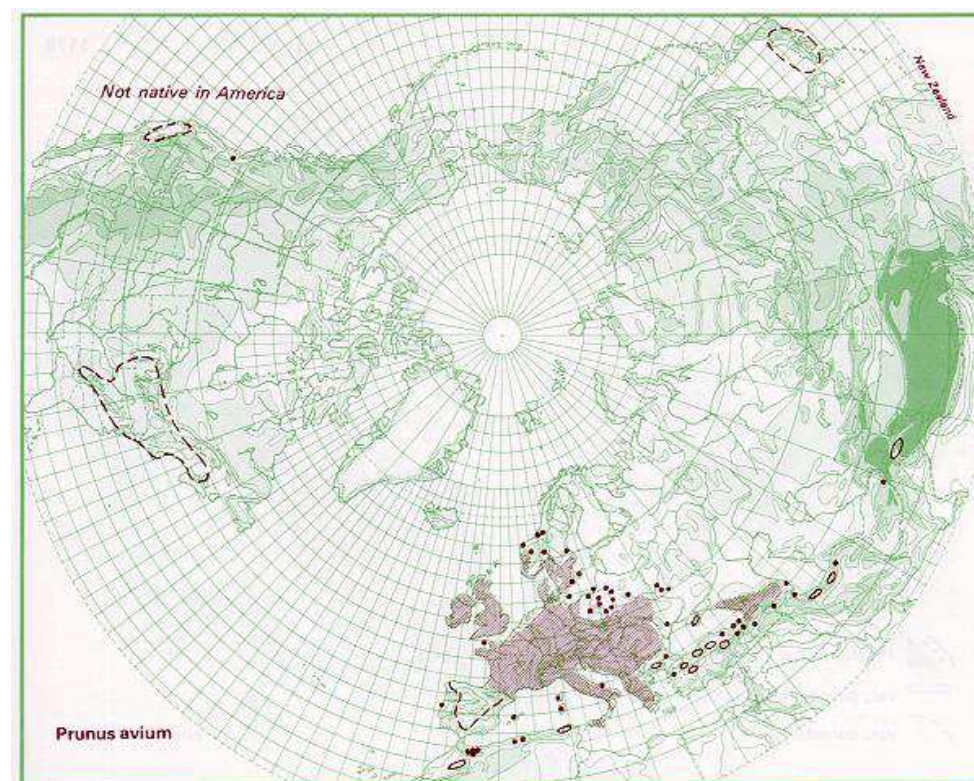
17.385 t

Serbia's area harvested in 2016:

