

Improving the assortment of table grape cultivars with new clones with increased adaptability to the current climate changes

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ABSTRACT

In Romania, in the last three decades, it was registered a decrease of the vineyards surfaces planted with table grapes, this generating an increase in imports of this very healthy aliment. At the same time, the climate changes registered in recent years such as dry periods alternating with torrential rains, or climatic accidents which affected the existence of vineyard plantations, caused damages both on the quality and quantity of table grape productions. For this reason, at the Research and Development Station for Viticulture and Oenology Murfatlar, during the period 2008-2022, selection research was carried out in some of the valuable populations of table grape cultivars such as 'Centennial seedless', 'Bican roz' and 'Moldova', by following the characters regarding the resistance of some individuals to stressful environmental factors. From the populations of the 3 cultivars, clonal elites for each of them were selected and tested virologically. The healthy elites were multiplied and transferred to the comparative field where, after 5 years of observations and determinations, the most valuable elites were tested and registered. In the selection process, characters such as ampelographical, phenological, agrobiological qualities were followed. It were registered the following characteristics: ripening date, productivity, general appearance of the grapes, skin colour, compactness, shape and size of the berry, resistance to diseases and pests, adaptability to the stressful environmental factors such as drought, late frosts, etc. As a result of the selection activity spread over 14 years, these elites were tested by the State Institute for the Testing and Registration of Cultivars (I.S.T.I.S.) and registered in the Official Catalogue of Cultivars from Romania. This paper present the partial results of this research, respectively the following clones: 'Centennial seedless 48 M'f, 'Bican roz 6 Mf' and 'Moldova 3 Mf'.

Keywords: grapevine, clonal selection, resistance characters, environmental factors

INTRODUCTION

According to the International Organisation of Vine and Wine statistics (STATE OF THE WORLD VITINICULTURAL SECTOR 2020), Romania takes the 10th place in the world in terms of wine-growing area and the 13th place in terms of grape production. In contrast, only 5% of the grapes produced are intended for fresh consumption. More than that, in the last three decades, it was registered a diminution of the vineyard's surfaces planted with the table grapes, that generated an increase of the imports of this very healthy aliment

The basic unit of the initiation of the clonal selection scheme is represented by the individuals that expresses the maximum capacity of the ampelographic and agronomic characters that are part of the old populations.

Over time, the qualities of the old cultivars in the population tend to erode, for this reason the mass selection is necessary as a method of vegetative improvement of the cultivars. (Oprea and Moldovan, 2007). At the same time, climate changes become a greater challenge from year to year, which makes clonal selection a necessary practice to preserve the cultivar of grapes and to adapt it to the high maintenance costs, by increasing the production potential, thus developing a sustainable viticulture.

During 2008-2022, at Murfatlar was carried out the selection and multiplication of several valuable clonal elites that belong to the populations of some table grape cultivars found in the own plantations. The amelioration activity was oriented towards the creation and introduction into production of several new clones with high production potential, but also superior in terms of quality and with increased resistance to the unfavourable environmental factors induced by climate changes.

MATERIAL AND METHOD

It was used the OIV (International Organisation of Vine and Wine) regulation of clonal selection activity, recently improved, in 2017, (OIV-VITI resolution 564A-2017) which specifies the methodology for the correct performance of clonal selection.

The biological studied material is represented by the cultivars cultivated in the old plantations of the Research and Development Station for Viticulture and Oenology Murfatlar. Valuable plants were chosen from the population whose characteristics stood out for their technological, organoleptic and taste properties, appearance, production and resistance to biotic and abiotic environmental factors.

Three of the table cultivars were studied: 'Centennial seedless', 'Bican roz', and 'Moldova'. From the populations of the 3 cultivars, 10 clonal elites for each cultivar were selected and tested virologically. The healthy ones were multiplied and planted in the comparative field, where they were studied further.

After 5 years of observations and determinations, stable individuals from the agrobiological point of view and with resistance characters manifested constantly, were multiplied by grafting and passed into the field of perspective elites. The most valuable elites were registered for DUS (to reveal the characters of uniformity and distinctiveness) and UPOV (ampelographic description), were tested at I.S.T.I.S. and after 2 years of observations it was possible to approve them to be registered in the Official Catalogue. These clones were: 'Centennial seedless 48 Mf', 'Bican roz 6 Mf' and 'Moldova 3 Mf'.

RESULTS AND DISCUSSIONS

There are presented below the main ampelographic, productive and qualitative characteristics of the obtained clones.

Centennial Seedless 48 Mf

'Centennial seedless 48 Mf' is a productive and qualitative clone, with increased resistance to drought and downy mildew, obtained at Murfatlar in 2021.

