

## Researches Concerning the Influence of Some Morphological Characters on Paprika Pepper Yield used in Solarium Type

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**Abstract.** Paprika bell / chilli peppers fruits are consumed upon technical or physiological maturity, fresh or processed in the preserve industry or as bell / chilli peppers paprika. Each cultivating country focused on a certain feature of the different varieties of paprika bell / chilli peppers: this resulted in cultivars adapted to local conditions and, through improvement, to hybrids that meet producers and consumers requirements. In Spain, a paprika bell / chilli pepper is cultivated on lime soils, which makes them sweet. In Hungary, they market such bell / chilli peppers paprika as: delikatess, edelsuss (sweet), halbsuss (sweet), rosen (rose), and hot. In Romania, paprika bell / chilli pepper was introduced in the 19th century by Bulgarian vegetable growers. The first paprika bell / chilli peppers crops were around Timișoara (Cenadul Mare, Tomnatic, Vizejdia, Lovrin), circa 1923. By the end of the 19<sup>th</sup> century, paprika bell / chilli peppers were cultivated all over Transylvania. The experiment developed during 2011 at the Didactic and Research Base of the Faculty of Horticulture and Forestry, from B.U.A.S.V.M. from Timișoara. The biological material used in the trials was represented by 5 cultivars (hybrids and lines) of foreign origin, i.e.: Délibáb F<sub>1</sub>, Sláger F<sub>1</sub>, Bolero F<sub>1</sub>, SJN 5 and SJD 5. To do so, we set comparative cultures after the monofactorial method with randomised blocks and 4 replicates. The highest values of the technological factors on fruit weight per plant were in the genotypes Délibáb F<sub>1</sub>, Sláger F<sub>1</sub>, and SJD 5. There was strong instability associated with a high impact of the interaction genotype x technological factors on phenotypic expression of fruit weight in the line SJN 5.

**Keywords:** paprika bell / chilli peppers, morphological characters, quantity yield, culture in solarium type

### INTRODUCTION

Paprika bell / chilli peppers fruits are consumed upon technical or physiological maturity, fresh or processed in the preserve industry or as bell / chilli peppers paprika (Apahidean, Al. S., M. Apahidean, 2004).

Sweet or hot bell / chilli peppers paprika is used in spicing and colouring different meat, poultry, pasta, and pastry produce. Hot bell / chilli peppers are also used in medicine due to their content in capsaicin (Ciofu *et al.*, 2003).

The chemical composition of the bell / chilli peppers is complex. It is generally admitted that mature paprika bell / chilli peppers fruits contain the following: water – 86.88% of the dry matter; fibres – 23.4% of the dry matter; sugars – 45.0% of the dry matter; proteins – 15.0% of the dry matter; lipids – 2.5% of the dry matter; vitamin C – 250 mg / 100 g; Beta carotene – 25.0 mg; oxalic acid – 20.0 mg / 100 g; vitamin B<sub>1</sub> – 0.7 mg / 100 g; vitamin B<sub>2</sub> – 0.5 mg / 100 g; vitamin E – 2.3 mg / 100 g (Indrea *et al.*, 2007).

The area of distribution of paprika bell / chilli peppers crops, a thermophilous species, ranged between 55° southern latitude and 55° northern latitude, mainly in southern areas.

Each cultivating country focused on a certain feature of the different varieties of paprika bell / chilli peppers: this resulted in cultivars adapted to local conditions and, through

improvement, to hybrids that meet producers and consumers requirements. In Spain, a paprika bell / chilli pepper is cultivated on lime soils, which makes them sweet. In Hungary, they market such bell / chilli peppers paprika as: delikatess, edelsuss (sweet), halbsuss (sweety), rosen (rose), and hot. In Romania, paprika bell / chilli pepper was introduced in the 19th century by Bulgarian vegetable growers. The first paprika bell / chilli peppers crops were around Timișoara (Cenadul Mare, Tomnatic, Vizejdia, Lovrin), about 1923. By the end of the 19<sup>th</sup> century, paprika bell / chilli peppers were cultivated all over Transylvania.

