

Expressiveness of the main characters of Roial, a new hot pepper cultivar from Vegetable Research and Development Station Buzau

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Abstract Hot peppers (*Capsicum* sp.) are an important and valuable cash crop grown all over the world. It is used for culinary purposes but it can also be eaten fresh or used as spice or food colorant. In Romania, pepper crop occupies an important place, ranking the fourth place in terms of yield after cabbage, tomatoes, and onion. In Romania, the pepper crop is grown especially by small farmers in order to make a sustainable living. Vegetable Research Development Station Buzau (V.R.D.S.) has been studying hot peppers intensively since 1996. For breeding purposes there are frequently used the diversity of landraces, therefore at V.R.D.S a program for improvement of local landraces has been developing. The aim of this work was to study the expressiveness of the main characters of Roial cultivar, for a period of 3 years. In order to obtain the Roial variety, two local landraces cultivated in vegetable basin Buzau were selected, and noted as L32 and L97. The breeding method used was repeated individual selection. Throughout the vegetation period, during a period of 3 years biometric and phenological observations were made. The descriptors used were the one from UPOV and IPGRI Guidelines. For all agro-morphological, descriptive statistics were calculated, statistics indices use for each character were: the means, standard deviation (SD) and coefficient of variation (CV%). In order to establish the quality of Roial fruit, the firmness, the dry matter content and the soluble solids contents were measured for both unripe and fully ripen pepper. The researches have been completed so far with obtaining of a new variety of hot peppers that has been registered in the Official Catalogue of Species and Varieties of Cultivated Crops under the name 'Roial'. Currently, the variety is in a conservative selection process and it is important to evaluate the expressiveness of the main characters in order to keep the variety in optimal parameters and at the same time to preserve the purity of the variety.

Key words

biodiversity, breeding, *Capsicum* sp., Romania

Hot peppers (*Capsicum* sp.) are an important and valuable cash crop grown all over the world [8]. It is used for culinary purposes but it can also be eaten fresh or used as spice or food colorant. Due to the high content of bioactive compounds (e.g. ascorbic acid, flavonoids, phenolics and carotenoids) and essential nutrients, hot peppers have antioxidant, antiviral, antimicrobial, anti-inflammatory and anticancer properties. *Capsicum* species are also used in medicine and cosmetics [10, 12]. Also, chili peppers are an excellent source of vitamin A, B, C, E and P [8, 10]. In addition to the culinary and medicinal importance, chilli pepper can be used as ornamental plants [1, 2, 9, 11].

In this regard, the fruits from *Capsicum* species, are grown worldwide with a harvested area of 1.776.334 ha of dry chilies and 1.990.423 ha of fresh peppers in 2018 with a production of 4.164.594 tones of dry chilies and 36.771.482 tones of fresh peppers [17].

In Romania, pepper crop occupies an important place, ranking the fourth place in terms of yield after cabbage, tomatoes, and onion [14]. In Romania, the pepper crop is grown especially by small farmers (3.395 family [16]) in order to make a sustainable living. The harvested area of green chilies and peppers comprises, in Romania (2018), 17.977 ha with a production of 229.662 tones [17].

Vegetable Research Development Station Buzau (V.R.D.S.) has been studying hot peppers intensively

since 1996. For breeding purposes there is frequently used diversity of landraces, therefore at V.R.D.S a program for improvement of local landraces has been developing. Anyway, over the years, due to the fact that no conservative selection has been made, for the absence of a coherent breeding program and because new varieties of chilli peppers started to be cultivated, the local landraces has been aggressively exposed to the phenomenon of genetic erosion, reaching to the point where almost losing identity [3].

The aim of this work was to study the expressiveness of the main characters of Roial, for a period of 3 years. Currently, the variety is in a conservative selection process and it is important to evaluate the expressiveness of the main characters in order to keep the variety in optimal parameters and at the same time to preserve the purity of the variety.

Material and Method

The Genetic, Breeding and Biodiversity Laboratory from Vegetable Research and Development Station Buzau has a valuable germplasm collection of hot peppers consisting of 200 genotypes, structured in 3 groups according to their genetic stability: 57 stable genotypes, 93 advanced genotypes and 50 segregate genotypes.

