Results in potato breeding department of potato research and development station Targu Secuiesc

Baciu Anca¹, Mike Luiza¹, Popa Daniela¹, Nemes Zsuzsanna¹

¹Potato Research and Development Station Targu Secuiesc, Romania

*Corresponding author. Email: anca.mihab@gmail.com

Abstract

Potato, from the breeding point of view, presents the following biological physiological specific features: vegetative multiplication, heterogeneity of progenitors', large plasticity, sterility, incompatible to hybridization, excessive sensibility to diseases. The first three specific features advantage the breeding process on a large scale, but the last two thus complicates the breeding activity and constitutes important problems to success.

The breeding of potato has as permanent objective the obtaining new varieties with high yield capacity, with high resistance to diseases and pest, with high quality, which have to give the satisfaction to consumers.

The creation of new potato varieties is a continue process, which has to take into account the change of ecological conditions, with increase of aggressively and pathogenity of diseases and pest, apparition of rases, stems, brotypes, pathotipes, as well as the continue increasing of consumers demands.

Key words

Potato, cultivars description, breeding

Founded in 1981 la as a special requirement of county administration for development of potato industry in Covasna County, the Potato Research and Development Station Targu Secuiesc had in administration 1482 ha of agricultural land till 1990. After this year, the area of the station has been progressively diminished till 367.01 ha, as a public a domain, according the HG 1460/2006.

The main direction of research and development:

* Breeding of new varieties for fresh consumption and processing, with high agronomical characteristics, adapted to ecological conditions of Romania;
* Selection of maintaining and multiplication of clonal material from the new potato varieties obtained in Romania in the mountain condition (over 1200 m a.s.l.);
* Seed potato production of high grades;
* Testing the storage capacity of new varieties;
* Extension and transfer of research and development results.

The breeding of potato is a main and permanent activity to supply new performant varieties, for certain periods.

The main objectives of breeding are consist in creation of new varieties for fresh consumption and processing, with high yield capacity, with high resistance to diseases and pests (late blight, viruses, potato wart, nematodes etc.) and with good characteristics of quality (physical, chemical, culinary and technological).

For potato crop, a good variety with a high quality of seed potato is the main factor, with a contribution of 40 – 60% for obtaining high yields.

The main research activities performed in the Targu Secuiesc Depression had the aim to established the yield capacity of new breeding lines and varieties of potato in the network of research, the dynamics of yield performing, the resistance to viruses and potato wart (Synchytrium endobioticum) the content of starch and culinary quality, and testing of these in different soil and climatic conditions.

In the field of potato breeding in the frame of S.C.D.C. Targu Secuiesc, the result has been materialized in:

- 11 homologated potato varieties: Productiv, Ioana, Armonia, Speranta, Star, Nemere, Coval, Redsec, Milenium, Luiza and Mikel;
- 1 potato variety under way of patenting: Nemere;
- 8 patented potato varieties: Coval, Redsec, Milenium, Luiza, Ioana, Armonia, Speranta and Mikel.

During 1999 – 2009 have been tested 65 potato breeding lines in the network of National Institute for Testing and registration (I.S.T.I.S. Bucharest) and 11
potato varieties of Potato Research and Development Station Targu Secuiesc had been homologated.

**Materials and Methods**

All varieties are obtained by sexual hybridization followed by individual clonal selection, according to the classical scheme of potato breeding – 12 years.

The main steps of working method were:
- Established of genitors according to physiological and technological qualities of tubers with destination for processing;
- Sexual hybridization, followed by all steps: seedlings, vegetative populations, descendants, comparative crops for completion (3 years in the network of research units and 3 years in the network of National Institute for testing and Registration of Varieties / ISTIS) and selection for maintaining in the field of clonal selection on over 1000 m a.s.l. (Red Water);

**Results and Discussions**

**Potato variety COVAL**

Genitors (BOBR X SUPER)

**Morphological characters:** Tubers have round – oval shape. Color of skin and pulp is yellow. Stems are erect. Leaves are semi compact with middle size foliols, green clear. Flowers are white and big.

**Physiological characteristics:** The vegetation period is 90 – 100 days (middle late variety). It is resistant to PVY and nematodes (*Globodera rostochiensis*) and middle tolerant to late blight (*Phytophthora infestans* (Mont.) de Bary).

**Culinary quality:** It has a good culinary quality (group B). It is recommended for consumption during autumn and winter.

**Yield capacity:** It has a high yield capacity (47.8 t/ha).

**Zoning:** Coval variety is recommended for very favorable zones of potato production.

**Potato variety REDSEC**

Genitors (M.P.I. 61-516-20 X CERTO)

**Morphological characters:** Tubers have round shape. Color of skin is red and color of pulp is yellow.

**Culinary quality:** It has a good culinary quality (group B). It is recommended for consumption during autumn and winter.

