

SECONDARY TECHNICAL OPERATIONS USED TO FORM THE CROWN OF THE TREES IN THE CHERRY ORCHARDS ON GISELA 6 IN THE FIRST YEARS AFTER PLANTING

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ABSTRACT

The study was carried out in the spring of 2020 in the north of the country, variety Grace Star grafted on the rootstock Gisela 6, thin spindle crown shape. Planting distance 4.2x1.8 m. In spring 2021 was organized with the following gradation: 1. Trees trained after the thin spindle crown (control); 2. Solitary incision above the buds and processing the cut with water; 3. Solitary incision above the buds and treatment of the cut with growth regulator Progerbalin LG; 4. Circular incision at 25-30 cm distance on the axis with processing of the cut with Progerbalin LG growth regulator; 5. Extirpation removal of 4-5 axillary buds from top to bottom of the leader while keeping a bud intact. It was established that, to increase the branching potential of the tree axis when training intervened with solitary incisions above the buds and circular incisions at a distance of 25-30 cm on the axis with the processing of the cut with the growth regulator Progerbalin LG in the ratio one part of product to 8-10 parts of latex paint.

INTRODUCTION

In horticultural practice, when cherry growers form the crown of trees, they tend to garnish the axis with vegetative macrostructure and fruiting microstructure using secondary technical operations such as: notching, strangulation, transverse incision, extirpation of buds, twisting etc. (Babuc et al. 2015, Cimpoeş 2000).

The incision is a secondary technical operation by which the bark is cut, on a width of 3-6 mm above the buds without degrading the woody vessels in the spring period after the budding and is extended until the appearance of the first leaves, so that the wound can then heal (Jacyna & Lipa 2008, Long et al. 2014). Solitary incisions should be made 2-3 mm above the bud and extend $\frac{1}{4}$ of the length of the shaft circumference (Long et al. 2015).

In recent years, in the practice of fruit growing, apart from the incision above the buds, circular incisions are also made on the axis of the tree, made at a distance of 30 cm from each other. This secondary technical operation allows to increase labor productivity during the execution of the work and more rational packing on the area of the shaft of the tree (Long et al. 2020).

The branching potential increases when the cuttings are processed with growth regulators whose active substances are 1.8% GA4+7+1.8% 6-BA, GA4 or GA4+7 (Bennewitz 2010, Peşteanu & Bostan 2018, Toprak et al. 2018) in the ratio

of one part of product and 8-10 parts of paint per latex base (Long et al. 2014, Long et al. 2020, Peşteanu 2021).

MATERIAL AND METHODS

The study was carried out during 2021, in the cherry plantation established in the spring of 2020 at S.R.L. "AGRO-MAG-DAR" enterprise, Gordineşti village, Edineşti district. Cherry trees of the Grace Star variety grafted on Gisela 6 rootstock, thin spindle crown form, were taken as research objects. Planting distance 4.2x1.8 m.

In order to study the influence of various secondary technical operations on the formation of the crown and to more rationally garnish the tree axis with vegetative macrostructure and fruitful microstructure to obtain early productions, the following experimental variants were developed:

V1 – Trees driven by thin spindle crown (control)

V2 – Solitary incision above the buds and processing the cut with water.

V3 – Single incision above the buds and treatment of the cut with growth regulator Progerbalin LG (1.8% GA4+7 +1.8% 6-BA) in the ratio of one part product to 8-10 parts latex paint.

V4 – Circular incision at a distance of 25-30 cm on the axis with processing of the cut as in the V3 variant.

V5 – Staggered removal of 4-5 axillary buds from the axis while keeping one intact bud, with subsequent repetition of the given operation. The terminal bud of the stem remains intact, then we extirpate 4-5 axillary buds inserted in a spiral while keeping one intact bud. Thus, every 10-15 cm on the axis, one bud placed in a spiral is kept.

In the spring, when the buds start to turn green, in the V2 variants; V3 and V4, in the area of the tree's axis, it intervenes above the axillary buds through a sectioning of the liberian vessels, without penetrating the sapwood to interrupt the centripetal flow of trophic substances. The incision above the buds was made when the daytime temperature was at least 8-12°C and the relative humidity of the air 60-65%.

The statistical processing of the data was carried out by the dispersion analysis method.