In order to obtain the Roial variety, two local landraces cultivated in vegetable basin Buzau were selected, and noted as L32 (Bulgarian hot peppers) and L97 (Dutch hot pepper). The local landrace were grown together and a new genotype was extracted. The following year, the new genotype was grown isolated under greenhouse conditions to keep biological purification of the accession. For a period of 6 years, the new genotype was studied from agro-morphological point of view, and negative selective mass was applied and only pure genotype was kept. The breeding method used was repeated individual selection [3, 7, 14]. The main objectives followed in the breeding process were:

yield and quality potential, earliness, disease tolerance and extreme environmental conditions.

The crop technology used was the one specific for chilli peppers [3]. Throughout the vegetation period, during a period of 3 years (2018-2020) biometric and phenological observations were made. The descriptors used were the one from UPOV and IPGRI Guidelines. The qualitative characters were noted based on visual evaluation while the quantitative traits were counted, measured using metric rulers, calliper and weighed using weighing balance. For all agro-morphological, descriptive statistics were calculated: the means, standard deviation (SD) and coefficient of variation.

For the fruit at harvest maturity and for the fully ripen fruits, the dry matter content (DM) was determined with KERN DBS60-3 thermo balance. Fruit firmness was determined by measuring the penetration force using a fruit pressure tester FT011, equipped with a piston of 3 mm diameter. The results were expressed in kgf/cm². The soluble solids (TSS) were measured with digital refractometer KERN OPTICS ORF 1RS, the result were converted from refractive index (RI) in % Brix.

Results and Discussions

Roial cultivar (Figure 1) can be grown in greenhouse and in the field, in all pepper area crop favourable in Romania. The mean values of plant characteristics are presented in Table 1. The plant height of this variety varies from 66.6 to 83.2 cm with an average bush diameter of 39.3 cm. The length of leaves varies between 7.8-10.6 cm and a mean width of 4.43 cm. The flower colour is white without spots on the corolla. The colour of the anthers observed immediately after blooming before anthesis is pale blue and the filament colour observed immediately at anthesis is white. Due to these characteristics of flowers and because it presents elongated fruit shape [15]. Roial cultivar belongs to *Capsicum annuum* species.



Figure 1. Roial fruit details: 1. Cross section; 2. Unripe fruit; 3. Crop detail

The average length of fruit at maturity stage is 21.53 cm, with a mean width of 1.08 cm. Number of fruits per plant varies between 50-62 fruits. The weight of the fruits varies between 13.43-18.40 g, with a mean weight of receptacle of 5.35 g. The mean length of pedicel is 3.72 cm, with a mean width 0.54 cm. Roial variety has obtuse shape at pedicel attachment, the

fruit shape of blossom end is pointed and the fruit blossom end appendage is absent. Sinuation of pericarp at basal part of fruit is very strong and sinuation of pericarp excluding basal part is medium. The fruit shape in cross section, at level of placenta, is circular and the fruit shape in longitudinal section is horn shaped (Figure 1).

Table 1. Mean values of plant characteristics in open field

Plant characteristics	Units	Value \pm Standard deviation	Coefficient of variation %
Stem length	cm	25.76 \pm 2.12	8.23
Plant height	cm	73.7 \pm 8.5	11.60
Bush diameter	cm	39.3 \pm 1.27	3.05
Foliole length	cm	9.7 \pm 1.64	16.97
Foliole width	cm	4.43 \pm 0.9	20.46
Petiolo length	cm	4.63 \pm 0.7	17.97
Number of fruits/plant	pcs	58.3 \pm 5.7	12.27
Fruit length	cm	21.53 \pm 0.6	2.79
Fruit width	cm	1.08 \pm 0.03	3.24
Fruit basal diameter (cm)	cm	1.35 \pm 0.06	4.80
Fruit median diameter (cm)	cm	1.08 \pm 0.03	3.24
Fruit apex diameter (cm)	cm	0.35 \pm 0.04	11.43
Fruit weight (g)	g	19.23 \pm 2.54	15.68
Pericarp weight (g)	g	10.8 \pm 0.95	8.77
Receptacle weight (g)	g	5.35 \pm 1.6	30.54
Pedicel length (PDL)	cm	3.72 \pm 0.06	1.72
Pedicel diameter	cm	0.54 \pm 0.05	9.44
Pericarp thickness	mm	2.1 \pm 0.1	4.76
Number of seeds/fruit	pcs	85 \pm 2	1.08

Placenta length is $>1/2$ fruit length and the pericarp thickness varies between 2.00-2.2 mm. The fruits have straws and smooth seeds and the average number of seeds/fruit is 85.

