

EVALUATION OF SOME APPLE ELITES WITH GENETIC RESISTANCE TO DISEASES, CANDIDATES FOR OBTAINING NEW CULTIVARS

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ABSTRACT

The researches performed at the Voinești Research-Development Station for Fruit Growing have taken into consideration the highlight of the performance characteristics of some apple elites with a genetic resistance to diseases, obtained from hybrid combinations performed in the period 2004–2005. The apple elites, candidates for obtaining new cultivars, resulted from the selection of the 3260 apple hybrids, obtained from the initial breeding material with a great genetic diversity.

The five selected apple elites have shown genetic resistance to diseases, fruits with a superior quality and correspond to the objectives that must be met by a cultivar.

The elites obtained through sexual hybridisation from the 'Goldenspur' x 'Florina' had fruits that have an average above 160g, yellow or yellow-greenish colour and good taste. The elites obtained through sexual hybridisation from 'Florina' x 'Idared' have fruits that have an average of 160-180 g and covered up to ¾ of the surface with red.

The apple elites with a genetic resistance to diseases, candidates for varieties, obtained at SCDP Voinești in the period 2004–2005 correspond to the producer's requirements, sensitive to economic efficiency, with an increased production potential, with quality fruits that for sure will meet the consumer's requirements, which are continuously increasing.

INTRODUCTION

The apple assortment has seen a significant change in the last decades, promoting varieties that mainly satisfy the demands of the producer, sensitive to economic efficiency, high production potential, the appearance of the fruit, different periods of consumption, etc., as well as the taste of the consumer. These requirements are satisfied by the creation and expansion in the culture of apple cultivars with genetic resistance to diseases, which for the new orchards are the links of high-performance economic technology, with immediate effect through the total or partial elimination of fungicide treatments.

Obtaining apple varieties is a long-term and highly complex activity, especially when considering obtaining cultivars with genetic resistance to diseases, regardless of the used research method.

The breeding process being continuous, allowed over time to create a genetic basis of complex selection, using in combinations as parents apple cultivars and elites with genetic resistance to diseases, which have incorporated various resistance genes.

The research performed in SCDP Voinesti highlight the performance characteristics of some apples with genetic resistance to diseases, candidates for obtaining new cultivars.

MATERIAL AND METHODS

The complex genetic base existent at Voinesti Research-Development Station for Fruit Growing consisting of selection fields, the nursery of hybrids and competition microcultures, was the main source for the selection of apple elites with genetic resistance to diseases, which were multiplied in the SCDP Voinesti nursery and have been the base for starting some competition microcultures (trials), where these have been studied from a productivity and fruit quality point of view.

The apple elites with a genetic resistance to diseases obtained at SCDP Voinesti are appropriate from a productivity and fruit quality point of view, these being analysed by the criteria and techniques necessary for approval set through DSO and VAT tests, to become cultivars.

In view of highlighting the performance characteristics, the culture technology was correctly applied to the apple elites studied so as not to affect the production capacity and the quality of the fruits. The research undertaken focused on observations and determinations regarding resistance to the attack of diseases and pests as well as the mode of fructification and the quality of the fruits.

RESULTS AND DISCUSSIONS

The improvement process being continuous, it requires that new selection bases be created every year, composed of hybrid offspring that possess a complex variability, being involved as maternal and paternal parents, cultivars or parents in such a way that the deadline for the realization of the new valuable form shrinks.

Success in breeding is largely conditioned by the clarity of the proposed objectives, but at the same time it is dependent on the existence and knowledge of genetic resources. The creation of a great genetic variability and diversity provides real sources for the sought-after selection.

The selected apple elites, candidates for the approval of new cultivars, in addition to the productivity characteristics, superior quality, of the young, genetic resistant to diseases, depending on the culture area, must also meet other qualities that must be added to the essential conditions, namely:

- degree of adaptability to climatic conditions;
- production destination;
- the market requirements of the obtained production;
- safety of the source of production and delivery of tree planting material;
- the economy of culture technology.

The use of parents that possess the gene of resistance and productivity imprints in the offspring a high rate of transmission of valuable characteristics, making the work of the breeder easier in a certain way. The other characteristics added to the essential conditions are highlighted only on the basis of further research.