**Yield capacity:** It has a high yield capacity (47.8 t/ha).

**Zoning:** Redsec variety is recommended for very favorable zones of potato production.
are semi compact with big folios, green clear. Flowers are white reddish and big.  

**Physiological characters:** The vegetation period are 100 – 110 days and this variety belonging to middle late varieties. It is resistant to PVY and tolerant to late blight (*Phytophthora infestans* (Mont.) de Bary).

**Culinary quality:** It has a good culinary quality (group B). It is recommended for consumption during autumn and winter.

Yield capacity: It has a high yield capacity (44.3 t/ha).

Zoning: *Redsec* variety is recommended for all favorable zones of potato production.

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**Potato variety MILENIUM**

**Genitors (FANAL X OMEGA)**

**Morphological characters:** Tubers have round – oval shape with shallow eyes. Color of skin and pulp is yellow. Stems are tall. Leafs have middle size foliols, green clear. Flowers are white.

**Physiological characters:** The vegetation period are 100 days and this variety belonging to middle late varieties. It is resistant to PVY and sensitive to late blight (*Phytophthora infestans* (Mont.) de Bary). It is resistant to cist nematodes (*Globodera rostochiensis*).

**Culinary quality:** It has 18.53% starch content and belongs to C group. It is recommended to winter consumption and processing.

**Yield capacity:** It has a high yield capacity (38.1 t/ha).

**Zoning:** *Milenium* variety is recommended for all favorable zones of potato production.
Potato variety LUIZA  
Genitors (FANAL X OMEGA) 
Morphological characters: the plant is well developed, with a medium number of stems; the flowers are big and have white colors. The tubers are oval, with no deep eyes, the skin is yellow and the flesh is yellow. The sprouts have a middle size, they have a conic shape at the beginning of development and cylinder shape later, the terminal bud have a red – violet colors, with short lateral ramifications. 
Physiological characteristics: Luiza variety belongs to the group of middle late varieties, with a vegetation period of 85 – 100 days. 
Yielding capacity: was tested at the Station for Agriculture Research Braila and it is over 52.5 tones/ha.

Culinary quality: is very good and belongs to B class, recommended to production of chips, having a yellow color, after frying and 7 rate on a scale from 1 to 9. The content of starch is over 20%. This variety can be used for pommes frites production. 
Resistance to diseases and pest: Luiza variety is middle sensitive to late blight on leaves and tubers, very resisting to Y (PVY) and leaf roll (PLRV) viruses, resisting to potato cyst nematodes (Globodera rostochiensis).

Potato variety ALBIOANA  
Genitors MPI 69 x CARPATIN 
Morphological characters: the plant is well developed, with a medium number of stems; the flowers have a middle size and white colours with dark yellow anther. The tubers have a round shape, with yellow skin and white flesh, which is very rare and confers a high quality of chips production. 
Physiological characteristics: Albioana variety belongs to the group of middle late varieties, with a vegetation period of 90 – 100 days. 
Yielding capacity: was tested at the Station for Agriculture Research Braila and it is over 56.2 tones/ha.

Culinary quality: is good and belongs to B class, suitable for chips production, the colours of chips after frying is white, obtaining 9 rates on scale from 1 to 9. The content of starch is over 19%. 
Resistance to diseases and pest: Albioana variety is resisting to potato cyst nematodes (Globodera rostochiensis), middle resistance to late blight on leaves and tubers, resisting to viruses Y.
Potato variety GARED

Genitors: DESIRÉE X ROESLAU

Morphological characters: the plant is vigorous with a large number of stems and belongs to foliage type. The leaves have a medium size with light – green colour. The flowers have a medium size, having a violet colour with white points. The tubers have a short oval shape with shallow eyes. The colour of skin is red and the colour of flesh is cream. The sprouts have a conic shape with middle size and red – violet colours on the base of sprouts. The bud of sprout on light is half open and porosity is dense to very dense.

Physiological characteristics: Gared variety belongs to the group of late varieties, with a vegetation period of over 110 days.

Yielding capacity: was tested at the Station for Agriculture Research Braila and it is over 67.0 tonnes/ha.

Culinary quality: is good and belongs to B class. Gared variety is very suitable for pommes frites production. The content of starch is over 19%.

Resistance to diseases and pest: Gared variety is resisting to late blight on leaves and tubers, is resisting to leave roll virus (PLRV) and tolerant to virus (PVY). It is resisting to potato cyst nematodes ($Globodera$ rostochiensis), and black wart ($Synchitrium$ endobioticum).