The coefficient of variation shows values $< 35\%$ which denotes a stable and homogeneous population.

Earliness is determined by the number of days from germination to appearance of the first technologically mature fruit, as well as by total yield per plant and fruit

characteristics [6]. The variety registered a high yield per plant 1.2-1.5 kg, yield potential being over 10 t/ha and the vegetation period is 100-110 days, so Roial being an early variety.

In order to establish the quality of Roial fruit, the firmness, the dry matter content and the soluble solids contents were measured for both unripe and fully ripen fruit (Figure 2).

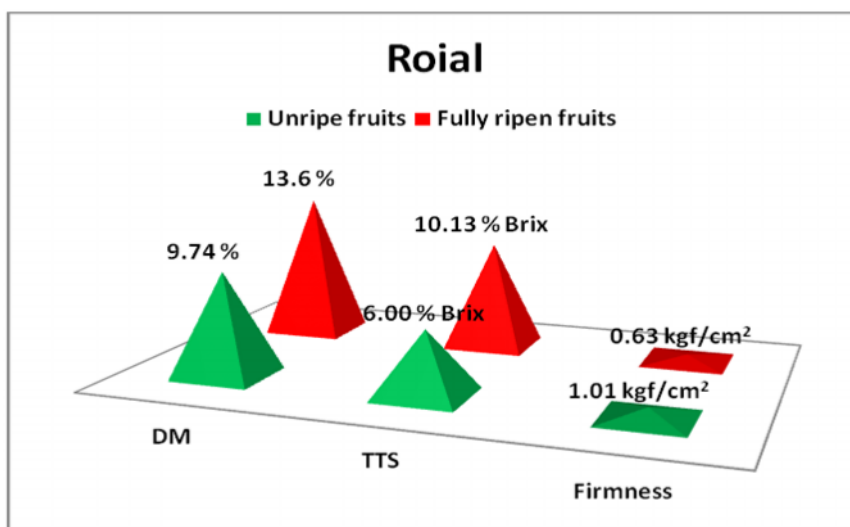


Figure 2. Dry matter content percentage, soluble solids content percentage and firmness of Roial cultivar

A rapid decrease of fruit firmness during fruit ripening has been observed in this study. Therefore the mean value for fruit firmness at harvest maturity (unripe fruit) was 1.01 kgf/cm², it has progressively decreased during ripening up to the 0.63 kgf/cm². Similar results regarding the firmness of peppers fruit were reported by [4, 5].

According to [13], colour change and TSS complemented with fruit firmness were reasonable indicators of maturity of pepper fruit. Throughout the vegetation period the soluble solid content increased from 6.00 % Brix for unripe fruits to 10.13% Brix for fully ripen fruits. The same result were observed in terms of dry matter content, the fully ripen fruit registered a higher value (13.60 %) of dry matter content compared to unripe fruits (9.74 %).

At physiologically maturity, due to the high dry matter content and large fruits with thicker pericarps, Roial variety can be recommended to be used for chili powder. At harvest maturity, Roial variety can be used for fresh consumption due to his moderately pungency.

Conclusions

The researches have been completed so far with obtaining of a new variety of hot peppers that has been registered in the Official Catalogue of Species and Varieties of Cultivated Crops under the name 'Roial'. The variety has a distinct phenotypic expressiveness with a high yield and quality potential. It can be used for food industry or for fresh consumption due to his moderately pungency, also it can be used for chili powder. Currently, the variety is in a conservative selection process and it is important to evaluate the expressiveness of the main characters in order to keep the variety in optimal parameters and at the same time to preserve the purity of the variety.

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