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Selection of the chance seedlings of 'Mézes körte' (*Pyrus communis* L.) from the gene bank of Keszthely

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Summary: We have concluded the selection tests of the 'Mézes körte' seedlings planted in the spring of 2006, with special emphasis on the cotyledonary, foliage leaf and the height of plant. Out of the 75 seeds planted in rows, there were 40–45 pieces growing out, so during the first cotyledonary test we had to calculate with almost 40% decay. On 12th April 2006, we recorded some of the important characteristics of the seedlings in their cotyledonary stage which characteristics were important from the point of view of selection (cotyledonary form, cotyledonary length, cotyledonary thickness, cotyledonary colour, cotyledonary petiole length, cotyledonary petiole thickness, cotyledonary petiole colour). The above morphological characteristics are shown in Table No. 1–6. We have also tested the seedling in foliage leaf state, paying special attention on the development stage of the plants (colour of foliage leaf , height of plant). We have completed statistical calculations of the two above mentioned characteristics. The result of that is summarised in Table No. 8–9. The variation coefficient show smaller value in the case of the foliage leaf number (15–32%), while the wider range of spread of the data referring to the height of the plant is shown by the 33–61% CV values. On charts No 4–9. we present the relationship between the height of the plant and the number of foliage leaf, as well as the differences between the two graphs. Based on the above charts and graphs it can be defined that the 40% destruction of the developing seedlings during the period till the next measurement reached 70-80% level. In spite of this however some seedlings showed strong and balanced growth (A_{44}, B_{42}, C_{25}, D_{16}, E_5, E_{39}, F_{38}), the further testing and selection of those is to be completed in the future.

Key words: pear, fruit quality, internal contents, vegetative expansion, selection of varieties, development of varieties

Introduction

Lippay (1664) was the first who gave a report on 'Mézes körte'. Regarding the fact that the characteristics of the two 'Mézes körte' trees stored in the gene bank of Keszthely have common characteristics with that of those mentioned by Lippay, we have not been able to find any further data up to now. It is possible that the different varieties of a class that used to be of great importance were called at this identical name. The variety populated in Keszthely was collected by Apostol from the settlement of Szentlőrinc in 1980. We have carried out examinations on the above named variety regarding its vegetative and generative characteristics since 1990. The reproduction of the variety in Mosonmagyaróvár took lace in the summer of 2000 on BA 29 (Provance) stock. Our objective was to monitor the stamina of growth of the breed as well as to evaluate the generative features and the examination of the nutrition content. It was also an objective to do a selection of seedlings of the freely grown varieties with excellent unique characteristics as well. The first one to be evaluated was the 'Mézes körte' variety. We have initiated these plant improvement embedded into experiments since the better utilisation of the agro ecological potential, the environment friendly technologies and the wide range of use of eco-production require the introduction of such pear varieties that have biotic and abiotic resistance that would also reduce the production costs. The 'Mézes körte', the 'Mosoly körte' and the 'Mogyoródi óriás' are recommended for the plant-breeders since they showed excellent nutrition value during our examinations so this way they are able to improve the selection of acknowledged breeds in production, for industrial use. The above breeds can be found both in the Keszthely and in the Mosonmagyaróvár practising garden and their monitoring is going on continuously. We have put an emphasis on the tests of the 'Mézes körte', however we also would like to involve other breeds in our examinations.

The characteristics of the 'Mézes körte'

In the pear gene bank in Keszthely we defined the features of co-blooming of the 'Mézes körte': the least co-blooming habitude was shown with 'Árpával érő' and 'Korai szagos körte', there was medium co-blooming habitude shown with 'Lőrinc kobak' and 'Magyar kobak' varieties, while the closest co-blooming habitude (80%) was shown with 'Köcsög körte' and 'Mosoly körte' with regards to the