In Romania, an area with a temperate climate, paprika bell / chilli peppers is an annual plant, while in its original areas it is a perennial. The average duration of the vegetation period is 100-150 days, from sprouting to maturation of the first fruits.

Paprika bell / chilli peppers cultivars and hybrids have different growth types, i.e.:

- Undetermined growth cultivation – in the growth and maximum development stage, plants grow like bushes. The stem ramifies dichotomically, 15-25 cm above the soil. Most flowers appear on secondary ramifications, which ensure the earliest high quality productions.

- Determined growth cultivation – producing flowers in the upper part of the main stem. Length growth is stopped by the large number of flowers.

- Semi determined growth cultivation – in which second rank ramifications of the stem are less developed than first rank ones. The flowers are solitary. Botanically, they are considered undetermined growth cultivars.

- Bush-like growth cultivation – the flowers appear as bouquets. Plant growth and development continues until the end of the vegetation period.

## MATERIALS AND METHODS

The experiment developed during 2011 at the Didactic and Research Base of the Faculty of Horticulture and Forestry, from B.U.A.S.V.M. Timișoara.

The biological material used in the experiment was represented by Délibáb F<sub>1</sub>, Sláger F<sub>1</sub>, Bolero F<sub>1</sub>, SJD 5 and SJN 5 hungarian paprika varieties.

The location of the experience was made after the model of polifactorial experiences, with four repetitions, namely:

-factor A (cultivar) with 5 graduations:

a<sub>1</sub> – Délibáb F<sub>1</sub>;

a<sub>2</sub> – Sláger F<sub>1</sub>;

a<sub>3</sub> – Bolero F<sub>1</sub>;

a<sub>4</sub> – SJD 5;

a<sub>5</sub> – SJN 5.

-factor B (planting scheme) with 4 graduations:

b<sub>1</sub> – 80+40×20 → 8,33 plants/m<sup>2</sup>;

b<sub>2</sub> – 80+40×30 → 5,55 plants/m<sup>2</sup>;

b<sub>3</sub> – 80+40×40 → 4,16 plants/m<sup>2</sup>;

b<sub>4</sub> – 80+40×50 → 3,33 plants/m<sup>2</sup>.

At the technical maturity, there were made measurements on the weight, length and diameter of fruits of every plant and also on the pulp weight and thickness (Berar and Poșta, 2005, 2006; Kajtor and Berar, 2007).

The observations have been made using the current observation techniques, experimental data processing has been performed using statistical and mathematical methods and those data regarding the production were calculated and interpreted on the basis of variance analysis (Ciulca, S. 2002).

## RESULTS AND DISCUSSIONS

Productivity or production potential as fundamental trait of every plant – seen not only in terms of biology but also in economic way – should be analyzed and known thoroughly in all its aspects (Berar *et al.*, 2004). Acknowledges of this are absolutely necessary in order to apply optimal solutions both in creation activity of new forms or hybrids, which refers to the improvement of plants, and in the activity of technological specialists that have the duty to cultivate them and to provide them with conditions that permit full expression of potential production (Savatti *et al.*, 2004).

Based on the data presented in tabel 1. We can observe that only the genotype (varieties and hybrids) had a real significant influence on the length of the fruit, due an uniformity of environmental conditions at the experience device level.

Tab. 1

Variance analysis for the effect of genotypes and planting scheme on fruit length in paprika pepper

Variability source	SS	DF	MS	F Test
Total	235,45	99		
Repetitions	10,02	4	2,51	1,57
Genotype	49,06	4	12,27	7,69**
Residual genotype	29,83	16	1,86	
Planting scheme	6,50	3	2,17	1,36
Genotype x Planting scheme	44,32	12	3,69	2,32*
Residual planting scheme	95,72	60	1,60	

Plant density per unit area, respectively the planting scheme, had a small and insignificant influence on the character. Also, we can observe that the combined effects of genotype and density had significant influence, statistically certified on the phenotypic manifestation of fruit length.

