

INFLUENCE OF ROOTSTOCK ON GROWTH AND REPRODUCTIVE CHARACTERISTICS OF CHERRY CULTIVAR ‘STELLA’ DURING THE PERIOD OF COMPLETE FRUITING

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During the period of 2004–2005 the rootstocks Gisela 5, Gisela 4, Weiroot 10, Weiroot 13, Weiroot 53, Weiroot 72, Weiroot 158 and P 1 (the Bulgarian selection of *P. mahaleb* L.) as well as selections of Giessen series – Gi-195/20 and Gi-497/8 were tested for cherry cultivar ‘Stella’. The trees planted in the autumn of 1996 in the experimental field of the Agricultural University in the town Plovdiv, Bulgaria, at distances of 6.0 x 4.5 m, were trained as free-growing crowns and were abundantly irrigated.

On the basis of the results in the period of full bearing (8th and 9th vegetation after planting), rootstocks can be determined as: vigorously growing – P 1, Weiroot 10 and Weiroot 13; semi-dwarfing to dwarfing – Gi-497/8, Weiroot 158, Weiroot 53, Gisela 4, Gi-195/20 and Weiroot 72; extremely dwarfing – Gisela 5. The greatest number of suckers was formed on Weiroot 10, Weiroot 13 and Gisela 4; comparatively insignificant number – on Weiroot 53, Weiroot 72 and Weiroot 158; and no suckers at all on the remaining ones – P 1, Gisela 5, Gi-195/20 and Gi-497/8. Weiroot 53 and Weiroot 72 induced the highest productivity in the trees, whereas P 1 induced the lowest.

Key words: sweet cherry, rootstocks, Gisela, Weiroot, growth, fruiting.

Introduction. During the last 10–20 years the world selection created a comparatively great number of new rootstocks for cherries (Bujdoso, Hrotko, 2005; Wertheim, 1998), which are nowadays the object of examination under different soil-climatic conditions in many countries (Bujdoso et al., 2004; Lichev, Lankes, 2003; Reisen, Lander, 1998). For the time being the rootstocks of the series Gisela (Franken – Bembenek et al., 1999; Gutzwiler, Lang, 2001) and Weiroot (Gutzwiler, Lang 2001) created in Germany provoke the greatest interest. Certain rootstocks of these series were introduced in Bulgaria in 1995; they were grafted and the trees obtained in the course of 9 years were observed in connection with their growth and reproductive characteristics. The results concerning the influence of rootstocks on the performance of cherry trees during the periods of vigorous growth and initial and rapidly increasing fruit-bearing, were published earlier (Lichev, Lankes, 2003,

2004). In the present article we report data on the development of the experimental trees of cultivar ‘Stella’ during the period of full bearing.

Materials and methods. The investigations were conducted during the period of 2004–2005 with the trees of cherry cultivar ‘Stella’ grafted on *in vitro* propagated rootstocks Gisela 5, Gisela 4, Weiroot 10, Weiroot 13, Weiroot 53, Weiroot 72 and Weiroot 158 and the selections Gi-195/20 and Gi-497/8 of the Giessen series. The trees of the same cultivar grafted on the seedlings of rootstock P1 (standard Bulgarian selection of *P. Mahaleb* L.) were used as control. The experimental plants (6 in number per variant, using a randomized block design), were planted in the autumn of 1996 in the experimental field of the Department of Fruit growing at the Agricultural University in the town Plovdiv at planting distances of 6.0x4.5 m. The trees were trained as free-growing crowns, grown under the conditions of herbicide treated fallow land and were irrigated. Plants were cut back after planting at a height of 90 cm, after which they were left to manifest freely their growth and reproductive characteristics. After completing the training of the crowns, the trees were submitted to winter pruning every year except the season of 2004-2005.

The region of the experimental plantation is characterized by comparatively mild winter and dry hot summer, with maximum temperatures in July and August often reaching 40°C. The yearly precipitation sum total (400–500 mm) was distributed irregularly, mainly in winter, spring and autumn. The soil was slightly alkali with pH=7,5 and with medium sandy – loam mechanical composition.

Results. At the end of 9th vegetation after planting, the trees on rootstocks P1, Weiroot 10 and Weiroot 13 had the thickest trunks whereas those on rootstock Gisela 5 had the thinnest ones, the remaining variants having intermediate values (Table 1).

Table 1. Growth characteristics of sweet cherry cultivar ‘Stella’ grafted on different rootstocks, at the end of 9th vegetation period (2005)

1 lentelė. ‘Stela’ veislės vyšnių su skirtingais poskiepais augimo savybės devintojo vegetacijos laikotarpio pabaigoje 2005 m.