'Mézes körte'. Taking into consideration of the average of the years by the 'Mézes körte' the strength of the blooming was medium (*Kocsisné Molnár*, 2006; *Okályi, & Maliga*, 1956). The experiments on the blooming of 'Mézes körte' stored in the gene bank of Keszthely, showed the following results based on the data having collected for 11 years. The number of shallow seeds by carpels is 0,39; the number of full seeds by carpels is 1,64; the average blooming strengths is 0,86; the average fertility is 8,15; the beginning of the blooming was on the 103,60 day of the year; the duration of blooming is 9,80; the number of flowers per inflorescence is 7,00 (*Kocsisné Molnár*, 2006). Examining the formation of the productive forms, as mentioned by literature (*Nyéki*, 1976) it was the fruit spur that occurred the most frequently (years 2002-2003), in the time of becoming productive, while the appearance of the productive bogs was seen from the year 2003. The relative ripening sequence of the possible breed was defined in relation to the breed named 'Árpával érő', which breed was in full ripening on average on the 16th July. In comparison to that breed the 'Mézes körte' was ripen 33,4 days later. The surface of 'Mézes körte' during the processing of the fruit is similar to that of those breeds, the colour of fruit jacket shows red colours. The jacket of the breed is hard, hard to chew, the sarcocarp is lightly juicy, scent is not significant, and its taste is middle-strong, strong. The breed has big and proportional core, the shape of the core is spindle-shaped or roundish. The most important parameters of the fruit are the following: length 42,30 mm, width 37,90 mm, neck 5,50 mm, the index of the shape 0,89, the index of the neck 0,13, the shape is pear shape (5/6), the weight is 31,00 grams. According to the most important nutritional value tests of the 'Mézes körte' the anhydrous material content with the 16,2%, was almost identical to that of the control 'Vilmos körte' defined value (16,1%). Outstanding total acid content was shown by the 'Mézes körte' (0,328%), the 'Fehérvári körte' (0,30%), the 'Zöld Magdolna' (0,285%) and the 'Mosoly körte' (0,283%), which results in comparison to the control 'Vilmos' variety (0,27%) were higher. Of all the examined breeds the pectin content of 'Árpával érő' (0,255%), the 'Magyar kobak' (0,248%) and the 'Mézes körte' (0,26%) were lower than that of the control variety, the 'Vilmos' with 0,33%. All the examined breeds, except for the 'Mogyoródi óriás', exceeded the average values of all the varieties, as well as the Vitamin C value of the control 'Vilmos' which vitamin C content was 6,20 mg/100g value. The highest vitamin C content was found in the 'Árpával érő' (8,83 mg/100g), the 'Fehérvári körte' (8,34 mg/100g) and the 'Mézes körte' (7,84 mg/100g) varieties. During the measurement of fructose content the following results were obtained: 'Mosoly körte' (9,6%), 'Mézes körte' (8,1%) 'Fehérvári körte' (6,8). The control 'Vilmos körte' showed lower percentage value (5,10%) (*Iváncsics*, 2004).

Material and methods

We have started the above mentioned experiments in the pear gene bank of Keszthely, then the given varieties were taken to the practise garden of Faculty of Horticulture in Mosonmagyaróvár, where they were reproduced on BA 29 (Provance) stock and we could do other observations. In the plantation the trees have slender spindle-shaped ramage, the distance of rows is 3,5 m, the distance of stools is 0,9 m. We paid special attention on two 'Mézes körte' trees, we gather in the fruit when overriped (2005.08.28-2005.09.05.). We counted the number of seeds collected of the fruit, we separated the shallow seeds and took a record of the size of fruit in line with their width and length. Following the drying of seeds we stratificated them by *Hrotkó* (1999), then taking them out of the pit in spring (2006. 04. 04.) we planted them in the seedling nursery (*Figure 1*).

Figure 1. The advancement of the sprouts when taken out of the pit by the 'Mézes körte' seedlings (Mosonmagyaróvár, 2006. April 04th.)

The recording of the morphological characteristics were completed in line with the methodological description of *Okályi & Maliga* (1956). The selection was completed in several steps. The selection started with the germinative plants, taking onto consideration the shape of cotyledonary as well as its size, thickness, colour and the cotyledonary neck length, thickness and color; the thicker, fattish húsos, vastag cotyledonous seedlings are more valuebale when one of the parents is a primitve breed. It is important that the neck of cotyledonary should be rather short. During the further selectios the best seedlings appeared with their strong structure, big foliage, thick and short leaf-stalk, strong tip of their sprit. The formation of the edge of the leaf was also an important mark, which was the strongly notched eged of leaf. Out of the recorded data we defined the average values, the spread and variational coefficient by *Sváb* (1973), furthermore we prepared charts, tables, diagrams with the use of Microsoft Office Excel 2003 and Microsoft Office Word 2003 programs.