Tab. 2

The influence of genotype on fruit length in paprika pepper on first harvest (31.VII)

Genotype	Fruit length (cm)		Relative values (%)	Difference / Significance
<b>Sláger - Délibáb</b>	17,61	18,76	93,87	-1,15 <sup>0</sup>
<b>Bolero - Délibáb</b>	19,63	18,76	104,64	0,87
<b>SJD 5 - Délibáb</b>	18,84	18,76	100,43	0,08
<b>SJN 5 - Délibáb</b>	18,03	18,76	96,11	-0,73
<b>Bolero - Sláger</b>	19,63	17,61	111,47	2,02***
<b>SJD 5 - Sláger</b>	18,84	17,61	106,98	1,23*
<b>SJN 5 - Sláger</b>	18,03	17,61	102,39	0,42
<b>SJD 5 - Bolero</b>	18,84	19,63	95,98	-0,79
<b>SJN 5 - Bolero</b>	18,03	19,63	91,85	-1,60 <sup>000</sup>
<b>SJN 5 - SJD 5</b>	18,03	18,84	95,70	-0,81

LSD<sub>5%</sub> = 0.92 cm    LSD<sub>1%</sub> = 1.26 cm    LSD<sub>0,1%</sub> = 1.73 cm

Medium values of fruit length, registered by the genotypes taken in study presented an amplitude of 2,02 cm, with limits from 17,61 cm for hybrid Sláger up to 19,63 cm at Bolero hybrid, due to an reduced variability (4,21 %). Hybrids Bolero, Délibáb and the variety SJD 5, have presented a significantly higher fruit length to the values achieved by hybrid Sláger. As well, hybrid Bolero showed a fruit length significantly superior from SJN 5. The differences recorded between the other genotypes had reduced values, and did not reached the level to be statistically ensured.

Tab. 3

The influence of planting scheme on fruit length in paprika pepper

Planting scheme	Fruit length (cm)		Relative values (%)	Difference/ Significance
<b>80+40x30 – 80+40x20</b>	18,78	18,16	103,41	0,62
<b>80+40x40 – 80+40x20</b>	18,58	18,16	102,31	0,42
<b>80+40x50 – 80+40x20</b>	18,78	18,16	103,41	0,62
<b>80+40x40 – 80+40x30</b>	18,58	18,78	98,94	-0,20
<b>80+40x50 – 80+40x30</b>	18,78	18,78	100,00	0,00
<b>80+40x50 – 80+40x40</b>	18,78	18,58	101,08	0,20

LSD<sub>5%</sub> = 0.71 cm LSD<sub>1%</sub> = 0.95 cm LSD<sub>0,1%</sub> = 1.23 cm

Regarding the unilateral effect of the studied planting schemes, fruit length to different genotypes recorded an amplitude of 0,62 cm having values contained between 18,16 cm at scheme 80+40x20 and 18,78 cm at 80+40x30 and 80+40x50, due to a very low variability (1,57 %). Consistent with the analysis of variance is observed that the differences between fruit lengths associated with different planting schemes are small and insignificant.

Tab. 4

The influence of interaction between genotype and planting scheme on fruit length in paprika pepper

No	Sowing period	Planting scheme			
		<b>80+40x20</b>	<b>80+40x30</b>	<b>80+40x40</b>	<b>80+40x50</b>
1	<b>Délibáb</b>	x19,50a	xy 18,82ab	y 17,90c	xy 18,81a
2	<b>Sláger</b>	x 17,41bc	x17,67b	x 18,28bc	x 17,08b
3	<b>Bolero</b>	x18,70ab	x19,94a	x 19,82ab	x 20,07a
4	<b>SJD5</b>	y18,19abc	y 18,38ab	x20,02a	xy18,77a
5	<b>SJN5</b>	y 16,98c	x 19,10ab	y 16,87c	x 19,16a

