

PARTIAL RESULTS REGARDING THE SELECTION OF SOME NUT TREE HYBRIDS IN ORDER TO OBTAIN GENERATIVE MOTHER PLANTS

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Abstract. In Romania, the establishment of nut tree plantations is continuously expanding, yet the seeding material production has never raised up to the level of cultivators requirements.

In our country, although the mother plants are confirmed as Targu Jiu 1, Secular and recently 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*.

By studying the rich stock of germoplasma, present in the district of Gorj, 20 hybrids, that have appropriate features to their formation as mother plants have been collected, so that they might improve the existing variety.

Keywords: *Juglans regia*, *Juglans nigra*, nut tree, graftid

INTRODUCTION

The development of modern fruit growing cannot be understood without a hard study of mother plants, because they greatly influence the degree of productivity of the varieties the constant of fruit bearing, which is a quality of fruit, the longevity of trees as well as their relationship the environment they live in.

The majority of nut tree cultivating countries have reached to the conclusion that multiplying the nut tree by intensive plantations for this species. The improvement of nut tree grafting technique has raised the problem of using genuine mother trees.

Although research regarding this very subject is rather recent and continuously developing, in no country have they precisely established the best mother tree for each variety nor did they establish the most favorable areas for each mother tree.

MATERIALS AND METHODS

Research was carried out during the period 2003-2007 under the pedoclimatic conditions of the subcarpatian area of Oltenia, in the nearby of Targu Jiu, and the material used in the selection papers was proceeded from both the spontaneous and cultivated flora.

The selection phases hint to identify the initial material both the individual and mass selection as well as the study on saplings and mother trees schools.

Via individual selection, have they collected 20 natural hybrids belonging to the species of *Juglans regia* and *Juglans nigra*, appropriate to the study conditions.

The biotypes have been codified under the short name the EL (the hybrid), followed by a number of order and the street short name or the location where they have been identified.

Observations and measurements were carried out over these selections, concerning: the main phenological phases of both generative and vegetative organs; observations over the mother plant size, consisting in the surface of the trunk selection, the diameter of the wreath; calculations over the physical

and technological features over the fruit and the agro productive features (weight, color, shape index, carpelar welding, % of the core).

RESULTS AND DISCUSSIONS

Since of hybrids under study are different in age or growing conditions, the analysis of the obtained results is going to aim at pointing out to the main features and characters concerning the biotypes.

The referential stages from phenological point of view for the selected hybrids, are spreading in vegetation, blooming and harvesting maturity.

The burgeoning has been observed as occurring in the second part of March, this being the earliest time, on the 21.03 at EL-8-TJ and on the latest time on 06.04 for EL-15-TJ. The earliest date of the blossom of the female flowers occurred on 14.04 at EL-2-PT, and the end of the blossom on 10.05 (EL-7-TJ, EL-16-TJ and EL-20-JN). The blossom period of the male flowers takes place between 16.03 at EL-12.05. Dichogamy is a usual phenomenon that often appears as well as on the nut tree and on the studied selections and the report between the protogine plants and the protender ones is almost equal. At all the selected elites the fructification type is terminal, more than half of them, having the protogine type of blossom (**Table 1**).

In the ecological area of Gorj County, where are seldom registered minimum values under -20 °C, the negative effects upon the trees is due to the big amplitude of the temperatures, because of the temperature differences between day and night.

The resistance of the trees at frost can be appreciated according to the presence or the absence of the wounds on the trunks and branches or by the absence or presence of dry young branches. From the 20 selections, half of them present resistance at frost during winter, among them is also mentioned the Nigra *Juglans* elite, six of them have medium resistance, (EL-6-TJ, EL-13-TJ) that is they are weakly benumbed on the top of the branches that are one year old, and only four of them are sensitive (EL-8-TJ, EL-9-TJ, EL-12-TJ and EL-18-TJ), being affected the wood one year old and only a little the one of 2-3 years old.