Results and discussion

Cotyledonary analysis

According to Okályi & Maliga (1956) the shape, size, thickness and colour of the cotyledonary, as well as the length, thickness and colour of the neck of cotyledonary has

outstanding importance as morphological mark, which had also been analysed by us (*Figure 2*). The *Tables 1–6* below represent the morphological marks of the cotyledonous stage seedlings planted in rows.

Figure 2. The hatched seedlings in cotyledonous stage (Mosonmagyaróvár, 2006. April 12.)

In the tables below it can be seen that we have examined some characteristics of the cotyledonary and neck of cotyledonary by bonitality scale. We indicated the frequency of the given feature, which we have also marked in percentage value. When sowing the seeds, we put 75 seeds into every row, out of which approximately 42, 45 pieces hatched. The devastation or loss of shooting was approx 40%. In *Table 7* can be seen, that this value further increased to 75%, but occasionally it reached 90% as well.

Analysis of the foliage leaf and growth of seedlings

The condense vascular system, the dark green leaves and big stipulate is an advantageous feature. The selection can be continued before the taking up of the seedlings. Emphasis must be put on the thickness of the sprit, as well as the localization and the size of the leading shoot and that of the side shoots. The more condense placing of leaves is more advantageous. The sudden decurrent spiral placing of leaves is undesirable. The wide, osculant bud is advantageous. Of all the above marks we paid special attention on the formation of the neck of leaf and the leaf-blade. In May 2006 the first foliage leaf analysis took place (*Figure 3*), then in July the second on took place: we entered the data row by row, which are summarized in *Table 7*. The recorded data were evaluated by the means of statistical calculations (average, spread, variety coefficient), and the results of these are published in *Tables 8 and 9*. Besides these we have also represented in a graph row by row, to show the relationship of the heights of the plants and the number of foliage leaves (*Figures 4 – 9*).

Figure 3. The first foliage leaf analysis (2006. May 15th.)

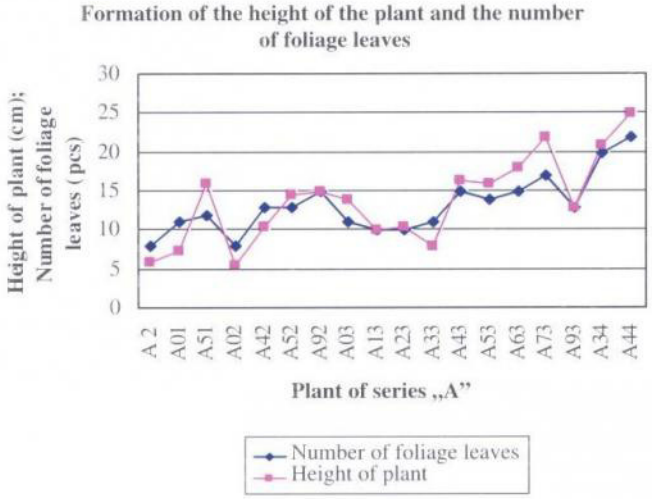

Figure 4. Formation of the height of plants and the number of foliage leaves by the seedlings of series „A" (Mosonmagyaróvár, 2006.07.05.)

Examining the plants of series, A, it can be seen that the two curves are co-current, (lower foliage leaf number has bigger height of plants) bigger, positive direction differences, (4 units, or over) can only be seen at two places: by the A_{15} –number, and the A_{37} – number plants. Here, the lower number of foliage leaves were obviously related to higher plants.