Ampelographic characters

It is a clone of great vigour, where the young shoot has a reddish colour with the apex completely open and the bristles absent or very rare. The shoots are semi-erect and present long tendrils.

The colour of the young leaf on the upper side is light copper red, with soft bristles between the main veins, and on the lower side of the limb, the bristles are absent or very rare.

The adult leaf has a shorter petiole compared to the median vein, and the limb is cordiforme, very large, weakly corrugated on the upper side, with sparse bristles on both sides (Figure 1).

The flower has fully developed stamens and incompletely developed gynoecium. The cultivar is seedless, presenting the phenomenon of parthenocarpy.

The grape is cylindrical-conical, long and large in size (Figure 1).

The berry is narrow, elliptical in shape and large, uneven in size. The colour of the skin is yellow and the separation from the pedicel is easy. Have a medium thickness of the epidermis, semi-crispy pulp, moderately firm skin with adhesion to the pulp. Anthocyanin pigmentation is absent or very pale.



Figure 1. Grape and leaf of 'Centennial Seedless 48 Mf'

Phenology

'Centennial seedless 48 Mf' is an early budding clone that blooms at the end of May or beginning of June, the ripening start in the first decade of August and the grapes reach full maturity in the first decade of September. The total vegetation period is 190 days.

Agrobiological characters

The clone has a fertility of 59%, a production per hectare 33% higher than the population, of 20 t/ha, with an average weight of grape of 527g and a weight of 100 berries of 198g (Table 1). The average values of the indexes of fertility and productivity are: CFR = 0.7; CFA = 1.1; IPR = 369; IPA = 596

It can accumulate up to 196 g/L sugar, having an acidity of 3.8 g/L expressed in sulphuric acid.

In terms of resistance to environmental factors, the 'Centennial seedless 48 Mf' clone resists well at the drought, and has medium resistance to frost (Table 1).

Table 1. 'Centennial seedless 48 Mf' – the clone characterization in comparison with the population

Tracked characters	Population	Clone
Maturation epoqe	Medium	Early-medium
The compactness of the grape	Lax	Medium
The size of the grape	Medium	Big
The size of the berry	Medium	Big
Epidermal thickness	Thin	Medium
Fertility	40%	59 %
Production	15 t/ha	20 t/ha
Downy mildew resistance	Medium	Good
Powdery mildew resistance	Medium	Medium
Botrytis resistance	Good	Good
Drought resistance	Medium	Good
Frost resistance	Poor	Medium

Cultivation area

The clone 'Centennial seedless 48 Mf' is recommended to be cultivated on the southern exposure lands, without strong air currents.

Bican roz 6 Mf

'Bican roz 6 Mf' is a valuable clone, obtained from an old Romanian cultivar, at Murfatlar in 2022.

Ampelographic characters

It is a clone that shows great vigour. The shoot apex is completely open, green, with sparse bristles. The young leaf has a green upper face with anthocyanin areas and the lower face with dense, soft bristles between the main veins. The shoots are green, with very rare bristles and their port is semi-erect.

For the mature leaf the petiole is slightly shorter than the median vein, green with brownish shades, the limb is pentagonal, medium embossing on the upper face with soft dense bristles between the main veins on the lower face (Figure 2).

The grape has a cylindrical-conical shape, is long, very large, compact, and have a medium ripening period (Figure 2).

The shape of the berry is truncated, large in size and pink in colour. Detachment from the pedicel is easy, the epidermis is thick, the pulp is moderately firm, the anthocyanin pigmentation is absent or very weak, and the seeds are fully formed.

Phenology

The clone "Bican roz 6 Mf enters in vegetation in the last decade of April, flowering in the first decade of June. Ripening is starting in the middle of August, the grapes being fully ripe in September. The total vegetation period is 197 days.



Figure 2. Grape and leave of 'Bican roz 6 Mf'

Agrobiological characters

The clone 'Bican roz 6 Mf' has a good fertility of 79%, with an average production per hectare 10% higher than the population from which it was selected, registering values of 20 t/ha (Table 2). The commercial production is 75-80%, and the production of grapes per plant is 10.76 kg. The average weight of the grape is 714 g, and the weight of 100 berries is, in average, of 225 g.

Table 2. 'Bican roz 6 Mf' – the clone characterization in comparison with the population

Tracked characters	Population	Clone
Maturation epoque	Late	Medium
The compactness of the grape	Medium	Compact
The size of the grape	Big	Very Big
The size of the berry	Medium	Big
Epidermal thickness	Medium	Thick
Fertility	56%	79 %
Production	18 t/ha	20 t/ha
Downy mildew resistance	Good	Good
Powdery mildew resistance	Medium	Good
Botrytis resistance	Good	Good
Drought resistance	Medium	Good
Frost resistance	Poor	Poor

The average values of the indexes of fertility and productivity are: CFR = 0.7; CFA = 1,2; IPR = 500; IPA = 857;

The amount of sugar in grapes can reach 174 g/L, with an acidity of 4.8 g/L expressed in sulphuric acid.