NATIONAL CENTER FOR MAINTAINING OF POTATO VARIETIES RED WATER, COVASNA COUNTY

A large number of potato varieties and distinguished breeding lines disappeared as an effect of nonfavourable climatically conditions and especially by viruses diseases, as well as other biological and viruses degeneration. To avoid the negative effect of degeneration on potato varieties and distinguished breeding lines, the method of selection for maintaining and multiplication of potato is applying in Romania in the frame of National Center for Maintaining of potato
varieties and distinguished breeding lines *Red Water,* Covasna County, which belong to the Station for Research and Development of Potato, Targu Secuiesc, Covasna County.

In this center are maintained and multiplied all distinguished varieties and breeding centers from Romania (National Institute for research and Development of Potato and Sugar beet Brasov, Research and Development Station for Agriculture Suceava, Research and Development Station for Potato Targu Secuiesc, Research and development Station for Potato Miercurea Ciuc).

Using the method of selection for maintaining it is possible an early identification of somatic mutations, disease (especially viruses) infection by visual elimination or by serological testing.

The viruses’ infection of potato leads to disturbed the metabolism of plants and produces anatomical – morphological alters as: mosaic, crinkle, rolling, browning of leaves and plants deformation.

The disturbing of plant metabolism has as negative effect the reduction of vegetation period, decreasing the yield capacity, depreciation of physical and chemical quality of tubers.

The genetically complex structure of cultivated potato (2n = 4x = 48) and strong segregation of long – expected characters in the obtained future progeny by sexual hybridization, complicated many times by nonfavourable linkage, are the backgrounds for initiation of maintain selection.

The selection of maintaining is defining as an amount of technical and organisational measures in the aim to maintain the biological purity (100%), typical characters and low viruses infection (0.2%) of new potato breeding lines and varieties.

This method offer the possibility of early recognizing of somatic mutation and infected plants with viruses and other diseases and removing of nontypical and infected clones.

The aim of the method is to avoid the disappearance of potato varieties or valuable breeding lines through viruses’ degeneration and somatic mutation.

The main objective of this method is to maintain in a natural isolation, in the mountains (over 1000 m a.s.l.), the national collection of potato varieties and new breeding lines, and multiplication of the best of them for promotion in the national system for seed potato production.

The selection field is situated in a high intermountain’s depression (Red Water Depression) in the Nemira Mountains, on the north of Targu Secuiesc Depression and on 5 – 6 km west of the mountain peak Sandru Mare, on the elevation of 1010 – 1025 m a.s.l.

The area of the field is 21.39 ha and is protected by fence of iron net.

**Conclusions**

The potato varieties LUIZA, IOANA and MIKEL have a good capacity of yield, are very well adapted to soil and climate condition of Romania on the base of testing activity on the network of the National Institute for Testing and Registration of Varieties (ISTIS) before homologation.

Thanks to the high content of starch and good culinary and technological qualities, all varieties are suitable to production of chips and pommes frites.

The high resistance to viruses Y (PVY) and leaf roll (PLRV) permits the multiplication of seed potato a longer time and obtaining a more profitable yield.

The utilization of complex fertilizer (15:15:15) is efficient till $N_{150}, P_{150}, K_{150}$ level, when is possible to obtain maximum clear profit.

The material and intelligence effort during the breeding activity, 12 years according to classical scheme, is disturbed by the pressure of viruses’ infection which constitutes the viruses’ degeneration and decrease of yield capacity of potato.

With all preventive measures (isolation of potato field from viruses infection sources, chemical treatments against aphids, elimination of viruses infected plants) during breeding process of potato, the viruses infection of biological material is higher and corresponds to A clones and some time to B class or
higher. Because of PVS which not produces visible symptoms.

The vegetative multiplication of potato permits an easier breeding, without modification of genetically base, but it has a strong drawback because of viruses’ degeneration and increase of viruses’ infection year after year.

The selection of maintaining represents a pluralism of technical and organisational measures with the aim to maintain the biological purity, typical characters and low viruses infection of new and valuable breeding lines.

The results of researches contributed to modernisation and increase of efficiency of National programme for selection of maintaining and multiplication of Romanian breeding lines, in the frame of scientifically system for competition of new varieties, in the same ecological and technological conditions.

The National Centre for maintain and multiplication of new breeding lines Red Water, can produce the demand material for testing in the network of ISTIS. The planting material of all breeding line will have the same origin and level of viruses’ infection.

The promotion of Romanian potato varieties by selection of maintaining will contribute alongside of other methods for production of initial material, to obtain new performances regarding the quality of seed potato.

References