-Genotype LSD<sub>5%</sub> = 1.62 cm LSD<sub>1%</sub> = 2.15 cm LSD<sub>0,1%</sub> = 2.79 cm (a,b,c)-Planting scheme LSD<sub>5%</sub> = 1.59 cm LSD<sub>1%</sub> = 2.12 cm LSD<sub>0,1%</sub> = 2.76 cm (x,y,z)

Given the effect of different planting densities on fruit length is noted that the scheme 80+40x20, the studied genotypes recorded a variation amplitude of 2,52 cm, with a range from 16,98 cm at SJN 5, and 19,50 cm at Délibáb due to a reduced variability (5,54%). At that density, hybrid Délibáb registered a significantly higher fruit length to SJN 5 and Sláger, while SJN 5 achieved a significantly lower fruit length even from hybrid Bolero.

In case of 80+40x30 scheme, genotypes included in this study presented values of this character, ranging from 17,67 cm at hybrid Sláger and 19,94 cm at Bolero, with a lower amplitude of 2,27 cm and a variability of 5,18 %. The differences between fruit length accomplished by hybrids and varieties were small and insignificant, except hybrid Bolero which manifested a significantly higher value than Sláger.

For scheme 80+40x40 fruit length achieved by genotypes registered values between 16,87 cm at SJN 5 and 20,02 cm at SJD 5, due to a amplitudes of 3,15 cm. Variety SJD 5, registered in this growing conditions significantly higher fruit length to the other, except hybrid Bolero.

In conditions of the planting scheme 80+40x50 the amplitude of variation of fruit length was 2,99 cm. So, in general, there were no differences registered, statistically ensured, between genotypes, except hybrid Sláger, which manifested a significantly lower fruit length to other genotypes.

Given the density effect on fruit length, for each genotype, it is observed that the hybrid Délibáb in conditions of culture at 80+40x20 is obtained the highest value of this character. In case of hybrids Sláger and Bolero, plant density did not significantly affect fruit length values. In case of variety SJD 5, the scheme of 80+40x40, allowed obtaining fruits

significantly larger than the corresponding densities of 80+40x20 and 80+40x30. The planting schemes of 80+40x30 and 80+40x50 ensured the highest significant values of fruit length, at variety SJN 5.

From the experimental data, on the interaction genotype x planting scheme on fruit diameter (Tab. 5), is noted that both genotype and density, have a significant influence on the diameter of the fruit, due to a low and insignificant influence of the environmental conditions. The effect of the genotype was significantly higher, than the effect of the planting scheme. Also the combined effect of plant density and genotype, had a distinct influence concerning that character.

Tab. 5

Variance analysis for the effect of genotypes and planting scheme on fruit diameter in paprika pepper

Variability source	SS	DF	MS	F Test
Total	23,12	99		
Repetitions	0,68	4	0,17	2,37
Genotype	14,02	4	3,51	48,91**
Residual genotype	1,39	16	0,09	
Planting scheme	1,08	3	0,36	5,02**
Genotype x Planting scheme	1,65	12	0,14	1,92*
Residual planting scheme	4,30	60	0,07	

Tab. 6

The influence of genotype on fruit diameter in paprika pepper

Genotype	Fruit diameter (cm)		Relative values (%)	Difference / Significance
<b>Sláger - Délibáb</b>	2,07	2,04	101,47	0,03
<b>Bolero - Délibáb</b>	2,96	2,04	145,10	0,92***
<b>SJD 5 - Délibáb</b>	2,23	2,04	109,31	0,19
<b>SJN 5 - Délibáb</b>	2,73	2,04	133,82	0,69***
<b>Bolero - Sláger</b>	2,96	2,07	143,00	0,89***
<b>SJD 5 - Sláger</b>	2,23	2,07	107,73	0,16
<b>SJN 5 - Sláger</b>	2,73	2,07	131,88	0,66***
<b>SJD 5 - Bolero</b>	2,23	2,96	75,34	-0,73 <sup>000</sup>
<b>SJN 5 - Bolero</b>	2,73	2,96	92,23	-0,23 <sup>0</sup>
<b>SJN 5 - SJD 5</b>	2,73	2,23	122,42	0,50***

