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NEW BRED CULTIVARS OF BELL PEPPER OBTAINED AT V.R.D.S. BUZĂU

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Abstract

Among the vegetables grown in Romania, bell peppers occupies a priority place due to favourable pedo-climate conditions, especially in the southern area of the country, as well as of high demand from consumers and food-processor. In Romania, peppers has traditionally been field-grown and harvested at mature-green stage. Lately, as a result of worldwide producers, the expressiveness of colour and shape had greatly diversified and the demand for high-quality coloured peppers has led farmers to look at quality-pepper cultivars grown in greenhouse. Starting from these premises, the Breeding Laboratory at Vegetable Research-Development Station Buzău approach a new theme aimed to obtain new cultivars with high yield potential and distinct phenotypic characteristics. Besides evaluation of yield potential, a particular emphasis has been focused on obtaining varieties that has different shapes and colours. Research has been completed by far with the achievement of new cultivars with colour ful fruits like orange, chocolate and indigo.

Key words*: breeding, Capsicum annuum L., Romania, coloured pepper.*

INTRODUCTION

In the past, in Romania, farmers limited themselves and had cultivated only traditional varieties of peppers, but now, as a result of imported seeds and imports of different kind of peppers, the expressiveness of colour and shape has greatly diversified.

Pepper (*Capsicum annuum* L.) is an important vegetable crop worldwide and can be consumed in many colours green, red, yellow, orange, or brown when ripe (Ilić et al., 2014). Improvements made in pepper breeding sector have allowed a diverse and large number of varieties into the market with distinct expressivity in accordance with direction of use. Peppers can be used fresh in salads, cooked in different dishes, used as a hot or sweet spice, and also in the industry, for pickles and different kind of preserves. They are fast gaining popularity, not only for their attractive colours, characteristic taste and aroma, but also for their health-promoting properties.

Peppers exhibit great genetic diversity in terms of colour, size, shape and chemical composition and therefore vary greatly in their antioxidant properties, vitamins and other phytochemicals (Chuah et al., 2008). According to a study, the colour of bell peppers is the major factor associated with the consumer purchasing decisions (Frank et al., 2001). Starting from these premises, Breeding Laboratory from Vegetable Research-Development Station Buzau, had approached a new theme aimed to obtain new genotypes with high yield potential and distinct phenotypic characteristic. So far, V.R.D.S. Buzau has a valuable collection of germplasm of peppers. Acquaah (2012) states that germplasm needs to be periodically rejuvenated and multiplied, because it represents the life of plant breeding and without it, this activity could not be carried out. Thus, it is used a genetic material for breeding and can itself be improved in order to increase the performance of the biological material obtained.

Any breeding process begins by collecting the genetically diversified germplasm that must incorporate a sum of features useful for the objectives pursued. The results obtained are determined by a large extent and abundance of genetic sources, by the combination of useful genes of which accumulation is sought in the organisms created. (Leonte C.N., 2011).

In this study, a special emphasis was placed on obtaining new genotypes of bell peppers with different shapes and colours, compared to the known ones, while evaluating their yield potential.
One important part in the breeding sector is the evaluation of the germplasm collection and the comparison between a few superior candidate genotypes to select one or more to be released as cultivars. The goal of this research was to evaluate four ascensions and to study their potential to identify the most promising one.

MATERIALS AND METHODS

Researchers who are working in the breeding sector have to choose between hundreds of plants in a segregation population to select only a small fraction of promising plant to be used in the advanced program. So far, V.R.D.S. Buzau has ended with the achievement of a valuable germplasm collection and has a number of 214 Capsicum genotypes, structured in three groups regarding genetic stability: segregating, advanced and stabile.
From a number of 42 varieties of *Capsicum annuum* var. *grossum* L., there have been selected 4 ascensions (A 60, A 62, A 66 and A 68) with distinct phenotypic characteristics. Afterwards they have been genetically stabilized by specific, long term breeding work.
On 7th March the seeds were sown in seedling trays with 70 cells, in a substrate with white peat and added nutrients. In the 3rd of May they were transplanted in a greenhouse.
The specific care work was respecting the crop technology and it was added the special techniques that consisted in handling the bell pepper shoots and the removal of the first floral button.
For reducing the damage caused by high temperatures and sunburn, starting from 15th of June, a shading net had been mounted on the top of the greenhouse. This had led to a decrease of damage caused by flower abortion and sunburn fruits. In this study, there were analyzed one hundred plants for each experimental variant.
During the vegetation period, phenological and biometric observations were made according to IPGRI standards for *Capsicum* spp.

