

EXPRESSINESS OF THE MAIN CHARACTERISTICS IN 'DECEBAL', A LONG PEPPER VARIETY

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Abstract

The research carried out at Vegetable Research and Development Station Buzău showed that among the heirloom varieties grown in Romania there is a variety of chilli pepper, 'Cornul Caprei', which has been widely cultivated as a local landrace population on large areas especially between Buzău farmers. Over time, due to introduction into new varieties, it was depreciated in terms of distinguishing characters. That is why, from 2002, Vegetable Research and Development Station aim was to rehabilitate the variety. The research had been finalized in 2015 when 'Decebal' variety derived from the local landrace population of 'Cornul Caprei' was patented. The variety can be cultivated successfully in arable area or in greenhouse, it has a high production potential and it can be used fresh and preserved. The aim of this study was to evaluate the variability of the main characters in conservative selection process. The research undertaken at the Laboratory of Breeding and Biodiversity has shown that the margin of variability of the main character has progressively decreased from the selection field to base field.

Key words: 'Cornul Caprei', VRDS Buzău, *Capsicum annuum*, local landrace.

INTRODUCTION

For future crop development landrace accessions have long been recognized as an important source of genetic diversity for crop species. Landraces are also known as an important part of human cultural heritage and are stored in genebanks across the world. (Hagenblad, 2012).

For conservation and maintenance of plant genetic resources there are two ways of monitoring and evaluating the plant material: conservation *ex situ* and *in situ*.

Conservation *ex situ* stands for all conservation methods in which the species are taken out of their natural habitat and are kept in surroundings made by humans (gene banks).

The *ex situ* measures were necessary because of the rapidly increasing gene erosion of landraces (Hammer and Teklu, 2008). But, as Hammer (2003) states a lot of the material stored in gene banks are not in good condition and urgently needs to be rejuvenated. In addition to *ex situ* conservation, there is *in situ* conservation, in the ecosystem. This can occur in the natural habitat (wild relatives, endemic species) or in

locations where plants (landraces) have evolved (on farm = agro-ecosystems). In contrast to *ex situ* conservation in gene banks, where only a section of the whole diversity is covered, the *in situ* approach is able to save larger parts of biological diversity (Hammer et al., 2003). Concerns for *in situ* conservation have existed at Laboratory of Breeding and Biodiversity from Vegetable Research and Development Station Buzau since 1996.

For breeding purposes there is often used diversity of landraces, therefore at Vegetable Research and Development Station Buzau a program for improvement of landraces has been developing. Zeven (1998) proposed two types of local landraces: autochthonous (landraces native to the place where found, in a specific region) and allochthonous (a landrace that is autochthonous in one region introduced into another region and becoming locally adapted).

In vegetable basin Buzau for more than 200 years, the allochthonous landrace, 'Cornul Caprei', has experienced favourable growth and development conditions (Vînătoru et al., 2014).

However, over the years, due to introduction of new varieties of chilli peppers, due to the fact that no conservative selection has been made and the absence of a coherent breeding program, the local landraces has been aggressively exposed to the phenomenon of genetic erosion, reaching to the point where almost losing identity.

Research on the local landrace ‘Cornul Caprei’ had begun with the inventory of the genetic heritage in this species. As Brezeanu et al. (2015) states the success of pepper breeding depends on the sufficient genetic variability, but this variability must be in conventionally usable form.

During the program, a large number of biotypes were identified, and a number of three, referred as ascensions, 16, 17 A and 17 B were retained and the intermediate forms were excluded (Vînătoru et al., 2014).

The breeding program on ‘Cornul Caprei’ landrace consisted in a rigorous selection of the main feature and the ability to achieve pure lines in subsequent generations.

The breeding program has ended in 2015 and ‘Decebal’ variety, which comes from ascension 17 A was patented, a cultivar that faithfully carries the authenticity of ‘Cornul Caprei’ local landrace; the other two biotypes are currently in the final stage of breeding and will be soon proposed to be patented.