At SDCP Voinesti, there is a rich base of selection for the future improvement works, but in the current paper, there are written the results obtained from the hybrid combinations performed in the period 2004 – 2005. The assessment of the apple hybridisation program is shown in Table 1.

Table 1

The evolution of the apple hybridisation program performed in the period
2004 – 2005 (SCDP Voinesti)

Crt no	Hybrid combination	Pollinated flowers	Obtained hybrid fruits	Planted hybrid seeds	Resulted Seedlings	
					No	%
	Year 2004					
1	'Florina' x 'Idared'	450	80	341	216	63,3
2	'Florina' x H3/5-90	60	9	49	16	32,1
3	'Goldenspur' x 'Florina'	422	117	854	280	32,7
4	'Florina' x H1/12	235	33	132	75	56,8
	Year 2005					
1	'Generos' x H 1/35	380	87	604	525	86,9
2	'Goldenspur' x H 2/44	390	280	1520	1220	80,3
3	'Goldenspur' x 'Florina'	650	274	1287	928	72,1
	TOTAL	2587	880	4787	3260	68,10

The hybrid apple seedlings were obtained through sexual hybridisation using as parents:

- sensitive varieties from the current assortment: 'Idared' and 'Goldenspur';
- diseases-resistant varieties: 'Florina', with Vf resistance gene; 'Generos' type obtained at SCDP Voinesti is tolerant to *Venturia* sp.; Poly resistance gene
- elites with genetic resistance to disease, selected at SCDP Voinesti H 3/5-90; H 1/53 H 2/44, H 1/12, having the Vf resistance gene

From the data presented in table I, it appears that in the period 2004--2005, 7 hybrid combinations were executed. From 2587 pollinated flowers, 880 hybrid fruits were obtained from which 4787 hybrid apple seeds were extracted and sown, obtained from hybrid combinations. In total, 3260 hybrid apple seedlings (Fig 1) resulted in a percentage of 68.10% of the hybrid seeds sown, these being planted in the fortification field and then transferred to the selection orchard.

In the years of experimentation (period 2004-2005) it resulted an initial breeding material of great genetic diversity, a fact that allowed and will allow the obtaining of perspective selections with superior characteristics to the parents used in breeding and even the apple varieties in culture. Annually, only apple hybrids were selected that showed genetic resistance to diseases, fruits of superior quality, those that corresponded to the previously established objectives, being grafted in the nursery.

The increase in genetic variability is especially achieved in hybrid combinations in which apple varieties and elites with genetic resistance to recently created diseases, which have incorporated complex resistance genes, are used as parents.



Figure 1. Seedlings obtained in jiffy pills and aspects from the time of flowering in apples

From the hybrid series made, some selections with genetic resistance to diseases and superior ones stood out. These were grafted in the nursery and were the subject of contest microcultures. The material subjected to selection and grafted in the nursery formed the basis of the evaluation in apple crops according to the characteristics of productivity, fruit quality and genetic resistance to diseases. The apple elites with genetic resistance to diseases, obtained at SCDP Voinesti, candidates for obtaining new cultivars, are presented below.



Figure 2. **Elite H 14/311-05**. Obtained through sexual hybridisation from the combination of 'Goldenspur' x 'Florina'

Elite H 14/311-05. The tree is of medium vigour, precocious, bears fruit on short formations. The flowering is medium and overlaps with most culture varieties. The fruit has an average of over 165g, is spherical in shape, yellow-green in colour on the entire surface. The white-yellow flesh is crunchy with a very good, similar taste with the Golden delicious cultivar. The percentage of dry matter is over 14%. Harvest maturity is at the beginning of October, and the consumption period extends until March 1st. The elite is resistant to the attack of *Venturia inaequalis* and *Podosphaera leucotricha*. It stands out for its precocity, resistance to the attack of the main diseases, special quality of the fruits.



Figure 3. **Elite H 4/38-05.** Obtained through sexual hybridisation from the combination of 'Goldenspur' x 'Florina'.