LSD<sub>5%</sub> = 0.20 cm    LSD<sub>1%</sub> = 0.27 cm    LSD<sub>0,1%</sub> = 0.37 cm

Genotypes studied (Tab. 6) presented a medium variability (17,26 %) of this character at an amplitude of 0,92 cm, with limits from 2,04 cm in case of hybrid Délibáb until 2,96 cm at Bolero. Therefore, hybrid Bolero manifested a fruit diameter significantly superior to other genotypes, being followed by variety SJN 5.

Tab. 7

The influence of planting scheme on fruit diameter in paprika pepper

Planting scheme	Fruit diameter (cm)		Relative values (%)	Difference / Significance
<b>80+40x30 - 80+40x20</b>	2,32	2,35	98,72	-0,03
<b>80+40x40 - 80+40x20</b>	2,37	2,35	100,85	0,02
<b>80+40x50 - 80+40x20</b>	2,59	2,35	110,21	0,24**
<b>80+40x40 - 80+40x30</b>	2,37	2,32	102,16	0,05
<b>80+40x50 - 80+40x30</b>	2,59	2,32	111,64	0,27***
<b>80+40x50 - 80+40x40</b>	2,59	2,37	109,28	0,22**

LSD<sub>5%</sub> = 0.15 cm    LSD<sub>1%</sub> = 0.20 cm    LSD<sub>0,1%</sub> = 0.26 cm

According to data presented in table analysis of variance, shows that reducing the plant density per surface unit has determined an increase of fruit diameter at the hybrids and varieties studied, but those differences to reach statistical ensure level. Only in the case of hybrid Bolero, reducing density to values of 80+40x50 scheme, allowed a significant increase in fruit diameter.

Concerning the effect of plant density per unit area, on fruit diameter, at studied genotypes, we observe a reduced amplitude of 0,27 cm, due to a variability of 5,13 % (Tab. 7). Fruit diameter for the first three planting schemes have no significant deviations. In conditions of a reduction in plant density by using the scheme 80+40x50, fruit diameter registered higher values, compared to other experimental planting schemes.

Tab. 8

The influence of interaction between genotype and planting scheme on fruit diameter in paprika pepper

No	Sowing period	Planting scheme			
		80+40x20	80+40x30	80+40x40	80+40x50
1	<b>Delibab</b>	x2,01b	x2,04b	x2,04b	x2,06c
2	<b>Slager</b>	x2,03b	x2,00b	x2,08b	x2,16c
3	<b>Bolero</b>	y2,85a	y2,66a	y2,79a	x3,56a
4	<b>SJD5</b>	x2,11b	x2,28b	x2,24b	x2,30c
5	<b>SJN5</b>	x2,76a	x2,62a	x2,70a	x2,86b

-Genotype LSD<sub>5%</sub> = 0.35 cm LSD<sub>1%</sub> = 0.46 cm LSD<sub>0,1%</sub> = 0.60 cm (a,b,c)

-Planting scheme LSD<sub>5%</sub> = 0.34 cm LSD<sub>1%</sub> = 0.48 cm LSD<sub>0,1%</sub> = 0.59 cm (x,y,z)

In the conditions of an appropriate planting densities scheme 80+40x20 genotypes studied in the experience, registered values of fruit diameter between 2,01 cm at Délibáb and 2,85 cm at Bolero and an amplitude of 0,84 cm. In this case, hybrid Bolero and variety SJN 5, have achieved values of that character significant superior to the other genotypes.