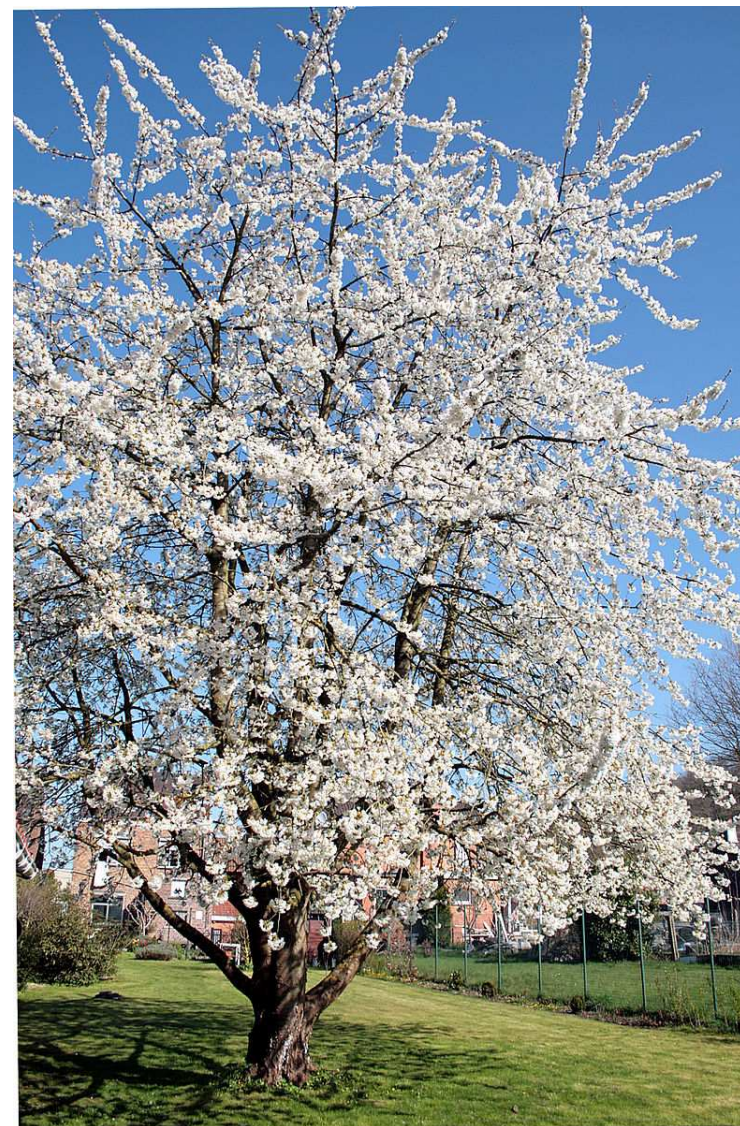
3.705 ha

Sweet or wild cherry (*Prunus avium* L.)

- Area of natural distribution: Europe, Anatolia, Maghreb, and western Asia, from the British Isles south to Morocco and Tunisia, north to the Trondheim fjord region in Norway and east to the Caucasus and northern Iran, with a small isolated population in the western Himalaya
- Forest tree in its native environment
- In Serbia wild cherry populates oak, beech and hornbeam forests up to 1.500 m a.s.l. and belongs to the endangered species of forest trees
- Deciduous tree, growing to relatively tall heights ≥ 10 m, with a trunk up to 1.2 m in diameter



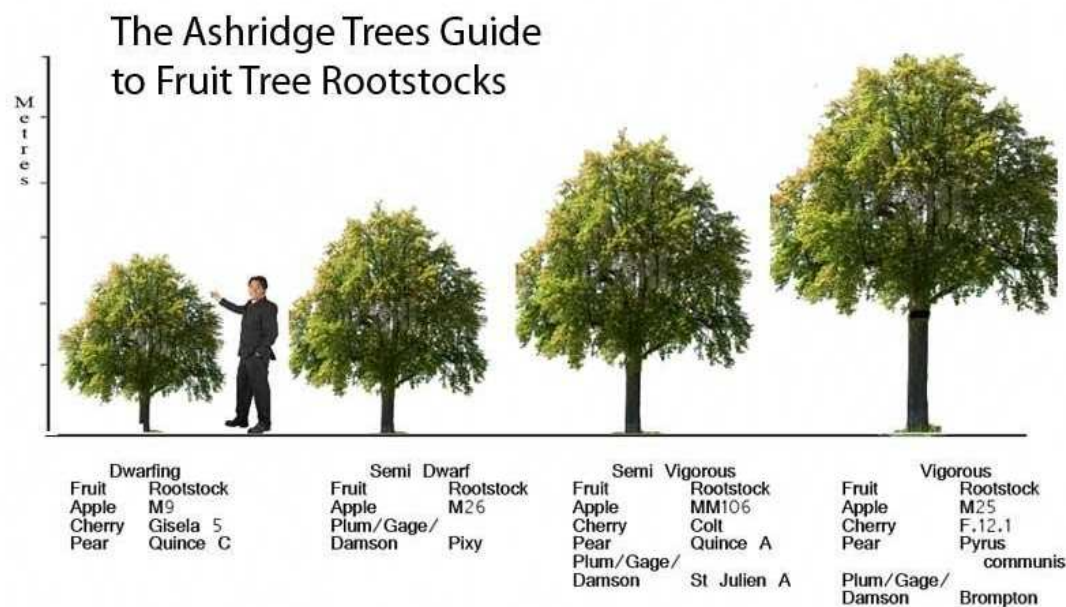
- High variability has been found in wild cherry natural germplasm
- Term 'Mazzard' refers to a selected self-fertile cultivar that is used as a seedling rootstock for fruiting cultivars
- Susceptible to drought, grows well on fertile, loose, deep and moderately humid soils



- High density orchard systems improve the low yields of traditional orchards
- Importance of grafting and scion-rootstock compatibility
- Size-controlling rootstocks – the introduction of dwarfing and semi-dwarfing cherry rootstocks