Rootstocks Poskiepai	Trunk cross section area Kamieno skerspjūvio plotas, cm ²	Tree height Vaismedžio aukštis, cm	Crown width Vainiko plotis, cm
P1	240.3	459.7	396.7
Gisela 5	50.8	231.2	163.1
Gisela 4	117.8	328.5	280.2
Gi-195/20	117.3	346.3	285.1
Gi-497/8	145.8	393.3	308.3
Weiroot 10	236.8	448.8	377.8
Weiroot 13	220.6	496.7	386.7
Weiroot 53	133.2	345.8	324.1
Weiroot 72	112.0	387.5	309.4
Weiroot 158	151.2	361.8	320.0
LSD ₀₅ / R ₀₅	35.9	41.6	37.6

The data on the tree sizes (Table 1) generally confirm the above-mentioned tendency in trunk thickness for distributing the rootstocks in 3 groups depending on the growth vigour induced by them on the graft. Results also indicate that the plants on Weiroot 13, P1 and Weiroot 10 are about 4.5–5 m high, which necessitates the application of ladders for picking of fruit and pruning whereas in the other trees these manual practices can be carried out without their application needed.

The studied rootstocks showed different tendencies toward suckering (Figure). Its strongest manifestation was in the rootstocks Gisela 4, Weiroot 10 and Weiroot 13, forming in the inter-row space (1,6 m wide) on the average from 14 to 17 shoots per tree during one vegetation. The rootstocks Weiroot 53, Weiroot 72 and Weiroot 158 showed a considerably smaller tendency to form suckers (4–6 per tree), whereas the rest of the plants (on P1, Gisela 5, Gi-195/20 and Gi-497/8) formed no suckers.

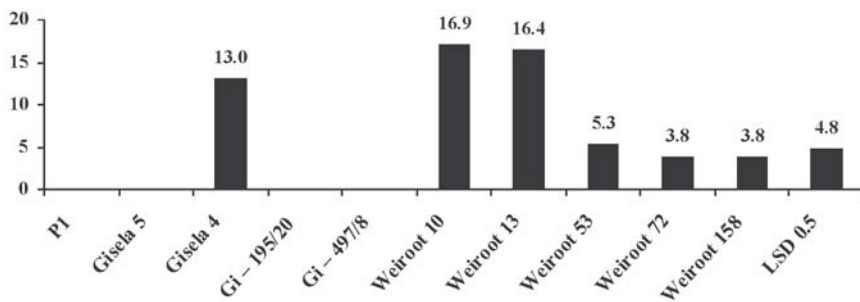


Fig. Number of suckers of sweet cherry cultivar 'Stella' grafted on different rootstocks, mean of 2004-2005

Pa v. 'Stela' veislės vyšnių su skirtingais poskiepiais atžalų skaičius, 2004–2005 m. vidurkiai

*Note: The number of suckers per tree was estimated only in the inter-row strip of 1.6 m width.
Pastaba: atžalų kiekis matuotas 1,6 m pločio pomedžio juostoje.

The data in Table 2 indicate that in 2005 the fruit-bearing in all variants was smaller than that of the previous vegetation, which was due to the partial frost-damage of the flower organs of the experimental trees in the winter and spring of 2004–2005. What makes an impression, however, is that the yield was reduced to the greatest degree in the trees on Gisela 5.

The biggest yield per tree during two years of study produced the bigger plants – these on Weiroot 10, Weiroot 13 and P1 (Table 2). Taking into consideration the fact that there were great differences in the vegetative development between the studied variants, we consider that the index resulting from the proportion between the yield per tree and the trunk thickness (Table 2), gives more correct notion about the fertility of cultivar 'Stella'. In this respect, the highest productivity of trees was induced by Weiroot 53 and Weiroot 72, the lowest – by P1 and the remaining rootstocks (Gisela 5, Gisela 4, Gi-195/20 and Gi-497/8, Weiroot 10, Weiroot 13 and Weiroot 158) had an intermediate position.

Table 2. **Fruiting of sweet cherry cultivar ‘Stella’ grafted on different rootstocks, 2004–2005**

2 lentelė. ‘Stela’ veislės vyšnių su skirtingais poskiepiais derlingumas 2004–2005 m.

Rootstocks Poskiepiai	Yield, kg/tree / Derlius, kg/medis			Yield efficiency in 2004–2005 Produktyvumas 2004–2005 m., kg/cm ²
	2004	2005	Total for 2004–2005 Suminis 2004–2005 m. derlius	
P1	32.9	28.7	61.6	0.26
Gisela 5	12.5	5.8	18.3	0.36
Gisela 4	22.5	17.0	39.5	0.34
Gi-195/20	20.9	16.2	37.1	0.31
Gi-497/8	22.0	19.7	41.7	0.28
Weiroot 10	35.9	34.4	70.3	0.30
Weiroot 13	32.1	31.8	63.9	0.29
Weiroot 53	29.9	22.9	52.8	0.40
Weiroot 72	21.9	19.2	41.1	0.37
Weiroot 158	26.2	21.6	47.8	0.32
LSD ₀₅ / R ₀₅	9.0	7.2	16.2	0.11