RESULTS AND DISCUSSIONS

Sowing was made on 7th March 2017 and after 12 days A 60 was the first one who sprout, with a germination percentage of 88%, it was followed by A 68 with the highest germination rate, 95%, afterwards A 62 had the lowest germination percentage only 81% and the last one who sprout was after 17 days A 66 with a germination rate of 91%.
Laboratory germination was also made and in Figure 1 can be observed the difference between the two of them.

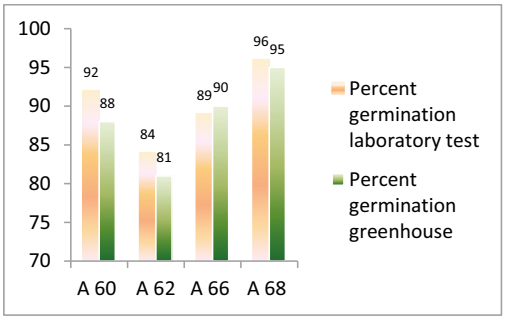

Figure 1. Germination results

Overall, at the beginning, the seeds germinated more slowly in the greenhouse than the lab. The highest difference was recorded by A 60, with a decrease of 4% towards laboratory germination value.
The ascensions A 62, A68 were also followed by a decrease towards laboratory germination value. The germination conditions in the lab are very controlled compared to the greenhouse; this may explain why there were some differences between germination results.
Only A 66 has recorded a 1% higher than laboratory germination analyses, but it has sprout at last. The peculiarities of climatic zoning for Buzau in 2017, was that in the second decade of April, there have been snow and ice frosts, for why vegetable crops had delayed till 15 days.
Planting was made in greenhouse on 3rd May 2017, when the seedling has reached the optimum planting age and the climatic conditions were favourable.
Plant growth habit on **Ascension 60** (A 60, Figure 2) was intermediate and has recorded an average height of 85 cm (stage 4 in IPGRI descriptors).

Figure 2. Ascension 60, plant view

Bell pepper fruit set percent was high, even on high temperature during summer. The imamture fruit is dark, indigo-black, crispy, aromatic and can be consumed fresh or cooked. At physiological stage fruits are red. When fruits turn red they have a sweet and strong aromatic flavour. More details about fruit characteristics can be found in Table 1. The root system is medium developed and shows medium resistance to pests (*Meloidogyn*e spp.).

Table 1. Fruits characteristics

Studied character	A 60	A 62	A 66	A 68
Fruit colour at intermediate stage	Indigo-black	Dark green	Intense indigo-black	Green
Fruit colour at mature stage	Red	Orange	Dark red	Brown
Fruit average length (cm)	10.62	8.71	7.99	11.68
Fruit average width (cm)	10.12	8.53	9.23	7.83
Fruit average wall thickness (mm)	9.83	6.93	6.10	6.45
Fruit average weight (g)	158.1	142.1	133.5	130.03
Fruit average pulp weight (g)	124.8	142.1	114.9	119.73
Fruit average receptacle weight (g)	33.3	23.2	18.6	10.3

Ascension 62 (A 62, Figure 3) has a intermediate plant growth habit, with an average height over 92 cm (stage 5 in IPGRI descriptors).

Figure 3. A 62, plant view

Fruit set was medium during hot summer. Unripe fruit has a dark-green colour and orange colour when ripe. As an important notice, it has been found that fruit tend to lose their flavour on their ripening process. The root system has a medium vigour and a medium to weak resistance to pest. There was a slight attack of nematodes on the roots (*Meloidogyne* spp.), but did not influence in a significant percentage the yield.

Ascension 66 (A 66, Figure 4) has recorded the lowest average height from studied ascension and fits to the lower limit of IPGRI descriptors (75 cm).

Figure 4. A 66, plant view

Observations made have shown that this ascension grows well and fruit set in vary conditions. It has recorded very good results on high temperature during summer and also on low temperature during autumn (October). Intermediate fruits are darker in colour than A 60 and at physiological stage turn dark red. The fruit taste is good, full of flavour in both ripening stages. The root system is vigorous and shows medium resistance to pest (*Meloidogyne* spp.).