- Main advantages of dwarfing and semi-dwarfing rootstocks: reduced tree size, precocity and high productivity
- Most of sweet cherry plantations are raised on very vigorous rootstocks including 'Mazzard' (*Prunus avium*) and 'Mahaleb' (*Prunus mahaleb*)
- Full-size rootstocks ('Mazzard', 'Mahaleb', 'Colt')
 - best suited to standard-density orchards
- Dwarfing rootstock 'Gisela 5' - poor adaptability in semi-arid climate



Research aim: to propose sweet cherry rootstocks both drought tolerant and precocious

- Selection of potential dwarf genotypes in a frame of autochthonous cherry germplasm
- 'Oblaćinska' sour cherry (*Prunus cerasus*) and ground cherry (*Prunus fruticosa*) genotypes were selected for further research

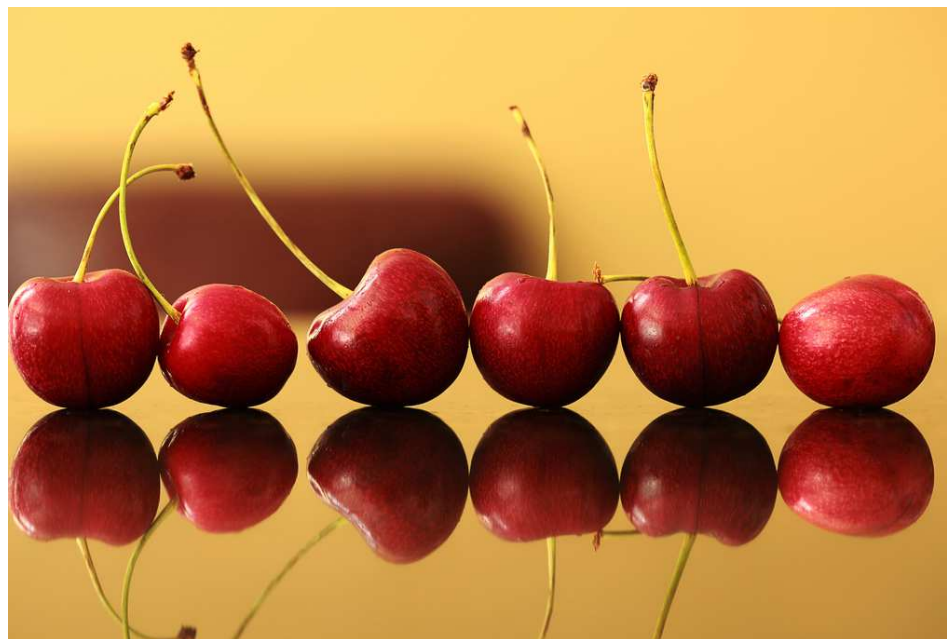


Plant material

- Rootstock selections were primarily collected from natural populations and orchards and further maintained at University of Novi Sad, Faculty of Agriculture Fruit Research farm, Novi Sad, Serbia

Genotype	Species, interspecific hybrid	Locality
Controls		
'Colt'	Prunus avium × Prunus pseudocerasus	Rimski Šančevi
'Mahaleb'	Prunus mahaleb	Rimski Šančevi
'Mazzard'	Prunus avium	Rimski Šančevi
Ground cherry		
SV2	Prunus fruticosa	Fruška gora
SV5	Prunus fruticosa	Fruška gora
SV7	Prunus fruticosa	Fruška gora
SV8	Prunus fruticosa	Fruška gora
'Oblačinska' sour cherry		
OV4 NC	Prunus cerasus	Nova Crvenka
OV5 NC	Prunus cerasus	Nova Crvenka

- Sweet cherry variety 'Summit' was grafted on all selected rootstocks
- Trees were planted at a spacing of 1.5 m within row and 4 m between rows, training system is Spindel
- Plantation is currently in the third vegetation
- The field trial was not irrigated, nor fertigation was applied
- Protective anti-rain covering systems, hail netting or bird barricades were not used



Standard (reference) rootstocks

- ‘Mazzard’

High vigor, moderate productivity, lack of precocity. No cases of incompatibility with sweet cherry scions have been recorded. It does not perform well in poorly drained or wet soils.

- ‘Mahaleb’

Slightly more precocious and slightly less vigorous than ‘Mazzard’. Drought-tolerant and extremely sensitive to water-logged soils. Incompatibility of some sweet cherry varieties was observed and this condition has been recorded up to six years after planting.