A similar behavior of genotypes in terms of fruit diameter was observed for schemes 80+40x30 and 80+40x40, where we registered amplitudes of 0,66 and 0,75 cm, due to significantly higher values to Bolero and SJN 5.

Tab. 9

Variance analysis for the effect of genotypes and planting scheme on fruit weight in paprika pepper

Variability source	SS	DF	MS	F Test
Total	6402,43	99		
Repetitions	128,42	4	32,11	1,56
Genotype	3964,75	4	991,19	48,14**
Residual genotype	489,24	16	30,58	
Planting scheme	223,86	3	74,62	3,62*
Genotype x Planting scheme	360,79	12	30,07	1,46
Residual planting scheme	1235,37	60	20,59	

For the scheme of 80+40x50, fruit diameter variability between the studied genotypes is high (24,16 %), and it can be noticed higher values of fruit diameter at hybrid Bolero and variety SJN 5.

Considering the results of the analysis of variance (Tab. 9) it can be noticed that both genotype and planting scheme had a real influence, significantly distinct on fruit weight, in conditions of reduced and insignificant influence of environmental conditions on this character. The contribution of the genotype to the variability of fruit weight was superior to the plating scheme. The combined effects of genotype and density on the expression of this character were reduced and statistically uninsured.

Regarding the effect of genotype in fruit weight shown in table 10 is noted that hybrids and varieties included in the study presented average values of this character between 17,48 g at Sláger and 33,97 g la Bolero, with an amplitude variation of 16,49 g, due to a high variability of 29,30 %. So, at the experience level the highest fruit weight values, significantly superior to others were made by hybrid Bolero, followed by SJN 5.

Tab. 10

The influence of genotype on fruit weight in paprika pepper

Genotype	Fruit weight (g)		Relative values (%)	Difference / Significance
<b>Sláger - Délibáb</b>	17,48	18,99	92,05	-1,51
<b>Bolero - Délibáb</b>	33,97	18,99	178,88	14,98***
<b>SJD 5 - Délibáb</b>	22,07	18,99	116,22	3,08
<b>SJN 5 - Délibáb</b>	29,30	18,99	154,29	10,31***
<b>Bolero - Sláger</b>	33,97	17,48	194,34	16,49***
<b>SJD 5 - Sláger</b>	22,07	17,48	126,26	4,59*
<b>SJN 5 - Sláger</b>	29,30	17,48	167,62	11,82***
<b>SJD 5 - Bolero</b>	22,07	33,97	64,97	-11,90 <sup>000</sup>
<b>SJN 5 - Bolero</b>	29,30	33,97	86,25	-4,67 <sup>0</sup>
<b>SJN 5 - SJD 5</b>	29,30	22,07	132,76	7,23***

LSD<sub>5%</sub> = 3.71 g   LSD<sub>1%</sub> = 5.11 g   LSD<sub>0,1%</sub> = 7.02 g

Regarding the unilateral effect of planting schemes (Tab. 11), fruit weight presented an amplitude variation of 3,68 g, with values between 23,25 g at 80+40x20 and 26,93 g in the case of 80+40x50, in conditions of a reduced variability of 7,10 %. Using the planting scheme 80+40x50 determined significant differences of fruit weight compared with other planting schemes, which have small differences and statistical uninsured.

Tab. 11

The influence of planting scheme on fruit weight in paprika pepper

Planting scheme	Fruit weight (g)		Relative values (%)	Difference / Significance
<b>80+40x30 - 80+40x20</b>	23,25	23,42	99,27	-0,17
<b>80+40x40 - 80+40x20</b>	23,86	23,42	101,88	0,44
<b>80+40x50 - 80+40x20</b>	26,93	23,42	114,99	3,51**
<b>80+40x40 - 80+40x30</b>	23,86	23,25	102,62	0,61
<b>80+40x50 - 80+40x30</b>	26,93	23,25	115,83	3,68**
<b>80+40x50 - 80+40x40</b>	26,93	23,86	112,87	3,07*

LSD<sub>5%</sub> = 2.57 g   LSD<sub>1%</sub> = 3.41 g   LSD<sub>0,1%</sub> = 4.44 g

Given the influence of different planting schemes on fruit weight (Tab. 12) is noted that at scheme 80+40x20 studied genotypes registered an amplitude of variation of 16,58 g with values ranging between 16,97 g at Sláger and 32,55 g at Bolero, due to a high variability (31,49 %).