The aim of this study was to evaluate the variability of the main characters in the conservative selection process (selection field, progeny field and base field).

MATERIALS AND METHODS

The germplasm collection from the Vegetable Research and Development Station Buzau has a number of over 280ascensions structured in three groups regarding genetic stability: segregating, advance and stable.

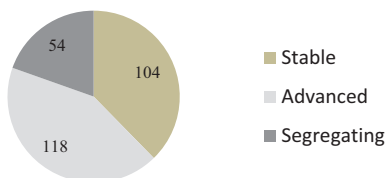


Figure 1. Germplasm collection status

‘Decebal’ variety was obtained by repeated individual selection with one choice. Since year 2016, was introduced into the conservative selection program.

Repeated individual selection with a single choice is used when the initial material consists of varieties and local landrace, where only elite plants are extracted once and only the most valuable descendants are retained (Selection scheme shown in figure 1).

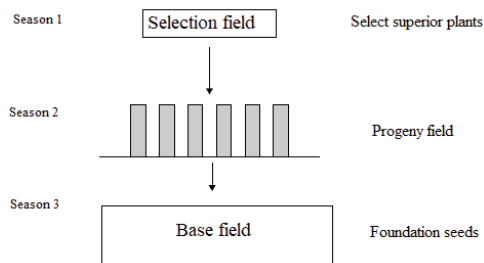


Figure 1. Selection scheme

The crop technology used was the one specific for chilli peppers. The seeds were sown in plastics pots with 70 cubes with a volume of 50 mL/cube in a mixture of peat and sand. The seedlings were planted 45 days after sprouting, in a sandy-loam soil, very well drain and the planting scheme used was 70x35cm. During plant vegetation different type crop techniques were taken into account: maintaining of soil moisture, manual and mechanical hoeing, cutting of the first flower, limiting the number of branches to a number of 3-4, eliminating of sterile shoots, fertilisations and plant protection, defoliating of basal leaves, plant kernel 40 days before plant suppression.

In selection field, a number of two hundred lines were retained following the evaluation of the main characters, succeeding that in progeny field a number of eighty-six lines from which and a number of forty-two lines were retained and mixed to form the base field.

Throughout the vegetation period from sowing to harvest period, biological checks were made and atypical plants, diseased plants and the one who did not fit into the specific phenophases of the variety or with different type of flowering were removed.

During the selection scheme (selection field, progeny field and base field), biometric and phenological observations were made with

emphasis on the main characters of the plants: fruit length (cm), fruit median diameter (cm), fruit weight (g), receptacle weight (g), seed weight (g), number of fruits/plant (pcs.) and total yield/plant (g).

Fruits were harvest at the full maturity. Each fruit was weighed individually and the numbers of seeds counted. Seeds were air-dried until constant weight and the weight of seed per fruit was noted.

Statistics indices used for each character were: the average ($\bar{x}$), standard deviation (SD), coefficient of variation (CV%), limits of variability ($\bar{x} \pm SD$) (Potlog and Velican, 1971).

RESULTS AND DISCUSSIONS

‘Decebal’ variety (figure 2) can be grown in greenhouse and in the field, in all pepper area crop favourable in Romania.

The variety has vigorous plants, with a height varying from 55 cm in the field and over 80 cm for the plant growing in the greenhouse. Bush diameter varies from 50-60 cm in the greenhouse and 35-40 cm in the field.



Figure 2. Crop view

Number of fruits per plant also differs from 12-16 fruits/plant in the greenhouse and 8-10 fruits/plant in the field. ‘Decebal’ has early ripening, with dark green fruits and orange-yellow at physiological maturity (Figure 3).

A distinctive character of the fruit is the slight crease that appears close to the receptacle.