RESULTS AND DISCUSSIONS

Greater height of the trees on the variants studied in 2021 were recorded when the axis was intervened with a solitary incision above the buds and the processing of the cut with the growth regulator Progerbalin LG (266 cm) and the staggered extirpation of 4-5 axillary buds on axis with the preservation of an intact bud (265 cm). Lower values of this indicator were recorded in the control variant (235 cm) and in the case of making solitary incisions above the buds and processing the cut with water (237 cm). The circular incision variant at a distance of 25-30 cm on the axis with the processing of the cut with the growth regulator Progerbalin LG made the height of the tree 247 cm (tab. 1).

Studying the fractional height of the tree (trunk, axis, arrow) we note that the practical trunk in all the variants studied varied from 68 cm to 73 cm, and the factors studied had no influence on them, because the base of the crown was conceived in the previous year, 2020.

A wider difference and an influence of the factor under study was registered in the case of the axis where a development from 70 cm to 85 cm was recorded. Lower values of the axis of the trees were recorded in the control variant (70 cm),

and higher in the variant with a solitary incision above the buds and processing the cut with the growth regulator Progerbalin LG (80 cm) and the variant with staggered extirpation of 4-5 axillary buds from the axis with the preservation of an intact bud (85 cm). In the case of the variants solitary incision above the bud and processing the cut with water and the variant circular incision at a distance of 25-30 cm on the axis and processing the cut with the growth regulator Progerbalin LG, they recorded average values, constituting in both variants 74 cm.

Table 1

The height of Grace Star cherry trees depending on the secondary technical operations used to form the crown, cm

Variants	Height, cm			
	Tree	The trunk	The axis	Needle
V ₁ (m)	235	68	70	97
V ₂	237	68	74	95
V ₃	266	73	80	113
V ₄	247	68	74	105
V ₅	265	70	85	110
LDS 5%	10,9	3,2	3,5	4,1

The arrow of the trees depended on the general development of the cherry trees of the variety Grace Star. In the case of the variants where a wider development of the axis was obtained (V₃ and V₅), we also obtained an increase in the extension shoot, constituting in the variant a solitary incision above the bud and processing the cut with the growth regulator Progerbalin LG - 113 cm, and in the variant with staggered extirpation of 4-5 axillary buds from the axis while keeping one intact bud - 110 cm. In the case of the other variants (V₁, V₂ and V₄), the index studied varied from 97 to 105 cm. The obtained results show that the arrow of Grace Star cherry trees is closely related to the height of the tree's axis.

The secondary technical operations used during the crown formation period of the Grace Star cherry trees at the beginning of the second year of vegetation did not register essential deviations on the development of the length of the trunk circumference, registering in the spring of 2021 values from 7.0 to 9, 0 cm (tab. 2).

The investigations carried out on the trunk in the fall of 2021 show that the length of the trunk circumference has increased, recording values from 16.0 cm to 18.0 cm in the variants studied.

On the development of the length of the trunk circumference in cherry trees of the Grace Star variety, the secondary technical operations performed on the axis during the formation of the crown influenced. Lower values of the given index were recorded in the case when the axis of the tree was not intervened with any secondary technical operation, the control variant, the variant with a solitary incision above the bud and processing the cut with the growth regulator Progerbalin LG and the circular incision variant at a distance of 25 -30 cm on the axis with the processing of the cut with the growth regulator Progerbalin LG, where the length of the trunk circumference was 16.0 cm on all the variants studied.

In the case of the variant with the staggered extirpation of 4-5 axillary buds from the axis while keeping one bud intact, the studied index recorded average values, constituting 17.0 cm, and in the variant with a solitary incision above the bud

and processing the cut with water, the length of the trunk circumference recorded major values - 18.0 cm.

Table 2

The length of the circumference of the trunk of cherry trees according to the secondary technical operations used to form the crown, cm

Variants	The length of the trunk circumference		Increasing the length of the trunk circumference
	spring of 2021	fall of 2021	
V ₁ (m)	8,0	16,0	8,0
V ₂	7,0	18,0	11,0
V ₃	9,0	16,0	7,0
V ₄	8,0	16,0	8,0
V ₅	8,0	17,0	9,0
LDS 5%	0,36	0,75	-

The increase in the length of the trunk circumference represents the difference between the values recorded at the end of the vegetation period and those obtained in the spring of 2021.