Tab. 12

The influence of interaction between genotype and planting scheme on fruit weight in paprika pepper

No	Sowing period	Planting scheme			
		80+40x20	80+40x30	80+40x40	80+40x50
1	<b>Délibáb</b>	x18,13b	x18,84b	x19,18cd	x19,82c
2	<b>Sláger</b>	x16,97b	x16,13b	x18,02d	x18,79c
3	<b>Bolero</b>	y32,55a	y30,80a	y30,92a	x41,63a
4	<b>SJD5</b>	x19,19b	x22,04b	x24,64bc	x22,43c
5	<b>SJN5</b>	x30,25a	x28,46a	x26,54ab	x31,96b

-Genotype LSD<sub>5%</sub> = 6.06 g   LSD<sub>1%</sub> = 8.05 g   LSD<sub>0,1%</sub> = 10.44 g (a,b,c)

-Planting scheme LSD<sub>5%</sub> = 5.74 g   LSD<sub>1%</sub> = 7.63 g   LSD<sub>0,1%</sub> = 9.93 g (x,y,z)

Using the scheme of 80+40x30 determined a variability of 26,83 % with the range between 16,13 g at Sláger and 30,80 g at SJN 5. At these densities genotypes Bolero and SJN 5 have registered a superior fruit weight to the other genotypes.

In the case of the density corresponding the scheme 80+40x40 genotypes included in the study presented an amplitude of fruit weight of 12,90 g, with limits from 18,02 g for Sláger and 30,92 g for Bolero, due to a variability of 22,34 % between varieties and hybrids. Hybrid Bolero, followed by variety SJN 5 presented positive differences and statistically ensured compared with other genotypes, in terms of this character.

Amid planting scheme 80+40x50 amplitude of average fruit weight achieved by varieties and hybrids was of 22,84 g with values between 18,79 g at Sláger and 41,63 g at Bolero, registering a variability of 36,12 %. Cultivars Bolero and SJN 5 manifested a superior capacity to harness this density of the culture, under the aspect of fruit weight. Changing planting scheme had a reduced influence and insignificant on fruit weight to most genotypes. In case of hybrid Bolero, increasing the nutrition space at values of scheme 80+40x50 allowed a significant increase of fruit weight.

Tab. 13

Variance analysis for the effect of genotypes and planting scheme on total fruit yield/plant in paprika pepper

Variability source	SS	DF	MS	F Test
Total	18632983	99		
Repetitions	429810	4	107453	1.97
Genotype	3647352	4	911838	16.68**
Residual genotype	874556	16	54660	
Planting scheme	5550379	3	1850126	32.76**
Genotype x Planting scheme	4742107	12	395176	7.00**
Residual planting scheme	3388779	60	56480	

The average values of fruit production/plant (Tab. 14) registered by the genotypes included in the study presented an amplitude of 525,77 g, with limits from 882,68 g in case of the hybrid Bolero until 1408,45 g at variety SJD 5, due to a high interpopulational variability (22,41 %). Thereby, at the level of the entire experience hybrid Délibáb achieved a total output value significantly superior compared to the values achieved by the rest of the genotypes. As well hybrid Sláger registered a significant increase of production compared to hybrid Bolero and variety SJD 5.