Elite H 4/38-05. The tree is of medium vigour, precocious, bears fruit on short formations. The flowering is medium to late. The fruit has an average of over 165g, conical, yellow in colour on the entire surface. The yellow flesh is crunchy with a very good taste. Harvest maturity is in the first ten days of October, and the consumption period extends until April 1st. The elite is resistant to the attack of *Venturia inaequalis* and *Podosphaera leucotricha*. It stands out for its precocity, resistance to the attack of the main diseases, special quality of the fruits and a good ability to be kept for the winter.

Elite H 1/59-04. The tree is of medium vigour, precocious, bears fruit on short formations. The flowering is early to medium. The fruit has an average of over 165g, spherical, yellow-green in colour on the entire surface. The white-yellow flesh is crunchy with a very good taste, slightly acidic. Harvest maturity is in the first ten days of October, and the consumption period extends until April. The elite is resistant to the attack of *Venturia inaequalis* and *Podosphaera leucotricha*. It stands out for its precocity, resistance to the attack of the main diseases, special quality of the fruits and a good ability to be kept for the winter.



Figure 4. **Elite H 1/59-04.** Obtained through sexual hybridisation from the combination of 'Florina' x H 1/12.



Figure 5. **Elite H 3/37-04** Obtained through sexual hybridisation from the combination of 'Florina' x 'Idared'

Elite H 3/37-04. The tree is of medium vigour, very precocious, bears fruit on standard formations. The flowering is medium. The fruit has an average of over 160g, yellow in colour, covered on 2/3 of the surface with red. The yellow flesh is crunchy with a very good taste. Harvest maturity is in the first ten days of October, and the consumption period extends until the end of April. The elite is resistant to the attack of *Venturia inaequalis* and rarely / slightly attacked by *Podosphaera leucotricha*. It stands out for its precocity, resistance to the attack of the main diseases and a good ability to be kept for the winter.



Figure 6. **Elite H 4/17-05**. Obtained through sexual hybridisation from the combination of 'Goldenspur' x 'Florina'

Elite H 4/17-05. The tree is of small-medium vigour, precocious, bears fruit on short formations. The flowering is medium to late. The fruit has an average of over 165g, conical, yellow in colour on the entire surface. The yellow flesh is crunchy with a very good taste. Harvest maturity is in the first ten days of October, and the consumption period extends until the March 15th. The elite is resistant to the attack of *Venturia inaequalis* and *Podosphaera leucotricha*. It stands out for its precocity, resistance to the attack of the main diseases, bearing fruits on short formations, good quality of the fruits and a good ability to be kept for the winter.



Figure 7. **Elite H 2/3-04**. Obtained through sexual hybridisation from the combination of 'Florina' x 'Idared'

Elite H 2/3-04. The tree is of small-medium vigour, very precocious, bears fruit on short and long branches. The flowering is medium, the floral bud is light pink. The fruit has an average of over 180g, yellow – green in colour, covered on $\frac{3}{4}$ of the entire surface with red. The white-yellow flesh is crunchy with a good taste. Harvest maturity is in the last ten days of September, and the consumption period extends until January. The elite is resistant to the attack of *Venturia inaequalis* and *Podosphaera leucotricha*. It stands out for its precocity, resistance to the attack of the main diseases, quality of the fruits and resistance up to January.

CONCLUSIONS

- In the experimental fields from SCDP Voinesti, from the period 2004-2005, it was obtained a valuable biologic material in apples with a great genetic variability which allowed the selection of valuable elites, candidates to become new varieties or parents for the future works of improvements.

- From the hybrid series achieved in the period 2004 – 2005, it was obtained an initial improvement material, with a great genetic diversity composed of 3260 apple seedlings from which there were selected perspective elites with characteristics superior to the parents used in the breeding program and even the apple cultivars tested.

- The five selected apple elites with genetic resistance to diseases, selected at SCDP Voinesti for obtaining new types meet the producer's requirements, sensitive to economic efficiency, these having an increased production potential, with quality fruits that for sure will meet the consumer's requirements, which are continuously increasing.

- The apple elites obtained at SCDP Voinesti in the period 2004 – 2005 cover a part of the consumption season together with genetic resistance to already known diseases and appreciated on the consumer market, these fitting differently in the recommended conveyer for Dambovita Orchard Pool.

- Through the promotion of the types of apples with genetic resistance to diseases, there are obtained beneficial economic results, environmental protection of batches of apples that have reduced pesticide residues, demanded more and more by consumers

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