

Studies Concerning The Variability Of Plant Productivity Characters In A Collection Of Local Landraces Of Bell Pepper (*Capsicum annuum* L.var.grossum)

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Abstract Exploring the local populations in different crop species allows finding valuable gene resources for different objectives for breeding. The study aimed to evaluate a collection of local landraces of bell pepper, originating from western Romania concerning the main traits that compose the production ability. The collection subjected to study presents a variability that can be used in pepper breeding programs for fruit weight and number of fruit per plant.

Key words

Bell pepper, local landraces, variability

Higher yields per plant are produced based on a large number of fruit in Satchinez, Siria, Tomnatic, Vinga landraces. In Temereşti I landraces production per plant is based on fruit size.

Key words: bell pepper, local landraces, variability, components traits of plant productivity

Exploring the local populations to different culture allows customized gene finding valuable resources for different objectives for improvement. Collection and capitalization in Romania is an old and ongoing concern [6,7]

Production capacity is a complex trait, the result of several morphological components. Total production for a production cycle depends on physiological activity of the plant, the speed of harvesting the fruits reach maturity. This pepper is very important at that early emergence and harvest fruit spread is a primary objective. [8]

Implementation depends on the number of fruit production per plant and their size. On bell pepper, the fruits may have a weight of 50 g to 150 g. [4] Depending on usage larger or smaller fruit are preferred. For conservation favorite fruits are smaller and bigger fresh fruit for consumption. The number of

fruit per plant, in correlation with their size, must exceed the 10 fruits value. [3]

Increase in bell pepper fruit has a dynamic influenced by different factors, including temperature. On bell pepper, the breeding achieved great progress, in culture being introduced, varieties and hybrids. [9] Local landraces can serve as a starting material for obtaining parental forms for commercial hybrids.

Improving production depends on the value of genotype, but can also be achieved by applying special techniques: the use of bio-stimulation. [2], seedling transplanting conditions [10] or conditions in protected areas. [5]

Materials and Methods

The main goal of this study was to evaluate a collection of local landraces of bell pepper, originating from western Romania, concerning the main component traits of production capacity. The 22 local landraces have been compared with Cristal variety. Local landraces were collected from the counties of Timis, Arad and Bihor. Their origin is presented in Table 1.

Tabele 1

Origin of studied local landraces

Origin	Genotype
Control- variety	Cristal
Timiş county	Gelu, Cutina, Moşniţa Nouă, Lovrin, Altringen, Satchinez, Temereşti, Răchita, Tomnatic, Cenad, Belinţ
Arad county	Buteni, Aldeşti, Seleuş, Juliţa, Şiria, Tăgădău
Bihor county	Şimian, Girişul de Criş, Fiziş, Rieni, Ceica

The study was carried out in field conditions over a period of three years. Experimental data were collected through field observations by performing measurements on representative samples, constituted of fruit that reached physiological maturity.

Experimental data processing was done by analysis of variance [1]

Results and Discussions

Cristal is an early variety, and among collected landraces eight were similar to the control variety, the other being more late varieties. Of the total studied landraces, 16 had yellow immature fruits and seven were green and concerning the fruit peak shape, 17 presented a sharp peak. (Table 1)

Table 2

Results for precocity and fruit shape in populations of bell pepper

No.	Genotype	Fruit ripening	Immature fruit color	Fruit peak shape	No.	Genotype	Fruit ripening	Immature fruit color	Fruit peak shape
1.	Cristal (control)	early	yellow	sharp	13.	Răchita	late	yellow	sharp
2.	Gelu	early	yellow	sharp	14.	Julița	early	yellow	sharp
3.	Buteni	very late	green	edged	15.	Șiria	semi late	yellow	sharp
4.	Aldești	semi late	yellow	sharp	16.	Girișul de Criș	early	green	edged
5.	Seleuș	very late	yellow	sharp	17.	Fiziș	early	green	sharp
6.	Cutina	late	green	sharp	18.	Tomnatic	semi late	yellow	sharp
7.	Moșnița Nouă	late	yellow	sharp	19.	Rieni	early	yellow	sharp
8.	Lovrin	late	green	edged	20.	Ceica	early	yellow	edged
9.	Șimian	semi late	green	sharp	21.	Cenad	early	yellow	sharp
10.	Altringen	late	yellow	sharp	22.	Belinț	semi late	yellow	sharp
11.	Satchinez	semi late	yellow	sharp	23.	Tăgădău	semi late	green	sharp
12.	Temerești	early	yellow	sharp					

Fruit sizes are elements that affect their mass, which is the main factor in determining the value of a genotype in terms of production. The longest fruits were present at Fiziș, Altringen, Temerești I and Belint II populations, and the shortest at Seleus population.