Table 1. The Main Phenological Phase of the Vegetative and Generative Organs

Number	Selection (hybrid)	Burgeoning	Date of blossoming				Dichogamy	The sweeping era of the fruits
			Male Flowers		Female Flowers			
			The beginning of the blossoming	The fall of the amentum	The appearance of stigmas	The end of blossoming		
1	EL-1-PT	28.03	24.04	08.05	16.04	26.04	Protogine	IX/2
2	EL-2PT	26.03	20.04	03.05	14.04	23.04	Protogine	IX/2
3	EL-3-TJ	28.03	16.04	01.05	18.04	05.05	Protender	IX/3
4	EL-4-TJ	01.04	19.04	28.04	26.04	08.05	Protender	X/1
5	EL-5-TJ	01.04	28.04	12.05	30.04	08.05	Protender	X/1
6	EL-6-TJ	28.03	19.04	28.04	21.04	03.05	Protender	IX/3
7	EL-7-TJ	23.03	28.04	12.05	23.04	10.05	Protogine	IX/2
8	EL-8-TJ	21.03	23.04	08.05	19.04	03.05	Protogine	IX/3
9	EL-9-TJ	23.03	19.04	03.05	19.04	29.04	Protender	IX/2-3
10	EL-10-TJ	27.03	16.04	30.04	21.04	03.05	Protender	X/1
11	EL-11-TJ	02.04	24.04	08.05	19.04	05.05	Protogine	IX/3
12	EL-12-TJ	30.03	28.04	10.05	21.04	03.05	Protogine	IX/3
13	EL-13-TJ	28.03	28.04	12.05	23.04	06.05	Protogine	X/2
14	EL-14-PT	30.03	24.04	07.05	19.04	03.05	Protender Protender	X/1
15	EL-15-TJ	06.04	19.04	03.05	26.04	08.04	Protender	X/1-2
16	EL-16-TJ	03.04	21.04	05.05	28.04	10.05	Protender	IX/3
17	EL-17-TJ	25.03	19.04	03.05	21.04	03.05	Protogine	IX/3-X/1
18	EL-18-TJ	30.03	24.04	08.05	23.04	03.05	Protogine	IX/3-X/1
19	EL-19-TJ	02.04	19.04	04.05	19.04	30.04	Protogine	X/1
20	EL-20-JN	30.03	19.04	12.05	22.04	10.05	Protogine	X/2-3

They have a good behaviour to the main diseases, *Xanthomonas juglandis* (bacteriosis) and *Gnomonia leptostyla* (anthracnose). The manifestation intensity of the diseases is in a close connection with the climatic conditions of the respective year, thus in the case of anthracnose, its manifestation is sporadic, but in case of bacteriosis the development of this disease was permitted due to climatic conditions at 50% from the studied trees.

The fruits size is a determinative element for the mother plant. Having been realized through the calculation of the size index, the fruits size represented values extended from 20.7 mm (EL-12-TJ) to 31.9 mm (EL-9-TJ).

All the selections have an equatorial diameter that doesn't outrun 29 mm; eight of the elites have fruits with a diameter that outruns 26 mm, thus they can be put in the class of nuts for consumption, if by any chance their final assessment doesn't allow their use as seed trees for mother plant. More than half of the selections present an unitary form of the fruits, namely spheroidal one (round), this resulting from the index value, such as (I_F), extended from 98 mm to 107 mm. The *Nigra juglans* fruits are ellipsoidal and ovoid, a little flattened and rather broad than long with the index value of 127.9 mm.

Concerning the medium weight of the fruits, it has been obtained a variability large enough from 4.4 gr at EL-12-TJ and 10,8 gr at EL-14-TJ, still six of the selections have the weight under 6 gr, for example EL-

7-TJ (5.7 gr), EL-8-TJ (4.8 gr), the rest have values from 6-10 gr. The *Nigra juglans* fruits have a medium weight of 14 grams.

The variation coefficient (s%) was also different. The selections EL-4-TJ (7.1 gr) and EL-11-TJ (6.2 gr) present the variation coefficient of the weight of fruits, the smaller one of 4,6 %, respectively 5,6 %.(Tab. No. 2, gr. 1).None of the selections present high values of the variation coefficient, that means nuts are more or less uniform having a small or a middle variation coefficient.

The content of the fruits in the kernel is a characteristic of great importance for the fruits quality but also for the profitableness of a nut tree plantation.