The variety is distinguished by the stability and genetic uniformity of the main characters, especially by the quality of the fruits, represented by its pronounced taste and aroma. ‘Decebal’ can be used for fresh consumption and also for various types of industrialized preparations like: sauces, pickles, chilli

powder. A strong feature of this variety is that it can be preserved as pickles, alone or in various combinations, without losing its shapes.



Figure 3. Different maturity stage of fruit and longitudinal section of fruit

The variability of the main characters on selection fields was presented in table 1-3.

It has been noted that fruit length has an average value of 18,3 cm in selection field and during selection, in base field the value has seen an increase with 1,3 cm.

Table 1. Variability of the main characters at the variety of long pepper ‘Decebal’ in selection field

Character	$\bar{X}$	SD	CV %	$\bar{X} \pm SD$
Fruit length - cm	18,3	3,1	16,9	15,2-21,4
Fruit median diameter - cm	2,9	0,3	10,3	2,6-3,3
Fruit weight (g)	55,5	7,7	13,9	47,8-63,3
Receptacle weight (g)	7,3	0,4	5,5	6,9-7,8
Seed weight (g)	1,7	0,3	17,6	1,4-2,1
Number of fruits/plant	15	4,0	26,7	11-19
Total yield/plant (g)	1108	120	10,8	988-1228

Average fruit weight had also known an increase from 55,5 g in selection field to a value of 65,8 g in base field. Plant yield also grows from 1108 g in selection field to 1331 g in base field.

Table 2. Variability of the main characters at the variety of long pepper ‘Decebal’ in progeny field

Character	$\bar{X}$	SD	CV %	$\bar{X} \pm SD$
Fruit length - cm	19,1	2,7	14,1	16,4-21,8
Fruit median diameter - cm	3,2	0,3	9,4	2,9-3,5
Fruit weight (g)	61,2	8,4	13,7	52,8-69,6
Receptacle weight (g)	7,6	0,4	5,3	7,2-8,0
Seed weight (g)	1,9	0,3	15,8	1,6-2,2
Number of fruits/plant	16,5	3,5	21,2	13-20
Total yield/plant (g)	1210	95	7,9	1115-1305

The number of fruits/plant had a value of 15 fruits, followed by an increase of 16,5 fruits in progeny field and 19 fruits in base field.

Seed weight values varies from 1,7 g in selection field to 2,0 g in base field. There is a correlation between fruit weight and number of

seeds and its weight. The number and weight of seeds per fruit tended to be low, at first harvest, but thereafter followed the pattern of fruit weight. Khah and Passam (2002) noted that there is a strong correlation between fruit weight and seed weight. The coefficient of variation shows values ranging between 3,8-26,7%, which denotes a homogeneous population.

Table 3. Variability of the main characters at the variety of long pepper ‘Decebal’. PB in base field

Character	$\bar{X}$	SD	CV %	$\bar{X}\pm SD$
Fruit length - cm	19,6	2,4	12,2	17,2-22,0
Fruit median diameter - cm	3,4	0,2	5,9	3,2-3,6
Fruit weight (g)	65,8	5,4	8,2	60,4-71,2
Receptacle weight (g)	7,8	0,3	3,8	7,5-8,1
Seed weight (g)	2,0	0,2	10,0	1,8-2,3
Number of fruits/plant	19	3,0	15,8	16-22
Total yield/plant (g)	1331	94	7,1	1237-1426

CONCLUSIONS

‘Decebal’ variety fully respects the quality and the characteristic of the local landrace from which it originates, ‘Cornul Caprei’, but it also has an improved yield. The variety can be grown successfully in field and in greenhouse areas. Throughout the conservative selection process, there was a narrowing of the variability of the main characters from the selection field to base field. Data presented showed that ‘Decebal’ variety is stable and distinct within the normal variability. The variety has been successfully returned into the market, and the demands from farmers had grown significantly from year to year. The researches have been successfully completed by saving from disappearance this valuable allochthonous landrace.

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