The largest diameters have been at Cutina and Ceica populations and the lowest average for this trait were present in Ohaba Lungă and Belinț I populations. (Figure 1)

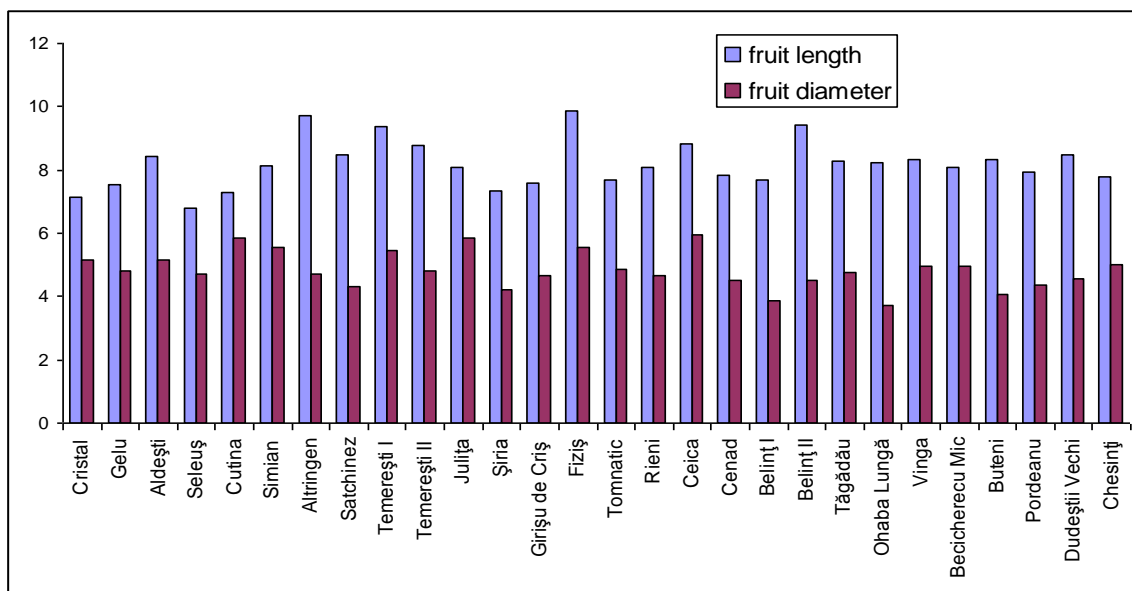


Fig. 1. Results regarding the fruit length and diameter bell pepper populations

For the most important traits involved in achieving production capacity, statistical calculations were performed during the experiment.

For the average weight of fruit it shows that the collected landraces are fairly close control variety.

Average of experimental years emphasize Temerești I landrace that with an average of 91.52 g average weight of fruit exceeds the control variety Cristal with a significant increase. In the same category of significance also ranks Cutina, Fiziș and Becicherecu

Mic landraces. Eight of collection landraces showed significantly less weight of fruit than the control variety.

This situation shows that the material collected from bell pepper has fruit similar in size to

those of improved varieties. For the breeding process these forms are useful regarding the improving of fruit average weight. (Table 2).

Table 2.

