

THE CONTRIBUTION OF THE ROUMANIAN RESEARCH CONCERNING THE COLLECTING AND USE OF GERMOPLASM FROM WALNUT TREES

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Abstract. In Romania, due to the poor variety of the rootstock, the walnut tree is grafted by mixing different *Juglans regia* L. saplings. In the County of Gorj, 19 selections corresponding to the main characteristics of the rootstock have been determinate. On these selections, various studies determining their biological nature have been done; fruits have been gathered and used for the experimental reproductions in the sapling nursery. According to the selection criteria, every year, on each biotype, the springing percentage have been counted, together with the medium diameter by package, the medium height, the percentage of STAS saplings obtained, and of thriving in the grafting process using the *Jupînești* type. The results of this analyse done in the sapling nursery have reached to the conclusion that the selection SL-10-TJ has obtained the highest springing percentage (86%). The medium height of the saplings indicates an irregular growth, which varies between 42 cm (SL-1-TP) and 63 cm (EL-7-TJ). As per the diameter by package, it varies between 14.1 mm (SL-1-TJ) and 16.5 mm (SL-18-TJ). The percentage of the springing STAS saplings is between 17% for the selection SL-15-TJ and 78% for the selection SL-6-TJ, and the thriving in the grafting process is high for all the selection, except for SL-9-TJ, with only 55%.

Keywords: *Juglans regia* L., nut tree, grafting

INTRODUCTION

Although the research regarding the collecting and use of germoplasm from walnut tree is rather recent and continuously developing, no country has managed so far to define the most favorable methods for the developing of the nut tree and of its rootstock.

The multiplication of the nut tree has raised a series of technical and economic problems which have led until now to obtaining insufficient quantities of qualitative seeding material [4].

In our country, although the mother plants are confirmed as *Tîrgu Jiu 1*, *Secular* and *Portval*, because of lack of seed tree materials, at present, most of the varieties are being grafted on saplings proceeded from a mixture of genotypes belonging to the species of *Juglans regia* L.

MATERIALS AND METHODS

Using the individual selection on the existing biotypes in the County of Gorj, 19 biotypes, (*Juglans regia* L.) with adequate features have been chosen to be studied.

The biotypes have been codified under the short name the SL (the selection), followed by a number of order and the street short name or the location where they have been identified, ex: SL-1-PT (Petrești), SL-3-TJ (Tîrgu-Jiu).

Beside the research on the phonological, biological and agro - productive features, the selection have been studied also for its "behaviour" in the fields of formation of the sapling nursery.

The sapling nursery was set in autumn with 100 pieces of nut seeds for each selection at a 90 cm distance between each row and 10-12 cm between each nut tree, placed in rather deep ditches, in the fruit-growing research station in Rîmnicu - Vîlcea.

The *Jupînești* sort was used as biological material.

Before beginning the proper grafting, the healthy, well developed mother plants between 1 and 2 years old, with an unharmed radicular system and a thickness at the grafting point of 8-20 mm, have been exposed to a process of performing for 10-15 days [1, 6].

At the same time, the grafting cuttings – one year old, healthy, of 50-80 cm length branches, with short (5-6 cm) internodes, round as section and with reduced marrow, underwent the same process of preforcing for only 3-4 days.

The preforcing was performed in a room covered with sawdust, at a temperature of 26-28 °C, with a relative moisture content of the air of 80-90% and aimed at reactivating the linking tissues.

The grafted material was bedded in boxes filled with sawdust and it was maintained at a temperature of 26-28°C for 10-15 days until the grafting point transformed into a callus.

The stimulation of the callus-development was done by means of heat – only at the grafting point : hot callusing- due to a special instalation.

Subsequent to the forcing period, the grafted and callused material was kept in cool rooms, at the temperature of 1-4°C until the risk of late white-frost passed and one could plant in Field I (C I) of the nurse.

RESULTS

In the sapling nursery, based on a 3 years average and according to the results presented in Table 1, the medium springing percentage of the nut trees includes 19 % at SL-18-TJ and 86 % at SL-10-TJ.

The biometrical measurements showed, at the end of the first year of vegetation, the medium diameter of the saplings (measured above the collet: 3-5 cm) and more than 8 mm for all selections (Table 2). In this situation the elites SL-3-TJ and SL-10-TJ distinguish themselves with a diameter of 11.9 mm, respectively 8.1 mm.