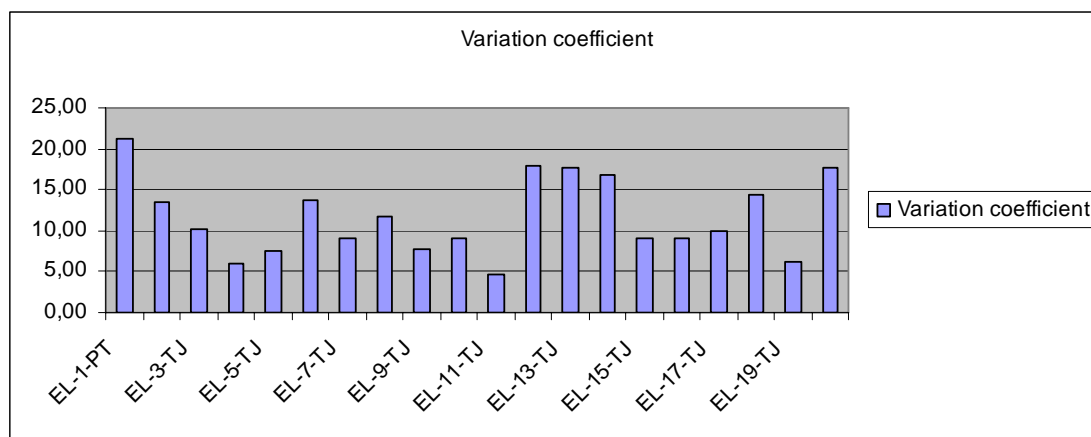
In order to obtain a mother plant, from this point of view is recommended that the percentage in the kernel outrun 40% of the fruit weight, may also be accepted biotypes with a lower percentage of kernel, because they may be interesting for other characteristics, such as: productivity, lateness, resistance at frost, etc.

For the studied plants we can not speak about a comparative characterization of the main features of growth and increase, as they are different from the point of view of age, place and growing up conditions.

The strength of the mother plant may influence the productivity and the longevity of the trees; it has a dominant character and is learned at the plants with a mother role, given with precision by the surface of the trunk section, the crown size and the height of the trees.

Table 2. The Main Physical Features of the Fruits on the Selected Elites

Number	Selection (hybrid)	Fruits size		Index of shape If (mm)	Fruits shape	Fruits weight		
		Size Index Im (mm)	Equatorial diameter (mm)			Medium weight (g)	Standard exception (s)	Variation coefficient (s%)
1	EL-1-PT	28.1	28.4	104.3	Spheroidal	8.1	1.70	21,3
2	EL-2PT	24.6	24.7	98.	Spheroidal	8.5	1.15	13,4
3	EL-3-TJ	26.8	26.9	104.1	Spheroidal	6.3	0.64	10,2
4	EL-4-TJ	27.4	25.7	119.0	Ovoid long	7.1	0.41	5,9
5	EL-5-TJ	27.2	24.9	116.2	Ovoid	7.6	0.57	7,6
6	EL-6-TJ	27.6	25.3	107.0	Spheroidal	6.8	0.94	13,8
7	EL-7-TJ	25.5	24.1	111.6	Ovoid	5.7	0.54	9,1
8	EL-8-TJ	24.6	23.3	111.8	Ellipsoidal	4.8	0.55	11,7
9	EL-9-TJ	31.6	28.1	121.8	Ovoid-long	8.1	0.63	7,7
10	EL-10-TJ	26.3	26.0	111.7	Ovoid	6.1	0.56	9,1
11	EL-11-TJ	27.0	26.2	110.0	Ovoid	6.2	0.29	4,6
12	EL-12-TJ	20.7	20.9	98.1	Spheroidal	4.4	0.68	18,0
13	EL-13-TJ	28.8	25.5	115.2	Ovoid	5.3	2.5	17,8
14	EL-14-PT	28.7	28.6	106.3	Spheroidal	10.8	1.78	16,9
15	EL-15-TJ	27.6	26.3	106.0	Spheroidal	6.5	0.58	9,0
16	EL-16-TJ	26.9	24.9	102.3	Spheroidal	8.8	0.76	9,0
17	EL-17-TJ	25.3	25.3	103.2	Spheroidal	5.6	0.55	9,9
18	EL-18-TJ	23.2	23.0	98.5	Spheroidal	4.6	0.60	14,3
19	EL-19-TJ	28.7	27.2	105.2	Spheroidal	8.2	0.51	6,2
20	EL-20-JN	28.8	25.5	127.9	Ellipsoidal	14.0	2.2	17,8