Results regarding the average in bell pepper

No.	Landrace	Weight of fruit (g)			Number of fruit/plant			Fruit weight/plant		
		Fruit average weight (g)	Percent from control variety (%)	Difference from control (g) and significance	Fruit number /plant	Percent from control variety (%)	Difference from control (g) and Significance	Fruits average weight/plant (g)	Percent from control variety (%)	Difference from control (g) and significance
1.	Cristal (control)	66,49	100	0	9,51	100	ctrl	619,25	100,00	Mt.
2.	Gelu	64,24	96,62	-2,24	6,24	65,66	-3,26	391,52	63,22	-227,69
3.	Aldești	75,49	113,53	9	8,00	84,12	-1,51	603,92	97,52	-15,29
4.	Seleuș	56,24	84,59	-10,24 ⁰	7,77	81,70	-1,74	435,51	70,33	-183,70
5.	Cutina	79,02	118,84	12,53*	11,05	116,19	1,54	896,81	144,83	277,60
6.	Șimian	75,51	113,57	9,02	10,86	114,19	1,35	916,46	131,85	197,24
7.	Altringen	68,29	102,70	1,8	9,64	101,36	0,13	648,40	104,71	29,18
8.	Satchinez	54,02	81,24	12,47 ⁰	20,67	217,35	11,16***	1202,12	194,13	582,91**
9.	Temerești I	91,52	137,64	25,03*	13,59	142,95	4,08	1192,80	192,63	573,58**
10.	Temerești II	64,33	96,75	-2,15	8,36	87,90	-1,15	540,13	87,22	79,08
11.	Julița	61,69	92,78	-4,8	9,10	95,68	-0,41	559,66	90,38	-59,55
12.	Șiria	61,86	93,03	-4,63	18,62	195,84	9,11***	1176,75	190,03	557,53**
13.	Girișu de Criș	59,93	90,13	-6,56	18,32	192,63	8,81***	1086,87	175,52	467,65*
14.	Fiziș	87,79	132,03	21,3*	11,83	124,39	2,32	1025,02	165,53	405,81*
15.	Tomnatic	66,17	99,52	-0,31	15,68	164,87	6,17	1039,56	167,88	420,35*
16.	Rinei I	68,87	103,58	2,38	9,94	104,57	0,43	684,18	110,49	64,96
17.	Ceica	60,47	90,94	-6,02	10,47	110,09	0,96	658,61	106,36	39,39
18.	Cenad	58,80	88,43	-7,69	11,84	124,50	2,33	697,52	112,64	78,30
19.	Belinț I	41,16	61,91	-25,32 ⁰	9,49	99,84	-0,01	403,29	65,12	-215,92
20.	Belinț II	55,95	84,15	-10,53	15,10	158,83	5,59*	896,43	144,76	277,21
21.	Tăgădău	58,77	88,38	-7,72	15,68	164,93	6,17*	884,15	142,78	264,94
22.	Ohaba Lungă	38,67	58,16	27,81 ⁰	14,02	147,42	4,51	550,07	88,83	-69,14
23.	Vinga	66,59	100,15	0,1	16,53	173,81	7,02**	1087,92	175,69	468,70*
24.	Becicherecu Mic	78,36	117,85	11,87*	12,50	131,44	2,99	978,15	157,96	358,94
25.	Buteni	52,46	78,90	-14,02 ⁰	12,37	130,12	2,86	624,80	100,90	5,59
26.	Pordeanu	55,16	82,96	-11,32 ⁰	14,92	156,88	5,41*	883,94	142,75	264,72
27.	Dudeștii Vechi	54,80	82,41	-11,69 ⁰	12,32	129,54	2,81	714,08	115,32	94,86
28.	Chesinți	62,99	94,74	-3,49	13,71	144,16	4,20	928,32	159,91	309,11
29.	Rieni II	38,27	57,55	-28,22 ⁰	12,20	128,33	2,69	476,15	76,89	-143,06
		DL 5%= 9,83 g; DL 1%= 33,24 g; DL 0,1%= 17,61 g			DL 5%= 4,87 fruits; DL 1%= 6,56 fruits; DL 0,1%= 8,72 fruits			DL 5%= 390,93 g; DL 1%= 526,33 g; DL 0,1%= 699,86 g		

The number of fruit per plant is an element of productivity. If it is taken into account the ability of flowering, fruit number is very large, but not all flowers became fruits. The average of this trait in the experimental years was between 20.67 fruits in Satchinez landrace and 6.24 fruit in Gelu landrace. Very interesting is the fact that the two populations are very different though they originate from two close localities.

Compared to the Cristal variety, three populations have a number of fruit per plant very significantly higher: Satchinez, Șiria, Girișu de Criș. Settlements Satchinez and Șiria have tradition for pepper cultivation, from here resulting the growers influence on this trait. A longer selection can improve this trait. Valuable for this trait are Vinga, Tomnatic, Belinț II, Ohaba Lungă and Pordeanu landraces, whose differences are statistically assured.

From these data it is confirmed that local populations can have a great capacity to fruition, the number of fruit carried on a plant being at least to control variety level, but for many populations is higher.

The number of fruit per plant leads to a superior fruit production per plant many collection landraces. Most valuable proved to be Satchinez landrace with a average mass of fruit per plant of 1202.12 g. Larger statistically assured production compared to Cristal control variety were present at Satchinez, Temerești I, Șiria, Girișu de Criș, Fiziș, Tomnatic and Vinga landraces.

Although lower values of production per plant have been recorded compared with the control variety, in any case the differences are not statistically assured. Therefore it appears that the collected bell peppers landraces are valuable regarding the production of fruit

per plant and can be used in breeding programs also as genitors and as populations in which selection can be applied directly.

Studying the elements of plant productivity is found that higher yields per plant are obtained based on the number of fruit per plant, the landraces that have

higher yields per plant compared to control variety, presents a number of fruit per plant in the same category: Satchinez, Şiria, Tomnatic, Vinga. Only Temereşti I landrace production per plant is based on fruit size. (Figure 2).