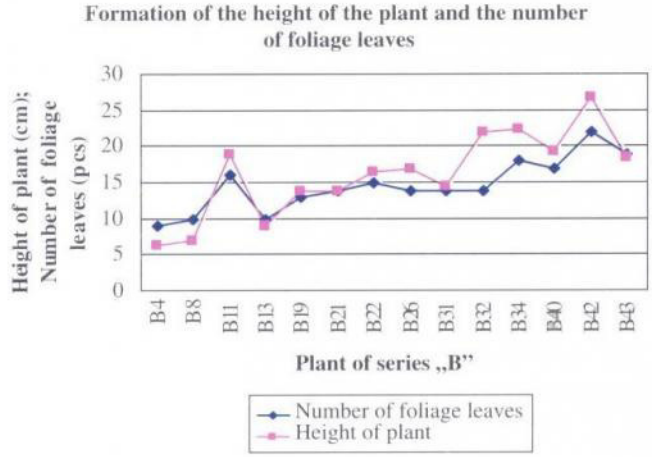

Figure 5. Formation of the height of plants and the number of foliage leaves by the seedlings of series „B" (Mosonmagyaróvár, 2006. 07. 05.)

Table 1. 'Mézes körte' seedlings cotyledonary analysis, frequency (Mosonmagyaróvár, 2006.04.12., „A" row)

Characteristics	Shape of leaf		Length of leaf		Thickness of leaf		Colour of leaf		Length of neck of leaf		Thickness of neck of leaf		Colour of neck of leaf	
	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%
1	26	57,7	14	31,1	6	13,3	4	8,8	20	44,4	20	44,4	19	42,2
2	3	6,6	20	44,4	27	60,0	20	44,4	10	22,2	15	33,3	12	26,6
3	2	4,4	1	2,2	2	4,4	11	24,4	5	11,1	-	-	1	2,2
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	4	8,8	-	-	-	-	-	-	-	-	-	-	3	6,6
Shortage	7	15,5	7	15,5	7	15,5	7	15,5	7	15,5	7	15,5	7	15,5
Undeveloped	3	6,6	3	6,6	3	6,6	3	6,6	3	6,6	3	6,6	3	6,6

Key (1-6. tables):
Shape of leaf: 1-oval (regular); 2-slightly lengthy; 3- lengthy; 4-revesre heart shaped; 5-deformed, acuminated, atwist; Length of leaf: 1-short; 2-medium; 3-long (turning); thickness of leaf: 1-thin; 2-medium thick; 3-thick; Color of leaf: 1-yellow; 2-light yellow; 3-light green, read border; 4-dark green, red border; 5-brown; Length of neck of the leaf: 1-short; 2-medium; 3-long; Thickness of neck of the leaf: 1-thin; 2-medium; 3-thick; Color of neck of the leaf: 1-white; 2-light green; 3-pink; 4-dark green; 5-red.

Table 2. 'Mézes körte' seedlings cotyledonary analysis, frequency (Mosonmagyaróvár, 2006.04.12., „B" row)

Characteristics	Shape of leaf		Length of leaf		Thickness of leaf		Colour of leaf		Length of neck of leaf		Thickness of neck of leaf		Colour of neck of leaf	
	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%
1	19	44,1	12	27,9	7	16,2	2	4,6	24	55,8	28	65,1	17	39,5
2	5	11,6	20	46,5	26	60,4	14	32,5	5	11,6	5	11,6	6	13,9
3	7	16,2	1	2,3	-	-	17	39,5	4	9,3	-	-	4	9,3
4	-	-	-	-	-	-	-	-	-	-	-	-	5	11,6
5	2	4,6	-	-	-	-	-	-	-	-	-	-	1	2,3
Shortage	6	13,9	6	15,9	6	13,9	6	13,9	6	13,9	6	13,9	6	13,9
Undeveloped	3	6,9	3	6,9	3	6,9	3	6,9	3	6,9	3	6,9	3	6,9
III	1	2,3	1	2,3	1	2,3	1	2,3	1	2,3	1	2,3	1	2,3

Table 3. 'Mézes körte' seedlings cotyledonary analysis, frequency (Mosonmagyaróvár, 2006.04.12., „C" row)

Characteristics	Shape of leaf		Length of leaf		Thickness of leaf		Colour of leaf		Length of neck of leaf		Thickness of neck of leaf		Colour of neck of leaf	
	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%
1	17	40,4	7	16,6	5	11,9	1	2,3	7	16,6	7	16,6	8	19,0
2	-	-	12	28,5	15	35,7	4	9,5	12	28,5	14	33,3	3	7,1
3	3	7,1	1	2,3	-	-	-	-	2	4,7	-	-	3	7,1
4	-	-	-	-	-	-	15	35,7	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	7	16,6
Shortage	20	47,6	230	47,6	20	47,6	20	47,6	19	45,2	19	45,2	19	45,2
Undeveloped	2	4,7	2	4,7	2	4,7	2	4,7	2	4,7	2	4,7	2	4,7