Graph 1. The Variation value of the fruits weight

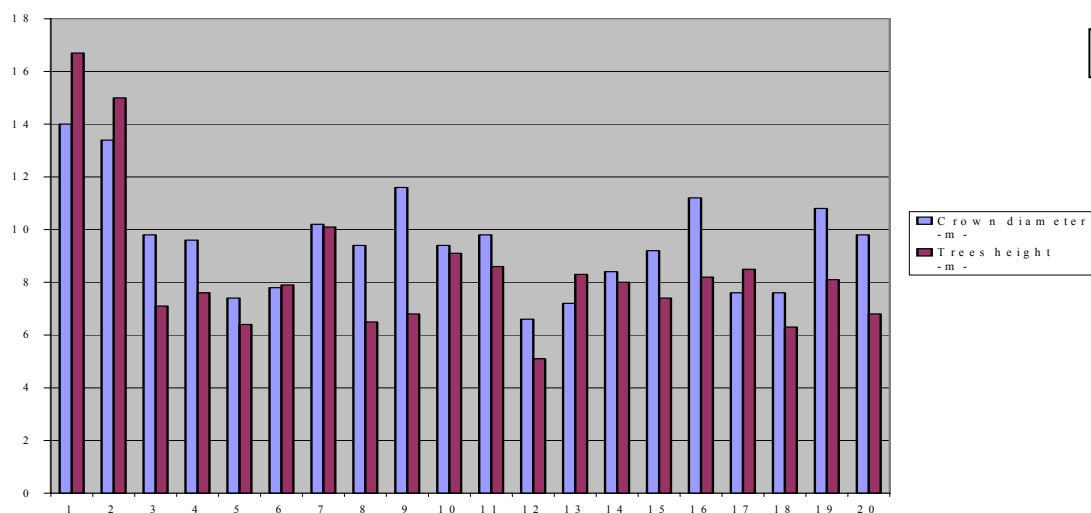
The surface of the trunk section (the same crop conditions and the same age) oscillates from 876.7 cm² at EL-7-TJ and 240 cm² to EL-18-TJ, respectively 240.4 cm² la EL-12-TJ. The volume of the crown is extended from 742.3 m³ at EL-7-TJ and 131.1 m³ at EL-12-TJ. (Table 3, gr. 2).

The two 40 year's old selections present differences between the two characters, such as: EL-1-PT has the surface of the trunk section of 2289.0 cm³ and the

volume of the crown of 2065.4 m³. The height of the trees has values from 5.1 m at EL-12-TJ and 16.7m EL-1-PT. At the studied plants the growing-up strength was determined by taking into consideration the above mentioned characters and differs in high strength EL-1-PT, EL-2-PT, EL-7-TJ, EL-17-TJ middle strength, EL-11-TJ, EL-3-TJ, and low strength EL-5-TJ, EL-12-TJ, EL-18-T.

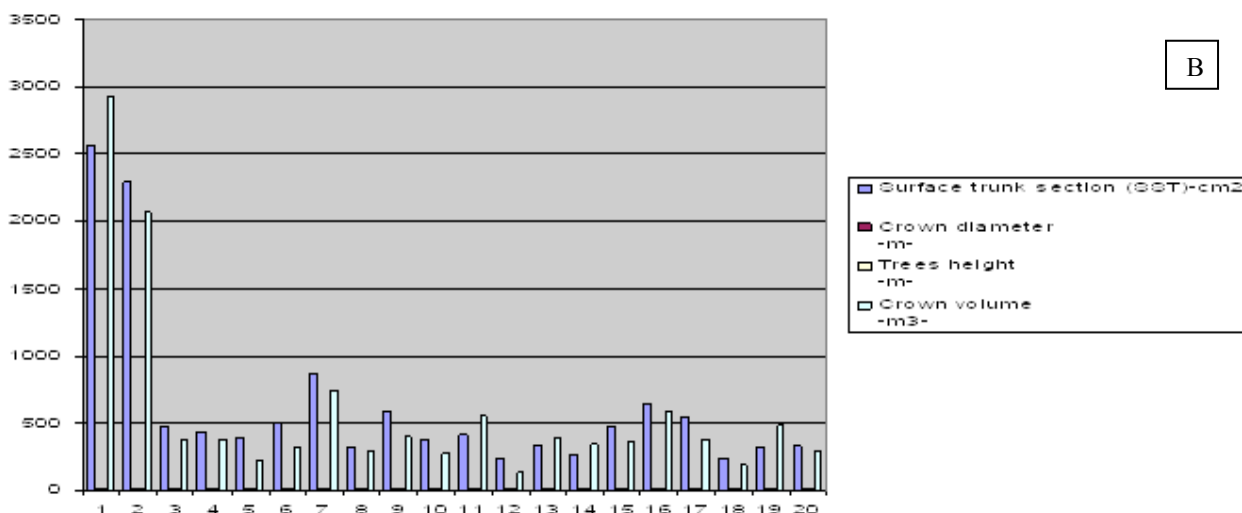
Table 3. The Main Growing –Up Characteristics of the Selected Nut Elites