- ‘Colt’

When irrigated, it produces a vigorous tree similar in size to ‘Mazzard’ with similarly low precocity. Sensitive to droughty soils and to cold winter temperatures. Susceptible to crown gall.

‘Oblačinska’ sour cherry (*Prunus cerasus*)

- Autochthonous and heterogeneous cultivar, an ecotype that was domesticated in Aleksandrovo, Serbia
- Low vigorous and suitable for dense planting
- Selection from the diverse gene pool of ‘Oblačinska’ sour cherry in Serbia is a continuous process undertaken by local growers
- It has been used for decades as a dwarfing rootstock for sweet and sour cherries in Serbia
- High compatibility with commercial varieties
- Induces the early production of flowers, consistently high fruit set and regular and heavy cropping
- Genotypes were selected as the result of positive clone selection within the range of its’ origin and the highest prevalence



Ground cherry (*Prunus fruticosa*)

- European ground cherry exists as a hedge or as shrubs in abandoned vineyards and villages in Serbia
- Clusters of European ground cherry are a part of the Middle European shrub community
- In Northern European areas, European ground cherry is resistant to winter frosts (temperatures down to -50°C) and drought, yields early and well
- Selection of genotypes was conducted based on noticed unique and rare properties important for the breeding objectives' realization – individual positive selection



Cultivar 'Summit'

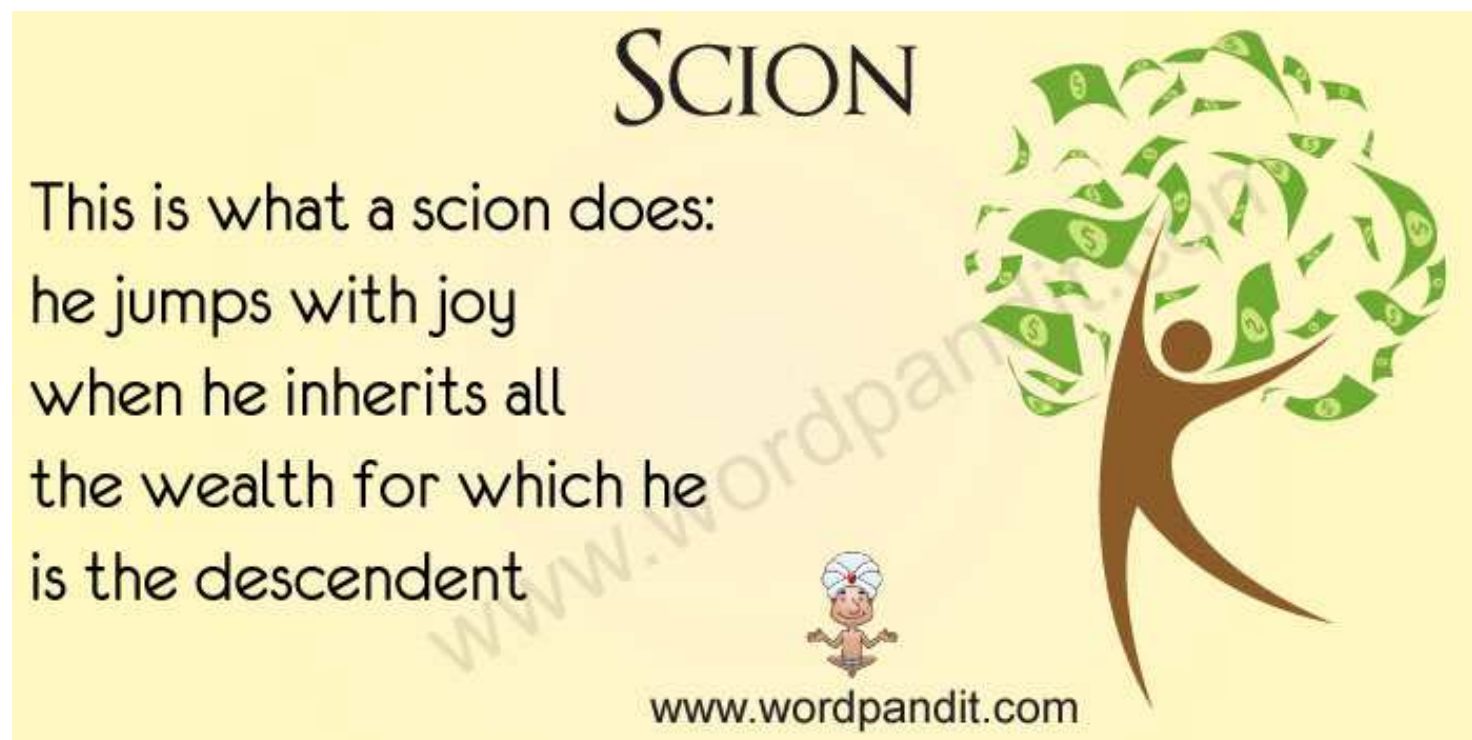
- Variety was named in 1973 by Agriculture Canada, Research Station, Summerland, British Columbia
- It originated from the cross Van X Sam, made in 1957 (K. O. Lapins)
- Large fruits (9 g), roundish heart-shaped
- Fruit skin is dark red when fully ripe, shiny
- The flesh is juicy, sweet and of high quality
- Tree is vigorous, spreading to upright
- It is known for very low yields, non precocious variety
- Susceptible to fruit cracking in rain