A more essential increase in the length of the trunk circumference on the variants taken in the study was recorded, when the axis of the tree was exposed to the solitary incision above the bud and processing the cut with water - 11.0 cm, and a smaller value (7.0 cm), in variant solitary incision above the bud and processing the cut with the growth regulator Progerbalin LG.

Increasing the length of the trunk circumference in the control variant, in the circular incision variant at a distance of 25-30 cm on the axis with the processing of the cut with the growth regulator Progerbalin LG and the variant with the staggered extirpation of 4-5 axillary buds from the axis with the preservation of an intact bud of recorded average values, constituting 8.0; 8.0 and 9.0 cm respectively.

In cherry culture, in order to impose earlier harvests within the crown, it is recommended to intervene on the axis of the tree with various secondary technical operations to obtain lateral ramifications and which have its contribution to the garnishing of the vegetative macrostructure with the fruiting microstructure.

The investigations undertaken during 2021 show that the number of annual branches, their average and total length have a direct correlation with the secondary technical operations with which the axis of the cherry trees was intervened.

The number of annual branches registered in the crown of trees of the Grace Star variety was influenced by the interventions carried out on the axis of the trees. A greater number of annual branches was recorded in the circular incision variant at a distance of 15-20 cm on the axis with the processing of the cut with the growth regulator Progerbalin LG (25 pcs/tree), and lower values were recorded in the control variant and the variant with the staggered extirpation of 4-5 axillary buds from the axis while keeping one intact bud, constituting 16 pcs/tree on both variants.

In the case of the variant solitary incision above the bud and processing the cut with water and the variant solitary incision above the bud and processing the cut with the growth regulator Progerbalin LG, the index in the study recorded average values, constituting 19.0 and 22.0 pcs/tree, respectively.

The average length of the annual branches is an indicator that shows us how the physiological processes unfold within the crown of the Grace Star cherry trees

during the vegetation period (Babuc et al. 2015). Depending on the secondary technical operation on the axis used to form the crown, we note that higher values of the index in the study were obtained in the variant with the staggered removal of 4-5 axillary buds from the axis while keeping one intact bud (87.0 cm) and the variant solitary incision above the bud and treatment of the cut with the growth regulator Progerbalin LG (86.0 cm).

Then, in descending order, the control variant was placed, without technical interventions on the axis of the tree (78.0 cm), the solitary incision variant above the bud and processing the cut with water (68.0 cm) and the circular incision variant at a distance of 25-30 cm on the axis with the processing of the cut with the growth regulator Progerbalin LG (52.0 cm).

The total length of annual growth in the crown of cherry trees depends on the number of these branches and their average length. The research carried out shows that the total length of annual growth on the studied variants varied from 12.48 to 18.92 m/tree.

Table 3

The average and total length of annual branches in the crown of cherry trees according to the secondary technical operations used to form the crown, cm

Variants	Number of annual branches, pcs/tree	Length of annual branches	
		average, cm	total, m/tree
V ₁ (m)	16	78	12,48
V ₂	19	68	12,92
V ₃	22	86	18,92
V ₄	25	52	13,00
V ₅	16	87	13,92
LDS 5%	0,65	2,37	0,61

Lower values of the total length of the annual growth in the trees of the Grace Star variety were recorded in the control variant (12.48 m/tree), the solitary incision variant above the bud and the water cut treatment (12.92 m/tree) and the circular incision variant at a distance of 25-30 cm on the axis with processing of the cut with the growth regulator Progerbalin LG (13.0 m/tree). Insignificant difference between these variants is also confirmed by the mathematical processing data.

A higher value of the studied index compared to the previous variants was recorded in the variant with the staggered extirpation of 4-5 axillary buds from the axis while keeping one intact bud (13.92/tree).

In the case of the single incision variant above the bud and processing the cut with the growth regulator Progerbalin LG, the index in the study recorded higher values - 18.92 m/tree, or an increase of 51.6% compared to the control variant.

Finally, it can be mentioned that the number of annual branches, their average and total length is correlated with the effectiveness of the secondary technical operations that intervene on the tree's axis to be garnished with lateral branches.

The low degree of cutting during the period of crown formation, including the use of various secondary technical operations, which lead to obtaining a greater number of branches with a horizontal position and early filling with fruiting microstructure, allows to increase the leaf surface and the entry of the trees into the

fruit economic in the narrowest terms.