Table 1. The behaviour of certain nut tree elites selected as mother plants in the nut tree nursery (taken in 3 years time)

No.	Selection (hybrid)	The number of sprung saplings			Average	The springing percentage (%)			Average
		1 st year	2 nd year	3 rd year		1 st year	2 nd year	3 rd year	
1	SL-1-PT	58	26	25	36	58	32	25	38
2	SL-2-PT	67	47	40	51	67	47	40	42
3	SL-3-TJ	37	77	53	56	17	77	53	49
4	SL-4-TJ	61	64	60	62	61	71	60	64
5	SL-5-TJ	53	83	61	66	53	83	61	66
6	SL-6-TJ	46	78	56	60	46	78	56	60
7	SL-7-TJ	53	67	71	66	53	67	71	66
8	SL-8-TJ	13	15	20	16	13	50	20	27
9	SL-9-TJ	48	45	41	46	48	64	41	51
10	SL-10-TJ	63	82	74	73	90	83	85	86
11	SL-11-TJ	20	53	43	36	20	73	43	45
12	SL-12-TJ	28	19	33	26	28	30	33	30
13	SL-13-TJ	35	27	38	33	35	54	38	42
14	SL-14-TJ	19	49	22	30	19	49	22	30
15	SL-15-TJ	29	59	49	46	29	59	49	46
16	SL-16-TJ	32	40	44	56	32	67	44	47
17	SL-17-TJ	35	75	54	56	35	75	54	56
18	SL-18-TJ	16	42	27	28	16	16	27	19
19	SL-19-TJ	52	55	60	56	52	61	60	57

Table 2. The growing features in thickness and length of the selected nut tree elites in the nursery

No.	Selection (hybrid)	The collets diameter (mm)		The height of the saplings (cm)		The medium diameter of the grafting (mm)	The medium length of the grafting (cm)
		1 st year	2 nd year	1 st year	2 nd year		
1	SL-1-PT	8.7	20.4	14	70	14.5	42.0
2	SL-2-PT	10.5	20.6	14	101	15.5	57.5
3	SL-3-TJ	11.9	28.6	13	109	15.7	61.0
4	SL-4-TJ	8.7	21.9	15	91	15.3	53.0
5	SL-5-TJ	8.2	20.1	10	90	14.1	50.0
6	SL-6-TJ	9.0	24.1	14	104	15.5	59.0
7	SL-7-TJ	9.5	24.0	14	112	15.7	63.0
8	SL-8-TJ	10.4	23.4	18	86	14.9	52.0
9	SL-9-TJ	9.0	23.2	14	92	14.6	53.0
10	SL-10-TJ	8.1	21.7	12	92	14.9	52.0
11	SL-11-TJ	10.8	20.7	16	86	15.7	51.0
12	SL-12-TJ	10.6	23.0	14	93	15.8	53.5
13	SL-13-TJ	9.7	20.7	14	80	14.7	47.0
14	SL-14-TJ	9.7	20.3	13	84	14.0	55.0
15	SL-15-TJ	9.6	22.4	12	98	15.5	55.0
16	SL-16-TJ	8.7	21.5	13	95	15.1	54.0
17	SL-17-TJ	11.8	21.2	15	85	15.5	50.0
18	SL-18-TJ	10.5	23.5	18	82	16.5	50.0
19	SL-19-TJ	8.8	19.1	13	77	14.2	45.0

By analysing the data in Table 3 the percentage of STAS saplings registers wide variations: SL-6-TJ, SL-8-TJ, SL-16-TJ, SL-9-TJ, SL-14-TJ, SL-5-TJ, SL-17-TJ distinguish themselves with 78%, 76%, 74%, 68%, 64% respectively 62%, while for the elites SL-15-TJ, SL-13-TJ, SL-3-TJ and SL-18-TJ it is under 40% (Fig. 1).

The *Jupîneşti* sort used for the grafting produced its first fruit (1-2 fruit / tree) right in Field II of the nursery (Fig. 2).

DISCUSSIONS

By comparing the medium calculated data, we notice the highest amount of nut tree sapling at elites SL-2-PT, SL-5-TJ in the first and the second year and the lowest amount at elites SL-8-TJ, SL-12-TJ, SL-14-

PT, in the first and the third year. The elite SL-4-TJ distinguishes itself for its constancy of the springing percentage- between 60 and 70 % each year (Table 1).

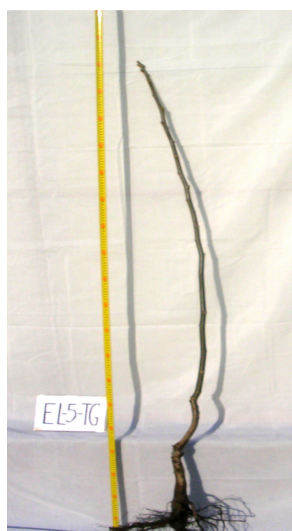
The biometrical measurements showed, at the end of the first year of vegetation, the medium diameter of the saplings (measured above the collet: 3-5 cm) and more than 8 mm for all selections (Table 2).

The height of the saplings also registered at the end of the vegetation period, is a studied element in the sapling nursery, oscillating between 18 cm at SL-8-TJ, SL-18-TJ and 10 at SL-5-TJ.

