CONTRIBUŢII PRIVIND SPORIREA VARIABILITĂŢII GENETICE LA MĂR ÎN PROCESUL OBŢINERII MATERIALULUI BIOLOGIC DE AMELIORARE

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

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Abstract

The researches performed at the Research Station for Fruit Growing Voinesti in the period 2004–2012, point out the creation of some new apple selection bases from the biological material, obtained by sexual hybridization. The increasing of genetic variability was remarked especially at the hybrid combinations, at which we used as genitors the recently created apple elites with genetic resistance to 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 cultivars - and in a more reduced percentage at the hybrid combinations: resistant cultivar x sensitive cultivar. The material undergoing selection and grafted in the nursery constitutes the base of the evaluation in test culture of the apple elites, regarding the features of productivity, fruits quality and genetic resistance to diseases.

Cuvinte cheie: combinații hibride, rezistență genetică la boli
Keywords: hybrid combinations, genetic resistance to diseases

1. Introduction

Obtaining of apple cultivars represents a long term and highly complex activity, especially when one has in view to obtain genetic diseases resistant cultivars, regardless of the used research method.

In the creation program of genetic disease resistant apple cultivars at the RSFG Voinesti, we annually realized the most diverse hybrid combinations, using matern and pattern genitors, which had to respond to the proposed objectives. The researches performed at the RSFG Voinesti in the 2004 – 2012 period, point out the creation of some new apple 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 genitors - recently created cultivars and elites with genetic resistance to diseases, which have included complex resistant genes.

2. Material and methods

The researches, deployed in the period 2004 – 2012 in the experimental fields of the Research Station for Fruit Growing Voinesti, had as objective to obtain some new apple tree hybrid generations, in view of the creation of new genetic disease resistant cultivars.

We used matern and pattern genitors with valuable productivity, fruits quality features and bothpartners - 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 cultivars.

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

The used technology was specific to the creation of apple cultivars, 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 seedlings and retaining those which presented resistance to the scab and mildew attack.

3. Results and discussions

The improvement process is continuous, so that this supposes the annual creation of new selection bases, composed of hybrid descendants, which shall possess a complex variability, being implied as matern and pattern genitors, cultivars or genitors – so that the realization term of new valuable forms shall decrease.

The improvement success 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 cultivar, 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 economy 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, facilitating 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 RSFG Voinesti there is a rich selection base for future improvement works, obtained in the period 2004-2012, the evaluation of the apple hybridizations program being presented in the table 1.

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

- sensitive cultivars of the present assortment: 'Idared', 'Goldspur';
- diseases resistant cultivars: 'Florina', 'Goldrush', 'Topaz', 'Golden Lasa', 'Ariwa' of foreign origin, 'Rebra' obtained at the RIFG Mărăcineni, 'Iris', 'Inedit', 'Remar' created at the RSFG Voineşti, all having the resistance gene Vf; the 'Generos' cv., obtained at the RSFG Voineşti, is scab tolerant - the Poly resistance gene;
- genetic diseases resistant elites, selected at the RSFG Voinesti: 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 open 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 seeds (7,955 obtained from hybrid combination and 1,856 resulted by natural pollination). In total, 6,289 apple 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 diversity, 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 cultivars existing in culture. We annually selected only apple 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 increasing of the genetic variability especially at the hybrid combinations, where we use as genitors the recently created apple cultivars 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.

4. Conclusions

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

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

From the hybrid series realized in 2004 – 2012 period, 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 superior characteristics versus their genitors used in the improvement – and even to the apple cultivars existing in culture.

5. References

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Table 1. Evaluation of the apple hybridization program in the period 2004 – 2012 (RSFG Voinesti)

Nr.	Combination	Pollinated flowers	Obtained hybrid fruits	Sowed hybrid seeds	Resulted seedlings	
					no.	%
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 o.p.		188	818	365	44.6
8	Florina o.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 o.p.		51	212	140	66.0
20	Goldrush o.p.		38	194	133	67.1
Year 2011						
21	Ariwa o.p.		21	112	41	36.6
22	Rebra o.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
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

- o.p. = open pollination