- Effect of the rootstock on sweet cherry fruit properties

Rootstock	Fruit weight (g)	Fruit height (mm)	Fruit width (mm)	Fruit thickness (mm)	Petiole length (mm)	Stone weight (g)	Mezocarp ratio (%)
SV2	8,42 ± 1,03 ^{cd*}	25,21 ± 1,24 ^{bc}	26,88 ± 0,97 ^{bc}	21,08 ± 1,17 ^{bc}	33,27 ± 2,49 ^{ab}	0,43 ± 0,06 ^a	94,94 ± 0,36 ^{de}
SV5	9,08 ± 0,57^b	25,86 ± 0,89^{ab}	27,66 ± 0,57^{ab}	21,13 ± 2,46 ^{bc}	32,87 ± 2,47 ^{ab}	0,41 ± 0,06 ^a	95,46 ± 0,61 ^{bc}
SV7	9,73 ± 0,79^a	25,94 ± 0,81^a	28,34 ± 1,07^a	22,48 ± 1,05^a	34,67 ± 2,13^a	0,40 ± 0,06 ^{ab}	95,84 ± 0,62^{ab}
SV8	8,03 ± 0,57 ^d	24,81 ± 0,70 ^{cd}	26,05 ± 0,75 ^d	20,72 ± 0,66 ^c	32,27 ± 2,69 ^b	0,39 ± 0,03 ^{ab}	95,19 ± 0,30 ^{cd}
OV4 NC	8,41 ± 0,91 ^{cd}	25,64 ± 0,75^{ab}	26,65 ± 0,87 ^{cd}	20,93 ± 1,29 ^{bc}	32,89 ± 2,71 ^{ab}	0,41 ± 0,08 ^{ab}	95,19 ± 0,61 ^{cd}
OV5 NC	9,02 ± 0,64^{bc}	26,08 ± 0,76^a	27,36 ± 0,78 ^{bc}	21,83 ± 1,24^{ab}	33,67 ± 2,66 ^{ab}	0,40 ± 0,04 ^{ab}	95,58 ± 0,55 ^{bc}
‘Colt’	6,74 ± 0,41^e	23,18 ± 0,46^e	24,62 ± 0,67^e	19,66 ± 0,60^d	29,87 ± 2,50^c	0,36 ± 0,04 ^{bc}	94,60 ± 0,61^e
‘Mahaleb’	8,87 ± 0,89 ^{bc}	24,37 ± 0,85 ^d	27,20 ± 0,96 ^{bc}	22,43 ± 0,73^a	31,93 ± 1,98 ^b	0,34 ± 0,04^c	96,11 ± 0,53^a
‘Mazzard’	7,26 ± 1,13 ^e	22,91 ± 1,08^e	25,16 ± 1,56^e	21,37 ± 1,14 ^{bc}	28,87 ± 3,40^c	0,33 ± 0,05^c	95,39 ± 0,81 ^{bcd}

* Values with the same letter are not significantly different at $P \leq 0.05$ (Duncan's multiple range test)



Thank you for your attention!

This research was supported by the Ministry of Education, Science and Technological Development of Serbia as a part of the project “Selection of sweet and sour cherry dwarfing rootstocks and development of intensive cultivation technology based on sustainable agricultural principles” (Technological Project No. TR 31038).