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ACHIEVEMENTS IN PEPPER BREEDING AT RESEARCH DEVELOPMENT INSTITUTE FOR VEGETABLE AND FLOWER GROWING - VIDRA

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Abstract

Pepper is one of the annual vegetable species occupying large areas both in open field and in protected areas. In our country there are cultivated several types: bell pepper, round pepper, long pepper for fresh consumption, paprika peppers and hot peppers. During 1980-2016, the Research and Development Institute for Vegetable and Flower and Vegetable Research Stations from Arad, Bacau, Buzau and Işalnița were obtained a large number of varieties of peppers of all types mentioned. At present, as a result of lower research funding, work to improve the pepper longer takes place only at the Institute Vidra and research vegetable stations Bacau and Buzau. Among the latest creations of the institute include varieties of sweet bell pepper: mid early Asteroid 204 (fruit of 120-210 g and yielding ability of 43-51 t ha) and Cornel 209 (fruit of 150-250 g. and yielding ability of 50-53 t/ha) and varieties of bell pepper: Bârsan (mid-early with conical fruit) and Vidra 9 (mid-late, fruit cordiforme, slightly elongated). All four varieties are more requested by the producers of vegetables for their high production potential, high quality fruit and good behavior to unfavorable biotic and abiotic factors.

Keywords: pepper, breeding, new varieties, yielding ability.

1. INTRODUCTION

Pepper is one of the annual vegetable species occupying large areas both in open field and in protected areas. Among the vegetable species cultivated in our country, the pepper (*Capsicum annuum* L.) plays an important role, having many uses. The pepper fruits can be consumed fresh and present a great importance for their high nutrition value and the fact that the vitamins are wholly used by the human body (Sbîrciog, 2012).The fruits' chemical composition is very complex. The content of C vitamin depends on the fruits maturity degree, colour and size (Ciofu et al., 2003; Sbîrciog, 2003; Somos,1984). The culture conditions influence the content of C vitamin, this being higher for the field cultures, as compared to greenhouse cultures. There is a big diversity worldwide as to the types and hybrids of the pepper culture, with different shapes and colours of the fruits, depending on the consumer's taste (Pintilie, 2004). In our country there are cultivated several types:

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bell pepper, round pepper, long pepper for fresh consumption, paprika peppers and hot peppers. During 1980-2016, the Research and Development Institute for Vegetable and Flower and Research Station from Arad, Bacau, Buzau and Işalnița were obtained a large number of varieties of peppers of all varieties mentioned.

At round pepper the mentioned research units have obtained many varieties from which are *Creola, Asteroid 204, Cornel 209, Splendens.*

At bell pepper the new varieties are Dariana Bac, Dariochea, Vidra 9, Bârsan, Arum, Buzău 10, Galben Superior (Yellow Best).

The most known varieties of long pepper are Ionel, Cosmin, Bogdan, Lung de Işalnița, Işalnița 85, Oranj and for chilli pepper Jovial and Vladimir.

At present, as a result of lower research funding, work to improve the pepper longer takes place only at the Institute Vidra and research vegetable stations Bacau and Buzau.

In order to obtain pepper varieties or hybrids that meet the requirements of growers and consumers, must set objectives and specific targets for breeding. The main general objectives of breeding peppers are fruit quality, resistance to pathogens, earliness and vigor, yielding capacity, stress tolerance, plant morphology. In addition to general objectives of improving, there are several specific objectives for pepper. An important objective remains uniformity of fruit on the form, color, flavor, thick pericarp, etc. Each type of pepper (round pepper, long pepper and paprika, chili, cayenne pepper or other) has its own requirements for improvement and researchers worldwide have obtained dozens of different varieties in each category. Breeders attach increasing importance of quality nutrition. Pepper is potentially an excellent source of antioxidants and other phytochemicals compounds with favorable effect on human health. They were created many cultivars with high and uniform level of ascorbic acid, flavonoids and carotenoids. Breeding teams are very concerned about the introduction of disease resistance. Thus, viral diseases have made good progress in the knowledge of the genetic basis of resistance and the introduction of these resistors. Have been introduced resistance to the TMV resistance (*from C. frutescens*) PMMV (from *C. chinense*), potato virus Y, CMV (*from C. baccatum*).

Research on resistance to *Xanthomonas campestris pv. vesicatoria* showed that there are several sources of resistance by hypersensitivity conditioned by by genes *Bs (Bs 1-Bs 6*). A part of these genes were transferred into commercial cultivars. Resistances to *Leveillula taurica* and *Phytophthora capsici* proved polygenic type and have not done varieties with safe resistance to these pathogens. Regarding resistance to root nematode *(Meloidogyne*) were discovered two resistance genes N, which have been transferred to some cultivars. These genes do not give resistance in all conditions and is looking for new sources of resistance. Shape and color of the fruit depends heavily on the type of pepper to be improved and consumer requirements.

Flavor and aroma of the fruit it is also very important at pepper. There are a large number of aromatics, sugars and acids that affect the taste and aroma and improvement for these characters is often subjective.

There are some breeding programs for a number of biochemical compounds in the fruit, other than capsaicin.

This is a complex character that depends on biotic and abiotic stress resistance and biological production potential. All these elements have their own genetic complexity. Progress in the second half of the 20-th century in getting pepper cultivars are remarkable. This was driven by a combination of increasing consumer demand for high quality products and expansion of vegetable seed production industry on a global scale. Obtaining of pepper hybrid seeds has led to an explosion of new cultivars in the last 25-30 years.