At the end of the second year of vegetation, by analysing the behaviour in the sapling nursery, one could register small coefficients of variation concerning the diameter of the plants (all over 19 mm) and the height varies from 70 cm (SL-1-PT) and 112 cm (SL-7-TJ).

Table 3. The behaviour of the selected elites in the grafting process

No.	Selection (hybrid)	Number of saplings	Number of STAS saplings for the grafting process	STAS sapling percentage (%)	Number of thriven sapling after the engrafting	Percentage (%) of thriving in the grafting process
1	SL-1-PT	58	32	55	25	78
2	SL-2-PT	67	29	43	22	76
3	SL-3-TJ	37	14	37	10	71
4	SL-4-TJ	61	36	59	24	67
5	SL-5-TJ	53	34	64	30	88
6	SL-6-TJ	46	36	78	33	92
7	SL-7-TJ	53	28	48	24	86
8	SL-8-TJ	13	10	76	9	90
9	SL-9-TJ	48	33	68	18	55
10	SL-10-TJ	63	32	50	26	81
11	SL-11-TJ	20	12	60	18	90
12	SL-12-TJ	28	14	50	13	93
13	SL-13-TJ	35	12	34	8	67
14	SL-14-TJ	19	13	68	11	84
15	SL-15-TJ	29	5	17	4	80
16	SL-16-TJ	32	26	74	24	85
17	SL-17-TJ	35	22	62	20	90
18	SL-18-TJ	16	5	31	4	80
19	SL-19-TJ	52	25	48	20	80

**Figure 1.** Jupînesti /J. regia L. – Field I**Figure 2.** Jupînesti /J. regia L. – Field II

The percentage concerning the grafting is only 55 % for elite SL-9-TG, the others with more than 80 %, the highest is to be registered for SL-5-TJ, SL-14-PT, SL-11-TJ, etc (Table 3).

As a result of analyzing the information registered in Table 2, at the end of the vegetation period in Field I, we observe that the sapling dimensions are above the minimal limits of the STAS (in 8 mm in diameter and 10 cm high) for elites SL-17-TJ, SL-4-TJ, etc.

In other respects, the damages cause by the low temperatures in the winter time from the end of the vegetation untill its taking again were insignificant and appeared in the apical part of the grafting, its lower part remaining unaffected on a part of 10-12 cm.

Similar studies of using some after species of *Juglans* as rootstock have seen made in France on *Juglans nigra*, and in the U.S.A. on *Juglans hindsii* [5, 8]. In the U.S.A., out of the intrespecific hybrids obtained on the nut tree we point out the *Paradox* and *Royal*. They present a good compatibility with the common nut tree *Juglans regia* L., but they have a bigger height.

Nut selections have been used in Greece as well, having as a results 7 of them valuable genotypes [7]. In Iran, also the first selection phase started in 1982 [2], when the identification collection and planting of the selected genotypes took places.

A serios selection activity took place in Rîmnicu Vâlcea, Romania in orden to obtain some valuable samples for both fruit and rootstock adjusted to the subcarpatian area.

A walnut cultivar study started in 1995 at Fruit Growing Research-Extension Station (SCDP Vâlcea) by M. Botu, Gh.Achim and I.Botu [3]. The aims of this study together with the breeding program are to introduce cultivars and valuable selections for walnut culture in the Oltenia region and even for the entire Romania. The observations referring to the flowering phenology, the growth behavior, occurrence of diseases and CLRV status, precocity of producing first fruits, etc.

Researches regarding the selection of some nut tree hybrids in order to obtain generative mother plants, proved that:

- in the sapling nursery, the highest springing percentage has been recorded for the selection SL-10-TJ (86%), and the lowest for the selection SL-18-TJ (19%); for the rest of the selections, only four have exceeded the admissible limit of 60% (Table 1)

- the biometrics measurements of the height shown an important irregularity of the size growth which is situated between 42 cm (SL-1PT) and 63 cm (EL-7-TJ), (Table 2). For the diameter of the package the figures are between 14-16 mm.

- at the end of the second year of vegetation, the saplings used for grafting have to have a diameter above 18 mm. All the selections reached this size, but analysing by comparison the data obtained (height and diameter) for the STAS saplings, the figures are between 17% for SL-15-TJ and 78% for SL-6-TJ (Table 3).

- the percentage of thriving in the grafting process has high values for all the selections, except the SL-9-

TJ (55%); the highest value being for the SL-12-TJ (93%) followed by SL-6-TJ with 92% and SL-17-TJ, SL-11-TJ and SL-8-TJ with 90% (Table 3).

Acknowledgements. The seeding material represents the most important element which contributes to the expansion of the plant growing in modern fruit growing exploitations. As research have shown up to the present, *Juglans regia* L. is for the moment the only rootstock likely to be used for taking care of some commercial plantations. Studies concerning that matter shall continue.

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