It has good resistance to drought, downy mildew and powdery mildew, being sensitive to frost (-14°C; -18°C).

It resists well to transport and storage in specially designed spaces.

Cultivation area

The clon' Bican roz 6 Mf' is recommended to be cultivated especially on south-facing land, without strong air currents, with rows planted in the N-S direction for uniform ripening.

Moldova 3 Mf

'Moldova 3 Mf' is a clone with good resistance to both biotic (disease and pest attack) and abiotic (drought) stress factors, obtained at Murfatlar in 2022.

Ampelographic characters

The vigour of the clone 'Moldova 3 Mf' is high, the apex of the shoot is semi-open, with thick bristles.

The young leaf is green, with anthocyanin areas, and the soft bristles between the main veins on the lower side of the limb are medium size (Figure 3).

Regarding the shoot, the colour of the dorsal part of the internode is green with red, and the ventral part is green. For the mature leaf, the petiole is much longer than the mid vein, green, the limb is pentagonal, of medium size, without embossing or very weak on the upper face.

The grape is cylindrical or conical, of medium size (Figure 3). The compactness is high and the ripening is late. The berry is truncated, large in size and with black skin colour. Detachment from the pedicel is easy, the epidermis is thick and the pulp is moderately firm.

Phenology

'Moldova 3 Mf' is a clone with late budding, flowering takes place at the beginning of June, and the ripening is initiated in the second decade of August. The grapes ripen at the end of September. The total vegetation period is 195 days.

Agrobiological characters

The fertility of the clone 'Moldova 3 Mf' is good, being of 79%. The average production per hectare is 27 tons and the production per vine is 11,8 kg. The average weight of a grape is 461 g and that of 100 berries is 281 g.

It accumulates a quantity of sugar of approximately 149 g/L, having an acidity expressed in sulphuric acid of 5,8 g/L. The average values of the indexes of fertility and productivity are: CFR = 1,4; CFA = 0,9; IPR = 415; IPA = 654;

In terms of resistance to environmental factors, the clone 'Moldova 3 Mf' is resistant to drought, downy mildew, powdery mildew, botrytis and sensitive to frost (-16°C; -18°C).

It withstands transportation well and is stored for a long time on the vine stock and in cold stores.

Cultivation area

The clone 'Moldova 3 Mf' is recommended for wine-growing centers that benefit from long and warm autumns.

Table 3. 'Moldova 3 Mf' – the clone characterization in comparison with the population

Tracked characters	Population	Clone
Maturation period	Late	Medium
The compactness of the grape	Medium	Compact
The size of the grape	Medium	Big
The size of the berry	Medium	Big
Epidermal thickness	Medium	Medium
Fertility	65%	79 %
Production	25 t/ha	27 t/ha
Downy mildew resistance	Good	Good
Powdery mildew resistance	Good	Good
Botrytis resistance	Good	Good
Drought resistance	Medium	Good
Frost resistance	Poor	Poor



Figure 3. Grape and leave of 'Moldova 3 Mf'

CONCLUSIONS

The work of continuous selection of valuable individuals from populations of vine cultivars for table grapes is very important for the identification and preservation of biotypes that show special quality attributes, free from viruses, which are the basis for the formation of future production plantations. Along with the general climate warming accompanied by disturbances in the water regime (alternation between dry periods and heavy rains) it is necessary to approach new directions in amelioration work related to the resistance of clones to the increased attack of some diseases, such as powdery mildew or to the atmospheric drought manifested mainly in the period of the berries growth.

The three clones identified, tested and registered at Murfatlar in 2021 and 2022 come from cultivars with high economic value, meeting both the quality requirements and in terms of adaptability, ensuring constant and economically profitable production in the areas recommended for cultivation.

The clone 'Centennial seedless 48 Mf' has high fertility and productivity (ensures production of 20 tons/ha), large bunches, with an average weight of 527 g, with large, uniform berries. The clone is more resistant than the population to downy mildew and drought.

The clone 'Bican roz 6 Mf' stands out for the size, colour and appearance of the grapes, which have an average weight of 714 g, increased productivity (ensures production of 20 tons/ha) but also better resistance to powdery mildew and drought.

The clone 'Moldova 3 Mf' comes from a cultivar with genetic resistance to diseases, stands out for the uniformity and appearance of the bunches, productivity (produces 27 tons/ha), proving also an increase resistance to drought.

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