Discussion. To a certain extent, similar differentiation between the studied rootstocks of Gisela and Weiroot series with respect to their growth vigour, was conducted by other authors as well after extensive field experiments (Stehr, 1996; Balmer, 1998; Bujdoso et al., 2004). The results obtained by us differ from those of indicated foreign authors by the conclusion that in the course of our experiment Gisela 5 was manifested as too dwarfing and in this respect it was proved to defer to the other dwarfing rootstocks – Weiroot 53, Weiroot 72 and Weiroot 158. Most authors comparing the rootstock Gisela 5 with those of the second generation of Weiroot series (Weiroot 53, Weiroot 72 and Weiroot 158) in the experimental field, did not establish such a great difference between them with respect to their vegetative development (Stehr, 1996; Balmer, 1998; Bujdoso et al., 2004).

In connection with sucker-formation potentiality of the examined rootstocks of Gisela and Weiroot series, other authors also reported similar results in most of them (Balmer, 1998; Löcher, 1991; Weber, 1992). Other opinions also exist, however, about some of rootstocks, according to which the trees on Gisela 5 are capable of forming suckers, if only insignificant in number (Balmer, 1998; Weber, 1992) and those on Weiroot 158 have no tendency to sucker-formation (Löcher, 1991).

If we make a comparison between the productivity of trees during their 8th and 9th vegetation (in 2004 and 2005) and that of the same plants by the end of 6th year after planting (Lichev, Lankes, 2004), we’ll establish that during the period of full bearing the priority of Gisela 5 and Gisela 4 decreased, whereas the productive potentialities of Weiroot 53 increased. In the remaining rootstocks no significant deviations with respect to their productivity in the two maturity periods were reported.

The results obtained by us about the fertility of the trees on Gisela 5 do not

coincide with the opinion of most research workers in the same field, according to whom this rootstock induces high productivity to the cultivars grafted on it not only in the period of initial and rapidly increasing fruit-bearing, but at a later time too (Stehr, 1996).

Conclusions. The results obtained during the period of full bearing (8th and 9th vegetation after planting) of cultivar 'Stella' leads to the following conclusions:

1. Depending on the growth vigour induced to the scion, the rootstocks can be distributed to three groups: vigorously growing – P1, Weiroot 10 and Weiroot 13; semi-dwarfing to dwarfing – Gi-497/8, Weiroot 158, Weiroot 53, Gisela 4, Gi-195/20 and Weiroot 72; extremely dwarfing – Gisela 5.

2. Weiroot 10, Weiroot 13 and Gisela 4 are distinguished by the highest potentiality for sucker – formation, Weiroot 53, Weiroot 72 and Weiroot 158 – by a low potentiality, whereas the remaining rootstocks (P 1, Gisela 5, Gi-195/20 and Gi-497/8) – do not form suckers.

3. The highest productivity was induced to the trees by Weiroot 53 and Weiroot 72 and the lowest – by P 1.

Gauta
2006 05 04
Parengta spausdinti
2006 08 07

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POSKIEPIO ĮTAKA 'STELLA' VEISLĖS VYŠNIŲ AUGIMUI IR REPRODUKČINĖMS SAVYBĖMS DERĖJIMO LAIKOTARPIU

A. Papachatzis

Santrauka

2004–2005 metais buvo tirtos 'Stella' veislės vyšnios su šiais poskiepiais: Gisela 5, Gisela 4, Weiroot 10, Weiroot 13, Weiroot 53, Weiroot 72, Weiroot 158 ir P 1 (Bulgarijos *P. Mahaleb* L. selekcija) ir Gi-195/20 bei Gi-497/8 (Giessen serijų selekcija). Sodas įveistas 1996 metų rudenį Plovdiv (Bulgarija) žemės ūkio universiteto bandymų lauke, vaismedžius sodinant 6,0 x 4,5 m atstumais. Formuoti laisvai augantys vaismedžių vainikai.

Kaip rodo derėjimo laikotarpiu (8–9 vegetacija po pasodinimo) gauti rezultatai, poskiepai gali būti skirstomi į: stipriai augančius – P 1, Weiroot 10 ir Weiroot 13; pusiau žemaūgius ir žemaūgius – Gi-497/8, Weiroot 158, Weiroot 53, Gisela 4, Gi-195/20 ir Weiroot 72; nykštukinius – Gisela 5. Daugiausia atžalų išaugo ant Weiroot 10, Weiroot 13 ir Gisela 4, palyginti nedaug – ant Weiroot 53, Weiroot 72 ir Weiroot 158 poskiepių ir visiškai atžalų neturėjo likusieji – P1, Gisela 5, Gi-195/20 ir Gi-497/8 poskiepai. Derlingiausi buvo vaismedžiai su Weiroot 53 ir Weiroot 72 poskiepais, mažiausiai derlingi – su P 1 poskiepiu.

Reikšminiai žodžiai: vyšnios, poskiepai, Gisela, Weiroot, augimas, derlius.