Table 4. 'Mézes körte' seedlings cotyledonary analysis, frequency (Mosonmagyaróvár, 2006.04.12., „D" row)

Characteristics	Shape of leaf		Length of leaf		Thickness of leaf		Colour of leaf		Length of neck of leaf		Thickness of neck of leaf		Colour of neck of leaf	
	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%
1	7	17,0	-	-	-	-	-	-	1	2,4	1	2,4	1	2,1
2	-	-	5	12,1	7	17,0	1	2,4	3	7,3	6	14,6	1	2,4
3	-	-	2	4,8	-	-	-	-	3	7,3	-	-	3	7,3
4	-	-	-	-	-	-	6	14,6	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	2	4,8
Shortage	34	82,9	34	82,9	34	82,9	34	82,9	34	82,9	34	82,9	34	82,9

Table 5. 'Mézes körte' seedlings cotyledonary analysis, frequency (Mosonmagyaróvár, 2006.04.12., „E" row)

Characteristics	Shape of leaf		Length of leaf		Thickness of leaf		Colour of leaf		Length of neck of leaf		Thickness of neck of leaf		Colour of neck of leaf	
	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%
1	10	22,2	4	8,8	7	15,5	-	-	6	13,3	9	20	5	11,1
2	-	-	9	20	7	15,5	7	15,5	8	17,7	5	11,1	7	15,5
3	2	4,4	1	2,22	-	-	-	-	1	2,22	1	2,22	3	6,66
4	-	-	-	-	-	-	8	17,7	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shortage	31	68,8	31	68,8	31	68,8	30	66,6	30	66,6	30	66,6	30	66,6
Undeveloped	2	4,4	-	-	-	-	-	-	-	-	-	-	-	-

Table 6. 'Mézes körte' seedlings cotyledonary analysis, frequency (Mosonmagyaróvár, 2006.04.12., „F" row)

Characteristics	Shape of leaf		Length of leaf		Thickness of leaf		Colour of leaf		Length of neck of leaf		Thickness of neck of leaf		Colour of neck of leaf	
	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%	Pcs	%
1	10	21,7	1	2,17	2	4,34	-	-	4	8,69	5	10,8	3	6,52
2	-	-	10	21,7	10	21,7	5	10,8	8	17,3	8	17,3	7	15,2
3	2	4,34	1	2,17	-	-	-	-	1	2,17	-	-	3	6,52
4	-	-	-	-	-	-	7	15,2	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shortage	34	73,9	34	73,9	34	73,9	34	73,9	33	71,7	33	71,7	33	71,7

Table 7. Foliage leaf analysis of the seedlings (Mosonmagyaróvár, 2006. 07. 05.)