Plant growth of **Ascension 68** (A 68, Figure 5) was intermediate, with a average height over 85 cm, according to IPGRI descriptor in 5th stage.

Figure 5. A 68, plant view

Fruit set is medium during high temperature in the summer. On intermediate fruit stage, the fruits are green and, as they ripen, they turn brown. Fruits have gone pretty fast to brown colour. The fruits had been remarkable by its taste and aroma. Root system is medium developed and has a medium pest resistance (*Meloidogyne* spp.).
In figure 6 are presented fruits in different ripening stages.

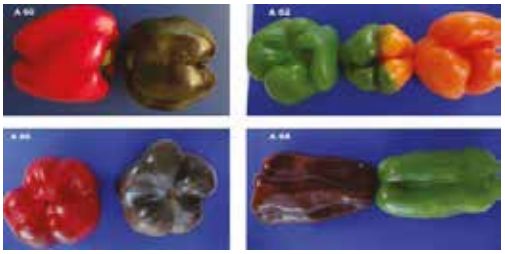

Figure 6. Fruits in different ripening stages

Regarding yield potential, an assessment of quality and quantity of yield was made for each studied genotype. In relation to yield quality, the fruits were separated in: first, second and third class. Records of obtained yields of all ascension are found in Table 2.

Tabel 2. Obtained yield

Ascensions	A 60	A 62	A 66	A 68
Fruit average weight, 1st class (g)	224.4	186.4	180.7	179.1
No fruits 1st class	8	9	12	10
Average Yield of 1st class/plant (g)	1779.2	1677.6	2168.4	1791
Fruit average weight 2nd class (g)	150	140	120	120
No fruits 2nd class	6	7	8	8
Average Yield of 2nd class/plant (g)	900	980	960	960
Fruit average weight 3rd class (g)	< 100	< 100	< 100	< 100
No fruits 3rd class	6	5	12	7
Average Yield of 3rd class/plant (g)	599.4	499.5	1198.8	699.3
Yield/plant (g)	3278.6	3157.1	4327.2	3450.3
Yield/plant (kg)	3.28	3.16	4.32	3.45

First-class fruits had the organoleptic characteristics of the variety, were uniform in colour, taste, appearance, texture and size. Ascension 66, has recorded a medium yield potential with a value of 2.168 kg/plant, and the smallest one was registered by Ascension 62 with 1.677 kg/plant. Fruits of smaller size and with minor flaws had been included in the second class and the registered average yield varies from genotype to genotype. The highest yield was recorded by A 62, with a value of 0.98 kg/plant and the lowest yield was reported by A 60 with a average yield of 0.9 kg/plant.
As a result of long vegetation period of bell pepper in Romania, it was found that all studied ascensions have a high yield potential, but some of them do not reach full ripening. In this study it has been framed as a 3rd class yield, a yield that cannot be marketed due to unripening of the fruits and their smaller size. For all ascensions, fruits bellow 100g were included on the 3rd class. The highest yield for the 3rd class was registered by A 66 with a value of 1.19 kg/plant and the lowest yield was recorded by L 62 with only 0,499 kg/plant. More details about yields registered by other ascensions can be found in Table 2. Recording a large number of fruits from the 3rd class has led to the conclusion that the varieties can also be grown in a prolonged cycle in a heated greenhouse and in this case, the yield of first and second class will have a significant increase. Regarding total yield potential of ascensions the record was owned by A 66 with a value of 4.32 kg/plant and the lowest yield was reported by A 62 with a 3.16 kg/plant.

CONCLUSIONS

The absence of national cultivars of bell pepper with different colour adapted to Romanian pedo-climate conditions motivated the beginning of this research at V.R.D.S. Buzau. In the study, four ascensions were examined with distinct phenotypic characteristics which will be enrolled and tested at ISTIS to be patented. Ascension 68 had distinguished by a special colour with a distinctive flavour and a potential yield plant of 3.45 kg/plant. It is well-known that bell pepper fruit set is very sensitive to environmental condition, in particular, to low or high temperatures that can affect pollen development and another dehiscence. From all studied genotypes, Ascension 66 has recorded the highest fruit set in extreme conditions and the highest yield, 4.32 kg/plant. Ascesion 60 was noted with earlier fruits and a yield of 3.28 kg/plant. The

lowest yield potential was recorded by Ascension 62, with only 3.16 kg/plant.

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