

CONTRIBUTIONS REGARDING THE APPLE TREES GENETIC VARIABILITY INCREASE IN THE PROCESS OF OBTAINING IMPROVING BIOLOGICAL MATERIAL

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Abstract

The researches performed at the Fruit Growing Research and Development Station Voinești in the period 2004–2012 point out the creation of some new apple trees selection bases from the biological material, obtained by sexuate hybridation. The genetic variability increase was remarked especially at the hybrid combinations, at which we used as genitors the recently created apple trees elites with genetic resistance against diseases, which included different resistance genes. The scab and mildew resistance feature was transmitted to a greater percentage in the case of hybrid combinations between the resistant breeds - and in a more reduced percentage at the hybrid combinations: resistant breed x sensitive breed. The material undergoing selection and grafted in the nursery constitutes the base of the evaluation in test culture of the apple tree elites, regarding the features of productivity, fruits quality and genetic resistance against diseases.

Key words: *hybrid combinations, biological material, apple trees genotypes, genetic resistance against diseases*

INTRODUCTION

Obtaining apple breeds represents a long term and highly complex activity, especially when one has in view to obtain genetic diseases resistant breeds, regardless of the used research method. In the creation program of genetic disease resistant apple tree breeds at the FGRDS Voinești, we annually realized the most diverse hybrid combinations, using matern and patern genitors, which had to respond to the proposed objectives. The researches performed at the FGRDS Voinești in the period 2004 – 2012 point out the creation of some new apple trees selection bases, simultaneously with the increase of the genetic variability in the process of obtaining the biological improvement material. The increase of the genetic variability is realized especially at the hybrid combinations, at which we use - as apple tree genitors - recently created breeds and elites with genetic resistance against diseases, which have included complex resistant genes.

MATERIALS AND METHODS

The researches, deployed in the period 2004 – 2012 in the experimental fields of the Fruit Growing Research and Development Station

Voinești, had as objective to obtain some new apple tree hybrid generations, in view of the creation of new genetic disease resistant breeds.

We used matern and patern genitors with valuable productivity, fruits quality features and both partners - or at least one of them - shall possess the genetic diseases resistant gene, increasing the genetic variability - and a greater probability to obtain genetic diseases resistant breeds.

In the period 2004 – 2012 we performed 25 hybrid combinations, at which we added 6 genitors, from which we used seeds obtained by natural polenation.

The used technology was specific to the creation of apple tree breeds, mentioning that we applied no phyto – sanitary treatments with fungicides - only 4-5 treatments with insecticides.

The used working method was the selection of the apple tree hybridation, retaining those which presented resistance to the scab and mildew attack.

RESULTS AND DISCUSSIONS

The improvement process is continuous, so that this supposes the annual creation of new selection bases, composed of hybrid

descendences, which shall possess a complex variability, being implied as matern and patern genitors, breeds or genitors – so that the realization term of new valuable forms shall decrease.

The improvement succes is conditioned to a large extent by the clarity of the proposed objectives, but simultaneously it depends on the existence and on the knowledge of the genetic resources. The creation of a great genetic variability and diversity offers real sources to the searched for selection.

A newly created breed, besides the features of productivity, superior fruits quality, genetic diseases resistance - depending on the culture zone, has to meet also other features, which have to be added to the essential conditions, meaning:

- the adaptability degree to the climate conditions;
- the destination of the a production;
- the knowledge degree of the breed;
- the market requirements of the obtained production;
- the security of the source of production and delivery of the tree growing seedling material;
- the economicity of the culture technology.

The use of some genitors, which possess the resistance and productivity gene, imprints into the descendency a greater transmission rate of the valuable characters, easing in a certain way the improver's work. The other characteristics, added to the essential conditions, are pointed out only based on further researches.

At the TGRDS Voinești there is a rich selection base for future improvement works, obtained in the period 2004-2012, the evaluation of the apple tree hybridation program being presented in the table 1.

The multitude of hybrid apple tree seedlings has been obtained by sexuete hibridation, using as genitors:

- sensitive breeds of the present assortment: 'Idared', 'Goldspur';
- diseases resistant breeds: 'Florina', 'Goldrush', 'Topaz', 'Golden Lasa', 'Ariwa' of foreign origin, 'Rebra' obtained at the TGRDI Mărăcineni, 'Iris', 'Inedit', 'Remar' created at the TGRDS Voinești, all having the resistance gene Vf; the 'Generos' breed, obtained at the

TGRDS Voinești, is scab tolerant - the Poly resistance gene;

- genetic diseases resistant elites, selected at the TGRDS Voinești: H 3/5; H 1/53; H 2/8; H 1/11; H 1/46; H 1/78; H 8/86; H 1/27; H 1/13; H 4/37; H 5/20; H 1/7, all have the Vf resistance gene.