Plant No.	Leaf (Pcs)	Plant (cm)	Plant No.	Leaf (Pcs)	Plant (cm)	Plant No.	Leaf (Pcs)	Plant (cm)
A_2	8	6	B_4	9	6,5	C_{10}	-	-
A_{10}	11	7,5	B_8	10	7	C_{12}	15	14
A_{15}	12	16	B_{11}	16	19	C_{13}	12	8,5
A_{20}	8	5,5	B_{13}	10	9	C_{17}	17	18
A_{22}	-	-	B_{19}	13	14	C_{18}	10	8,5
A_{24}	13	10,5	B_{20}	-	-	C_{19}	13	8
A_{25}	13	14,5	B_{21}	14	14	C_{23}	17	26,5
A_{26}	-	-	B_{22}	15	16,5	C_{25}	20	32,5
A_{29}	15	15	B_{26}	14	17	C_{27}	14	14
A_{30}	11	14	B_{31}	14	14,5	C_{28}	17	19,5
A_{31}	10	10	B_{32}	14	22	C_{29}	17	18
A_{32}	10	10,5	B_{33}	-	-	C_{30}	10	6,5
A_{33}	11	8	B_{34}	18	22,5	C_{33}	22	13
A_{34}	15	16,5	B_{37}	-	-	C_{37}	18	14,5
A_{35}	14	16	B_{40}	17	19,5	C_{38}	17	17
A_{36}	15	18	B_{41}	-	-			
A_{37}	17	22	B_{42}	22	27			
A_{38}	-	-	B_{43}	19	18,5			
A_{39}	13 (lower is aborted)	13						
A_{41}	-	-						
A_{43}	20	21						
A_{44}	22	25						
D_{16}	22	26	E_5	19	13	F_{13}	-	-
D_{17}	10	9	E_6	-	-	F_{14}	15	8
D_{18}	-	-	E_7	14	8	F_{20}	-	-
D_{20}	11	4,5	E_8	10	7	F_{21}	14	10
D_{21}	18	24	E_{14}	12	7,5	F_{30}	-	-
D_{35}	18	13	E_{15}	13	9	F_{32}	13	9
D_{40}	-	-	E_{17}	13	14	F_{33}	10	7,5
			E_{18}	15	20	F_{34}	-	-
			E_{19}	-	-	F_{38}	21	24,5
			E_{22}	14	15,5	F_{39}	11	9
			E_{25}	15	13	F_{40}	-	-
			E_{28}	14	13	F_{42}	-	-
			E_{33}	17	16	F_{44}	17	18,5
			E_{34}	13	16	F_{45}	11	8
			E_{35}	14	18	F_{46}	15	21
			E_{36}	-	-			
			E_{38}	16	16			
			E_{39}	17	17			
			E_{42}	13	7			
			E_{45}	12	8			

Table 8. Statistical calculations for the formation of foliage leaf number (Mosonmagyaróvár, 2006. 07. 05.)

Description:	Average	Spread	Variety coefficient
The plants of series ‚A,:	13,22	3,7503	28,368%
The plants of series ‚B,:	14,64	3,6290	24,788%
The plants of series‚C':	15,64	3,5215	22,515%
The plants of series‚D,:	15,80	5,1185	32,395%
The plants of series‚E,:	14,17	2,1861	15,427%
The plants of series, F,:	14,11	3,4439	24,407%
Total:	14,59	3,6082	24,730%

Table 9. Statistical calculations for the formation of the height of plants (Mosonmagyaróvár, 2006. 07. 05.)

Description:	Average	Spread	Variety coefficient
The plants of series ‚A,:	13,83	5,5359	40,028%
The plants of series ‚B,:	16,21	5,9346	36,610%
The plants of series ‚C,:	15,60	7,2726	46,619%
The plants of series ‚D,:	15,30	9,3781	61,294%
The plants of series ‚E,:	12,82	4,2717	33,320%
The plants of series ‚F,:	12,83	6,5907	51,369%
Total:	14,43	6,4972	45,025%

By the second series the curve is still co-current there are positive direction peaks at the end of the series (4 units or above than that), by the B_{32} – the B_{34} – and the B_{42} – number plants.

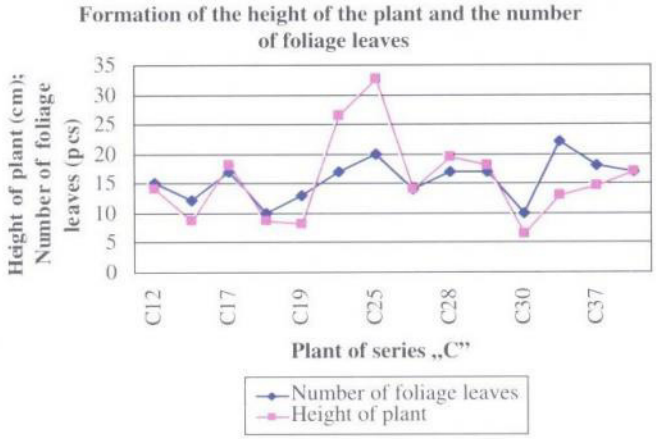

Figure 6. Formation of the height of plants and the number of foliage leaves by the seedlings of series „C" (Mosonmagyaróvár, 2006.07.05.)

In the series „C" there was a case when the plants showed negative direction difference, (a shorter plant had higher number of foliage leaves). This was the case by the C_{19} and C_{33} plants. Positive direction difference could be noticed by two consecutive plants: C_{23}, and C_{25}. Difference means 4 units or more than that in this situation as well.