The branching angle of the branches of any age within the vegetative ensemble plays a special role, because it gives the trees early or late fruiting. When trimming the crown of the trees, beginning fruit growers must use those secondary technical operations, which give the annual growths more horizontal angles of development, especially when they tend to have a plantation with a large cherry culture (Peșteanu A. 2021).

The results listed in table 4 show that the share of branches with different branching angles within the tree axis is different and correlates directly with the secondary technical operations performed within the tree axis.

Table 4

The influence of secondary technical operations on the branching angle of the annual growths located on the axis of the tree of the Grace Star variety, %

Variants	The size of the branching angle		
	< 45 ⁰	45 – 60 ⁰	> 60 ⁰
V ₁ (m)	-	40,0	60,0
V ₂	8,3	33,3	58,4
V ₃	14,3	14,3	71,4
V ₄	11,2	44,4	44,4
V ₅	11,1	33,3	55,6

Annual branches with an angle of less than 450 were not recorded only in the control variant. In the case of the variants where secondary technical operations were performed, the weight of the branches on the axis with an angle smaller than 450 varied from 8.3 to 14.3%.

The share of annual branches formed on the tree axis as a result of various secondary technical operations with the angle between 45-600 varied from 14.3 to 44.4%. A lower value of the index studied in the branches with an angle between 45-600 was recorded in the solitary incision variant above the bud and processing the cut with the growth regulator Progerbalin LG, where it constituted 14.3% of the total number of branches per spindle, and higher in the circular incision variant at a distance of 25-30 cm on the spindle with processing of the cut with the growth regulator Progerbalin LG – 44.4%. Within the other variants, the index under study registered average values.

Studying the weight of the annual branches on the axis with an angle greater than 600, we record higher values in the variant of solitary incision above the bud and the processing of the cut with the growth regulator Progerbalin LG – 71.4%, and lower values in the variant of circular incision at a distance of 25- 30 cm per axis with the processing of the cut with the growth regulator Progerbalin LG - 44.4%. The weight of the branches with the branching angle of the annual growths located on the axis of the tree on the other variants taken in the study recorded average values, between 55.6% in the variant of staggered extirpation of 4-5 axillary buds from the axis with the preservation of an intact bud up to 60.0% in the control variant.

The obtained results show that the branching angle of the annual growths formed on the tree axis can be influenced by the secondary technical operations undertaken within the tree.

The trend in practical fruit growing consists in filling the vegetative macrostructure with a fruitful microstructure as early as possible. Within the cherry trees of the Grace Star variety grafted on the Gisela 6 rootstock, in the second year after planting, the May bouquets from the two-year-old branches and the solitary buds located at the base of the annual branches can be considered as fruiting microstructure.

CONCLUSIONS

The secondary technical operations that intervene on the axis of the tree influence the growth processes, expressed by stimulating the formation of lateral branches and the intensification of the height of the trees, which was in direct correlation with the amount of annual branches obtained in the crown of the trees.

A greater number of annual branches was registered in the variants, when the axis of the trees was intervened by means of the solitary incision above the bud and the processing of the cut with the growth regulator Progerbalin LG and the circular incision at a distance of 25-30 cm on the axis with the processing cuts with the growth regulator Progerbalin LG.

The fruiting microstructure of the Grace Star cherry trees was under the influence of secondary technical operations, which were used to form the vegetative macrostructure, registering a more rational garnishment in the solitary incision variant above the bud and processing the cut with the growth regulator Progerbalin LG.

In the cherry plantations founded on the Gisela 6 rootstock and with a large planting area, in the formation of crowns with small dimensions, in the second year after planting, intervene on the buds on the axis by means of the solitary incision above the bud and processing the cut with the regulator of growth Progerbalin LG or circular incision at a distance of 25-30 cm on the axis with the processing of the cut with the growth regulator Progerbalin LG. This procedure starts when the growth cone of the vegetative bud starts to turn green, with the help of a fine-toothed window to cut the Liberian vessels and 2-3 rings of sapwood, so that the scarring of the cut does not happen immediately.

Increasing the branching capacity of the buds in the area of the incisions made, demonstrated a more beneficial effect when the place exposed to the cut was processed with the growth regulator whose active substance is 1.8% GA4+7+1.8% 6BA, in relation one-part product to 8-10 parts latex paint.

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