From the data presented in the Table 1 it results, that in the period 2004 – 2012 we performed 25 hybrid combinations, to which we added 6 genitors, from which we used the seeds, obtained by natural pollination. From 6,013 pollinated flowers we obtained 2,187 hybrid fruits, from which we extracted 11,099 seeds; from these we sowed 9,811 hybrid apple tree seeds (7,955 obtained from hybrid combination and 1,856 resulted by natural pollination). In total, 6,289 hybrid apple tree seedlings resulted, which were planted in the seedling nursery for fortification and then were transferred into the selection orchard.

In these 9 years of experimentation (2004-2012) resulted an initial improvement material of great genetic diversitaty, a fact that permitted and will permit to obtain some selection with perspective, with characteristics being superior to the genitors used in the improvement – and even to the apple tree breeds existing in culture. We annually selected only apple tree hybrids presenting genetic diseases resistance, with superior quality fruits; those that corresponded to the previously established objectives were grafted in the nursery.

We realized the increase of the genetic variability especially at the hybrid combinations, where we use as genitors the recently created apple tree breeds and elites with genetic diseases resistance, with complex resistance genes.

Already from the first hybrid series, we remarked some selections with genetic diseases resistance and with superior quality fruits; these we grafted in the nursery and they were the object of some competition micro - cultures.

The material subjected to the selection and grafted in the nursery constitutes the evaluation base in the testing cultures of the apple tree elites, regarding to the features of productivity, fruits quality and genetic diseases resistance.

Table 1. Evaluation of the apple tree hybridization program in the period 2004 – 2012 (FGRDS Voinești)

No.	Combination	Pollinated flowers	Obtained hybrid fruits	Sowed hybrid seeds	Resulted seedlings	
					nr.	%
	Year 2004					
1	Florina x Idared	450	80	341	216	63.3
2	Florina x H 3/5-90	60	9	49	16	32.1
3	Goldspur x Florina	422	117	854	280	32.7
	Year 2005					
4	Generos x H 1/53	380	87	604	525	86.9
5	Godspur x H 2/44	390	280	1520	1220	80.3
6	Goldspur x Florina	650	274	1287	928	72.1
	Year 2006					
7	Iris n.p.		188	818	365	44.6
8	Florina n.p.		66	389	273	70.0
	Year 2007					
9	Florina x H 2/8	112	38	109	59	54.1
10	Goldspur x H 1/11	281	76	268	152	56.7
11	Goldspur x H 1/46	248	96	202	121	59.9
	Year 2008					
12	Florina x H 1/78	215	48	256	146	57.1
13	Florina x Nicol	61	5	23	17	73.9
14	Florina x Iris	63	12	62	43	69.3
15	Remar x Golsrush	635	51	277	89	32.1
16	Remar x Iris	181	36	173	125	72.2
17	Inedit x H 8/86	214	44	225	146	64.8
18	Inedit x Remar	200	56	290	132	45.5
	Year 2009					
19	Iris n.p.		51	212	140	66.0
20	Goldrush n.p.		38	194	133	67.1
	Year 2011					
21	Ariwa n.p.		21	112	41	36.6
22	Rebra n.p. .		29	131	77	58.7
	Year 2012					
23	Topaz x H 1/27	128	7	38	29	76.3
24	Inedit x Ariwa	106	10	55	32	58.1
25	Goldrush x Golden Lasa	268	85	162	121	74.7
26	Goldrush x H 1/13	243	86	190	132	69.4
27	Goldrush x H 4/37	173	90	280	202	72.1
28	Goldrush x Inedit	256	78	275	208	75.6
29	Goldrush x Iris	102	23	90	60	66.6

No.	Combination	Pollinated flowers	Obtained hybrid fruits	Sowed hybrid seeds	Resulted seedlings	
30	Goldrush x H 5 / 20	93	49	160	128	80.0
31	Goldrush x H 1/7	82	57	165	133	80.6
	TOTAL	6.013	2.187	9.811	6.289	64,1

- n.p. = natural pollination

CONCLUSIONS

In the experimental fields of the FGRDS Voinești, in the period 2004 -2012 we obtained a valuable biological material at the apple tree with a great genetic variability, which will permit the selection of some elites, which will become breeds or genitors for the future improvement works.

For the increase of the genetic variability at the apple tree, we performed t 25 hybrid combinations, to which we added 6 genitors, from which we used the seeds, obtained by natural pollination.

From the hybrid series realized in the period 2004–2012, we obtained an initial improvement material, with a great genetic diversity, composed of 6,289 hybrid apple tree

seedlings, of which we selected elites with perspective, with characteristics superior to the genitors used in the improvement – and even to the apple tree breeds existing in culture.

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