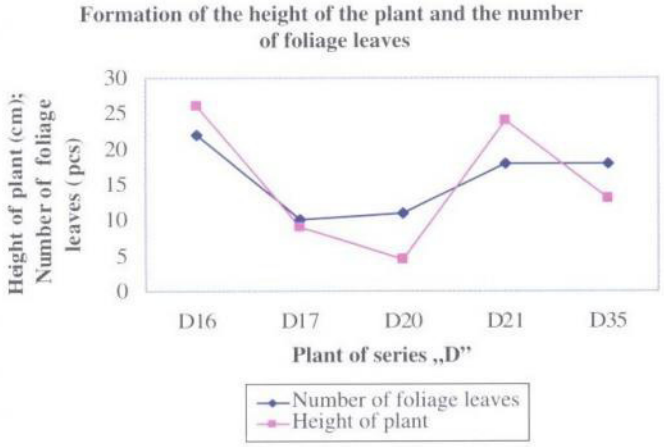

Figure 7. Formation of the height of plants and the number of foliage leaves by the seedlings of series „D" (Mosonmagyaróvár, 2006. 07.05.)

By almost all of the plants of series „D" big differences can be seen. We could experience negative direction difference by the D_{20} and D_{35} plants. The difference was positive direction by the D_{16} and D_{21} plants. If we reflect this difference to the series then it becomes obvious that lots of seedlings were starved during the experiment from series „D". The ground space of the remaining individual plants increased, which partly can be the explanation for the differences.

In this series there were the most differences discovered in the two characteristics, because we could experience negative direction difference by five plants (E_5, E_7, E_{15}, E_{42}, E_{45}), and by two we had positive direction differences (E_{18}, E_{35}).

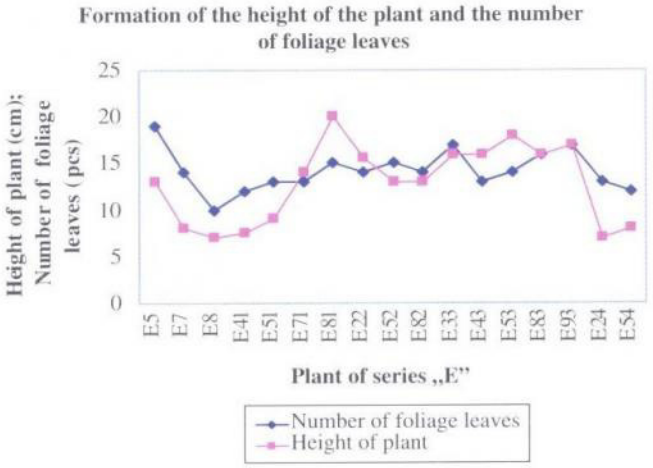

Figure 8. Formation of the height of plants and the number of foliage leaves by the seedlings of series „E" (Mosonmagyaróvár, 2006. 07. 05.)

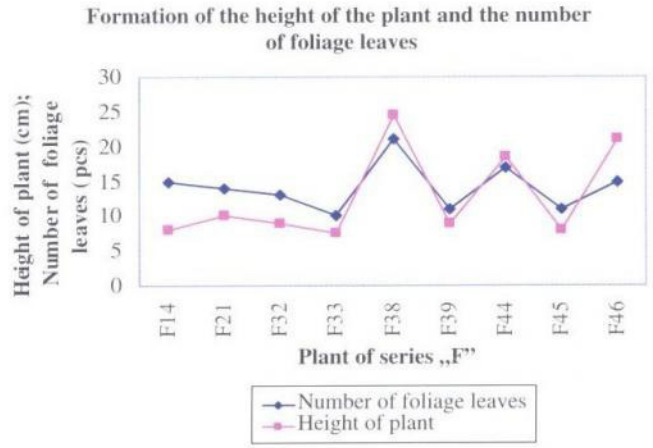

Figure 9. Formation of the height of plants and the number of foliage leaves by the seedlings of series „F" (Mosonmagyaróvár, 2006.07.05.)

In the last „F" series we could experience large-scale destruction of plants. The two curves move together, the negative direction differences in the beginning (F_{14}, F_{21}, F_{32}), would turn to positive direction difference at the last plant of the series (F_{46}).

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