Number	Selection (hybrid)	Age (years)	Surface of the trunk section (SST)-cm ²	Diameter of the wreath -m-	Trees height -m-	The volume of the wreath -m ³ -	Strength	Conduct
1	EL-1-PT	40	2568,3	14,0	16,7	2920,2	Big	Semi-erect
2	EL-2PT	40	2289,0	13,4	15,0	2065,4	Big	Semi-erect
3	EL-3-TJ	26	471,9	9,8	7,1	385,8	Middle	Erect
4	EL-4-TJ	26	435,7	9,6	7,6	376,3	Middle	Spread
5	EL-5-TJ	26	389,7	7,4	6,4	222,3	Small	Spread
6	EL-6-TJ	26	508,8	7,8	7,9	317,3	Middle	Spread
7	EL-7-TJ	26	876,7	10,2	10,1	742,3	Big	Erect
8	EL-8-TJ	26	315,8	9,4	6,5	292,8	Small	Semi-erect
9	EL-9-TJ	26	586,7	11,6	6,8	394,8	Middle	Spread
10	EL-10-TJ	26	378,5	9,4	9,1	269,7	Small	Spread
11	EL-11-TJ	26	412,4	9,8	8,6	552,6	Middle	Semi-erect
12	EL-12-TJ	26	240,4	6,6	5,1	131,1	Small	Erect
13	EL-13-TJ	26	336,3	7,2	8,3	391,1	Middle	Semi-erect
14	EL-14-PT	14	267,5	8,4	8,0	342,9	Middle	Erect
15	EL-15-TJ	26	471,9	9,2	7,4	356,7	Middle	Spread
16	EL-16-TJ	26	644,8	11,2	8,2	586,0	Big	Spread
17	EL-17-TJ	26	534,7	7,6	8,5	374,4	Big	Erect
18	EL-18-TJ	26	240,0	7,6	6,3	187,6	Small	Spread
19	EL-19-TJ	26	319,0	10,8	8,1	486,6	Middle	Erect
20	EL-20-JN	26	326,0	9,8	6,8	285,1	Small	Spread



Graph 2. Characteristics of the growth of the selected nut hybrids

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CONCLUSIONS

- In the environment fruit-growing area of Gorj County, there are lots of biotypes that may represent a special agro biological significance, adequate to the demands of becoming a good mother-plant.
- For the selected hybrids, the referential stages from the phenological point of view are: the increase of vegetation, the blossom and the harvest maturity.
- The burgeoning has been observed as occurring in the second part of March, this being the earliest time, on the 21.03 at EL-8-TJ and on the latest time on 06.04 at EL-15-TJ. The dichogamy phenomenon occurs, half of the selections are protogines, and the fructification type is terminal for all the selections.
- There is a good behavior to diseases in the case of anthracnose, its manifestation is sporadic on the elites EL-5-TJ, EL-6-TJ, EL-9-TJ, EL-18-TJ, in case of bacteriosis the development of this disease was permitted due to climatic conditions at 50% from the studied trees.
- The index size of the fruits presents values from 20,7 mm at EL-12-TJ and 31.9 mm at EL-9-TJ, more than half of the fruits have a more or less unitary shape, round with an index such as 98 mm at EL-2-PT and 107 mm at EL-6-TJ. The growth of the fruits varies from 4.4 gr at EL-2-tg and 10.8 gr at EL-14-TJ, and the kernel percentage is close or outruns the value of 50%, for example EL-11-TJ, EL-1-PT.
- The studied selections are classified, concerning the strength of the trees, into three different groups: high strength EL-1-PT, EL-2-PT, EL-7-TJ, EL-17-TJ middle strength, EL-11-TJ, EL-3-TJ, and small strength EL-5-TJ, EL-12-TJ, EL-18-TJ.

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