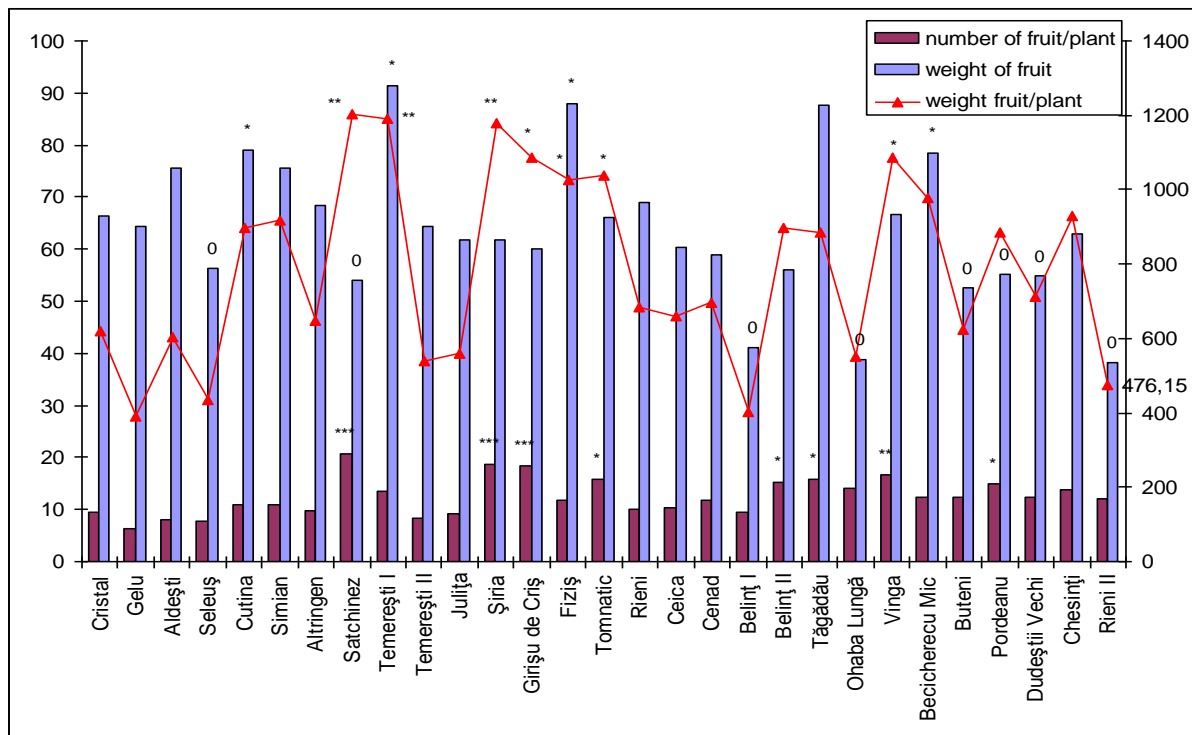


Fig. 2. Results regarding the elements of plants productivity from the bell pepper collection.

Conclusions

1. The collection that was subject to study presents a variability that can be used in breeding programs of bell pepper.

2. Fruit sizes are elements that affect their mass. The longest fruits were present at Fiziş, Altringen, Temereşti I and Belinţ II landraces, and the largest diameters were recorded at Cutina and Ceica landraces.

3. For average fruit weight, collected landraces are close to control variety. The heaviest fruits were registered at Temereşti I landrace. Landraces superior to control variety were Cutina, Fiziş şi Becicherecu Mic landraces. There are useful forms that can be used in breeding process.

4. The number of fruit per plant is an element of productivity in local populations. Compared to the Cristal variety, three populations have a number of fruit per plant very significantly higher: Satchinez, Şiria, Girişu de Criş. Settlements Satchinez and Şiria have tradition in pepper cultivation, from this resulting the influence of growers on this trait. Local landraces

have a high capacity to fruition, many populations being better than control variety.

5. Increases of production per plant statistically assured compared to control variety Cristal, were present at Satchinez, Temereşti I, Şiria, Girişu de Criş, Fiziş, Tomnatic and Vinga landraces. Studied bell pepper populations are valuable and can be used in breeding programs so as genitors, and as populations in which selection can be applied directly.

6. Higher yields per plant are obtained based on the number of fruit per plant, at Satchinez, Şiria, Tomnatic, Vinga landraces. At Temereşti I landrace the production per plant is based on fruit size.

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