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The importance of obtaining open-pollinated varieties cannot be diminished because these types serve as the genetic basis for most cultivars. In many countries and also in Romania, open-pollinated varieties still hold an important position in commercial production.
Male sterility is a character wanted by breeders to get parent lines that can be used to create F1 hybrids with heterosis effect. Two recessive genes were found to nuclear male sterility, and they were used for the production of commercial hybrids.
Cytoplasmic male sterility, although it was discovered in peppers, is little used due to its instability.

Breeding Methods

Pepper (*Capsicum annuum*) is considered rather autogamically although some research show that depending on the variety and growing area, the degree of cross-pollination range from 2% to 90%. Breeders use very different scheme for improvement: mass selection, pedigree breeding, SSD, recurrent selection, backcross and induction of mutations.
Just mention here that the backcross method's use is absolutely necessary for the introduction of a disease resistance gene, a process that lasts for 6-8 generations. Biotechnologies in pepper breeding programs presents interesting and there are useful results in genetic mapping. A complex team with researchers from many countries has failed to develop a genetic map of the specie, which includes 2262 markers, which is now available to all researchers. The map is of great interest to breeders, presenting all discovered resistance genes and molecular markers that can be used in breeding programs.
Progress on genetic engineering peppers are modest compared to other species, though some results are noticeable. Experimental genotypes were obtained with inclusion of the *bar* gene for resistance to glyphosate, multiple resistances to disease genotypes and genotypes that include genes for drought resistance. Breeders can use these genotypes to create valuable cultivars, which in addition to the characters or qualities mentioned will have high production capacity, high quality fruit and organoleptic characteristics demanded by consumers.

2. MATERIALS AND METHODS

The research was made during 2005-2013 at RDIVFG Vidra as part of the research topic and aimed to obtaining some new pepper cultivars (varieties and hybrids), with higher productions as compared to the current genotypes, which should be resistant to biotic and abiotic factors. The studies aimed at assessing the biological material obtained, in order to select the most valuable genotypes to be tested within the SIVTR network.
The biological material was formed of round pepper lines, bell peppers lines and long peppers lines, obtained from the intraspecific pollination among valuable pepper varieties and lines, followed by the pedigree selection and bulk positive selection yearly repeated, until F7 generation. During the vegetation period, various observations and biometrical determinations have been performed as per the UPOV sheet. In order to establish the production potential of the new red pepper genotypes, the harvest and record of the yield was made in dynamics, by determining the total average yield (t/ha) and relative yield (%). The production data were statistically processed by way of variant analysis, while the level of significance of the production differences was established by means of the difference limit.

3. RESULTS AND DISCUSSIONS

As a result of the work of breeding at RIDVFG Vidra were achieved in production two new round pepper varieties Asteroid 204 (*Figure 1*) and Cornel 209 (*Figure 2*). Both varieties are mid early, with 134-144 days from emergence to the first harvest, for the variety Asteroid 204 and 137-147 days for the variety Cornel 209. The fruits average is 120-210 g at Asteroid 204 and 150-200 g at

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Cornel 209, with thick pericarp, up to 12 mm. Yielding ability: 43-51 t/ha for variety Asteroid 204 and higher for variety Cornel 209, reaching up to 53 t/ha. At bell pepper type, were obtained Bârsan (***Figure 3***) and Vidra 9 (***Figure 4***), the first is mid-early and the second mid-late. The fruits of Bârsan variety are medium in size and conical, red at the physiological maturity and the variety Vidra 9 fruit is cordiforme, more heavily than fruits of Bârsan. Yielding ability in open field conditions is 45-48 t/ha. All four varieties are resistant to TMV and high tolerance to *Verticillium dahliae* and *Alternaria capsici* .

Figure 1 **- ASTEROID 204**

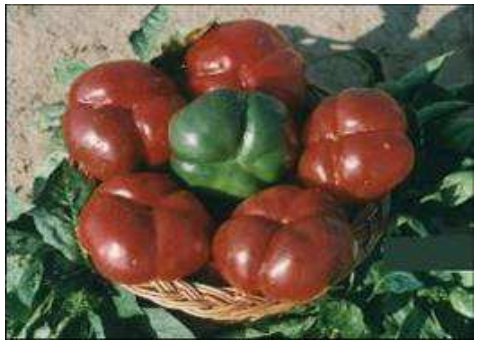

Figure 2 **- CORNEL 209**

Figure 3 **- BÂRSAN 204**

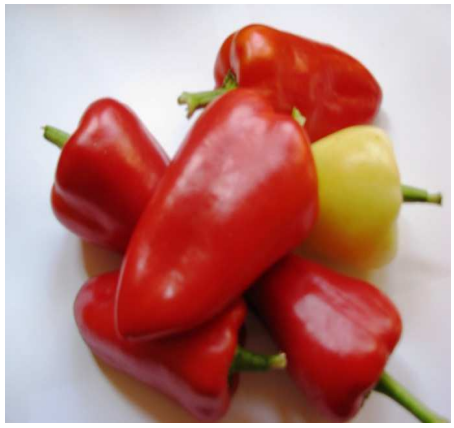

Figure 4 **- VIDRA 9**

4. CONCLUSIONS

Among the latest creations of the institute include varieties of sweet bell pepper mid early Asteroid 204 (fruit of 120-210 g and yielding ability of 43-51 t ha) and Cornel 209 (fruit of 150-250 g. and yelding ability of 50-53 t/ha) and varieties of bell pepper Bârsan (mid-early with conical fruit) and Vidra 9 (mid-late, fruit cordiforme, slightly elongated). All four varieties are more requested by the producers of vegetables for their high production potential, high quality fruit and good behavior to unfavorable biotic and abiotic factors.

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