Tab. 14

The influence of genotype on total fruit yield/plant in paprika pepper

Genotype	Fruit yield/plant (g)		Relative values (%)	Difference / Significance
<b>Sláger - Délibáb</b>	1086,27	1408,45	77,12	-322,18 <sup>000</sup>
<b>Bolero - Délibáb</b>	912,11	1408,45	64,75	-496,34 <sup>000</sup>
<b>SJD 5 - Délibáb</b>	975,16	1408,45	69,23	-433,29 <sup>000</sup>
<b>SJN 5 - Délibáb</b>	882,68	1408,45	62,67	-525,77 <sup>000</sup>
<b>Bolero - Sláger</b>	912,11	1086,27	83,96	-174,16 <sup>0</sup>
<b>SJD 5 - Sláger</b>	975,16	1086,27	89,77	-111,11
<b>SJN 5 - Sláger</b>	882,68	1086,27	81,25	-203,59 <sup>0</sup>
<b>SJD 5 - Bolero</b>	975,16	912,11	106,91	63,05
<b>SJN 5 - Bolero</b>	882,68	912,11	96,77	-29,43
<b>SJN 5 - SJD 5</b>	882,68	975,16	90,51	-92,48

LSD<sub>5%</sub> = 156.73 g    LSD<sub>1%</sub> = 215.94 g    LSD<sub>0,1%</sub> = 296.84 g

From the experimental data presented in Table 13 it is observed that both sources of variation (genotype and planting scheme) had a real influence, significant on total



production/plant, due to an uniformity of the environmental conditions in the experimental device. The planting scheme had a higher influence than the genotype on this character. It is also noted that the combined effects of genotype and density had distinct and significant influences on the phenotypic manifestation of total production/plant.

Regarding the unilateral effect of planting density studied (Tab. 15), fruit weight at different genotypes registered an amplitude of 576,39 g having values between 835,08 g at scheme 80+40x20 and 1411,47 g at 80+40x50, due to a high variability (28,55 %). Therefore, at the experience level increasing the nutrition space from 80+40x20 to 80+40x50 determined a significant increase in the production of fruits/plant. Between densities related to schemes of 80+40x20 and 80+40x30 there were registered no major differences, statistically ensured under the aspect of production/plant.

Tab. 15

The influence of planting scheme on total fruit yield/plant in paprika pepper

Planting scheme	Fruit weight (g)		Relative values (%)	Difference / Significance
<b>80+40x30 – 80+40x20</b>	1411.47	1116.96	126,36	294,51***
<b>80+40x40 – 80+40x20</b>	848.23	1116.96	75,94	-268,73 <sup>000</sup>
<b>80+40x50 – 80+40x20</b>	835.08	1116.96	74,76	-281,88 <sup>000</sup>
<b>80+40x40 – 80+40x30</b>	848.23	1411.47	60,09	-563,24 <sup>000</sup>
<b>80+40x50 – 80+40x30</b>	835.08	1411.47	59,16	-576,39 <sup>000</sup>
<b>80+40x50 – 80+40x40</b>	835.08	848.23	98,44	-13,15

LSD<sub>5%</sub> = 134.46 g    LSD<sub>1%</sub> = 178.82 g    LSD<sub>0,1%</sub> = 232.59 g

## CONCLUSIONS

According to the experimental obtained results concerning the influence of morphological characters upon the average production on fruiting/plant in paprika pepper, we can take the following conclusions:

- under the aspect of fruit length, hybrid Bolero (19,63 cm) stands out significantly from the other experimented cultivars;
- estimated average values of fruit diameter, exceeding 2,5 cm is registered in case of cultivars Bolero F<sub>1</sub> and SJN 5;
- under the aspect of fruit weight, medium values exceeding 20 g is registered at hybrid Bolero (33,97 g) and varieties SJN 5 (29,30 g) respectively SJD 5 (22,07 g);
- yields of fruits/plant over 1 kg is registered for the hybrids Délibáb (1,408 kg) respectively Sláger (1,086 kg);
- we recommend the protected cultivation system of paprika pepper hybrids Délibáb F<sub>1</sub>, Sláger F<sub>1</sub> and Bolero F<sub>1</sub>.

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