BREEDING FOR RESISTANCE TO (*VENTURIA INAEQUALIS*) IN SOME ROMANIAN APPLES PROGENIES

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Scab infection caused by *Venturia inaequalis* (Cke.) Wint. is one of the most serious diseases of apple reported from almost all apple producing countries and causes huge economic losses (up to 70% reduction in apple production). The infection leads to deformation in shape and size of the fruits, premature leaf and fruit fall, and enhances susceptibility of tree to chilling and freezing injuries. An new breeding programme in apple trees was started in spring 2009 at the University of Agronomical Science and Veterinary Medecine Bucharest. Plant breeding experience assured that recovery of fruit quality will be accomplished, whereas disease-resistance breeding experience was not so reassuring with respect to obtaining permanent disease resistance. The molecular genetics offers the promise of improving our understanding of the nature of plant resistance genes.The biological material is the maternal and paternal genitor used sexual hybridization came from natural pollination of the spur variety like Bolero, Waltz, Polka, and the resistance one (Piors, Enterprise, Braeburn, Galaxy, Remo).

Key words: *Venturia inaequalis*, apples, cultivars, breeding, resistance.

INTRODUCTION

Breeding for fruit resistant to pests and diseases has become a major objective for many research laboratories. Excessive use of pesticides is increasingly denounced by consumers and the rules controlling their use (particularly with respect to toxic residues) are increasingly restricting. The use of resistant cultivars reduces production costs and increases workers safety.

The *Venturia inaequalis* is an aggressive pathogen difficult to control once it is established in an orchard. Because a chemical control is so difficult, it was desirable to promote the breeding of cultivars resistant to this pathogen. The first research work to the resistant sources (Lesspinase, 1990) led to the discovery of breeding parents resistant to *Venturia inaequalis* within the apples species *Malus pumila, Malus baccata*, and also in the neighbouring species.

Prospecting through Romanian apples collections has lead us to the discovery of several sources of resistance to *Venturia inaequalis*.The different columnar or spur habit apple varieties was chosen among the different sources of resistance as it could also be used to develop a weeping variety in the sone breeding programme.

To start with, the resistance mode of herability was studied by creating F1 generations from the resistant parent crossed with a sensitive one, Waltz, Bolero, Polka, Charlotte. The resistance character is dominant and monogenic (symbols Rm1/m1). Breeding will the continued by creating the F2 generations and after that to improve fruit quality by using the cv. Jonathan as parent to introduce the oganoleptic characters. The paper describes the breeding work involved in this programme.

MATERIAL AND METHOD

Plant material used in this work is the susceptible apples varieties to the *Venturia inaequalis,* but with columnar habits; Polka, Charlotte, Bolero and the resistance one: Piors, Enterprise, Braeburn, Galaxy, Remo, were used in the pollination process. The next step is to study the resistance

heredity, but also to improvement in fruit quality trough the parent Polka, Charlotte and Bolero. Several strains of Venturia ianequalis will be used for artificial infection. The serological and molecular tools will be used to screening our populations, in terms of resistance to *Venturia inaequalis*.

RESULTS AND DISCUSSIOS

Starting from pollination to harvest fruit the results concerning the percentage of binding of flowers, dynamic binding of different varieties of apple blossoms, the dynamics of physilogical fruit fall, percentage of mature fruit, have shown that there are some populations that may be interesting to be tested of Venturia inaequalis under artificials infection conditions, like HP6, HP11, HP3, HP10, HP5.

Introducing a resistance into a fruit species trough traditional breeding methods is a slow process (it took 20 years from the initial self-pollinations before the first selections were obtained).

Concerning the percentage of binding of fruits we selected 4 populations, for the next step.

No	Name of varieties	Flower number	Number of fruits at 20.05.2010	Number of fruits at 02.08.2010	%Binding of fruits
1	HP 1	16	4	3	25
2	HP 2	10	5	5	50
3	1. HP 3	27	21	12	77.77
4	HP 4	34	19	1	55.88
5	HP 5	41	0	0	0
6	HP 6	156	93	44	59.61
7	HP 7	10	5	4	50
8	HP 8	21	19	9	90.47
9	HP 9	6	2	2	33.33
10	HP 10	86	7	1	8.13
11	2.HP 11	40	29	13	72.5

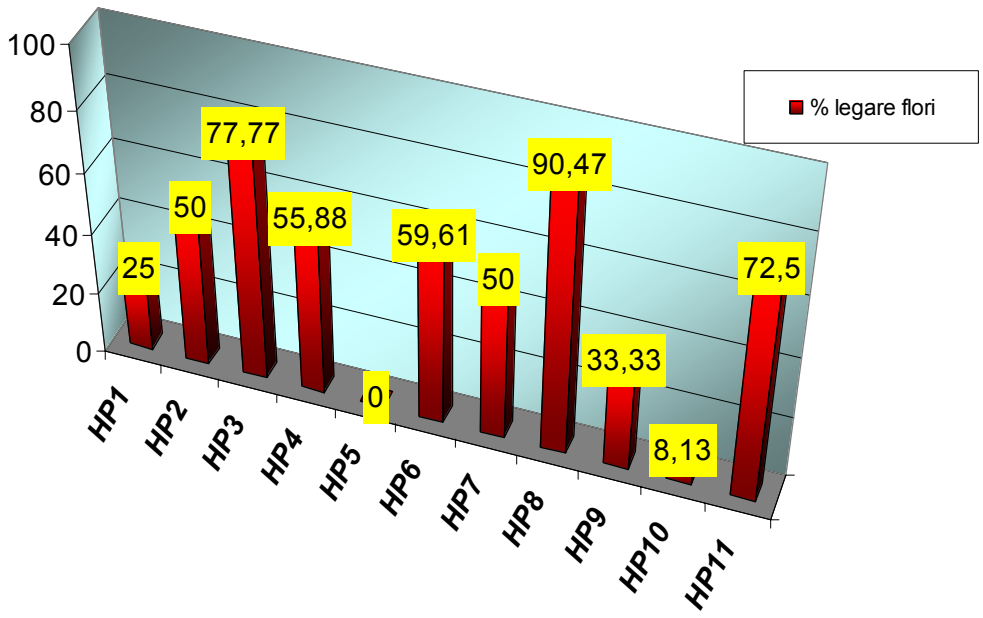

Fig. 1. Dynamic binding of different varieties of apple blossoms.

Fig. 2. The dynamics of physiological fruit fall.

No	Name of varieties	Number of fruits at 20.05.2010	Number of fruits at 02.08.2010	% Binding of fruits
1	HP1	4	3	75
2	HP2	5	5	100
3	1HP3	21	12	57.14
4	HP4	19	1	5.26
5	HP5	0	0	0
6	HP6	93	44	47.31
7	HP7	5	4	80
8	HP8	19	9	47.36
9	HP9	2	2	100
10	HP10	7	1	14.28
11	2HP11	29	13	44.82

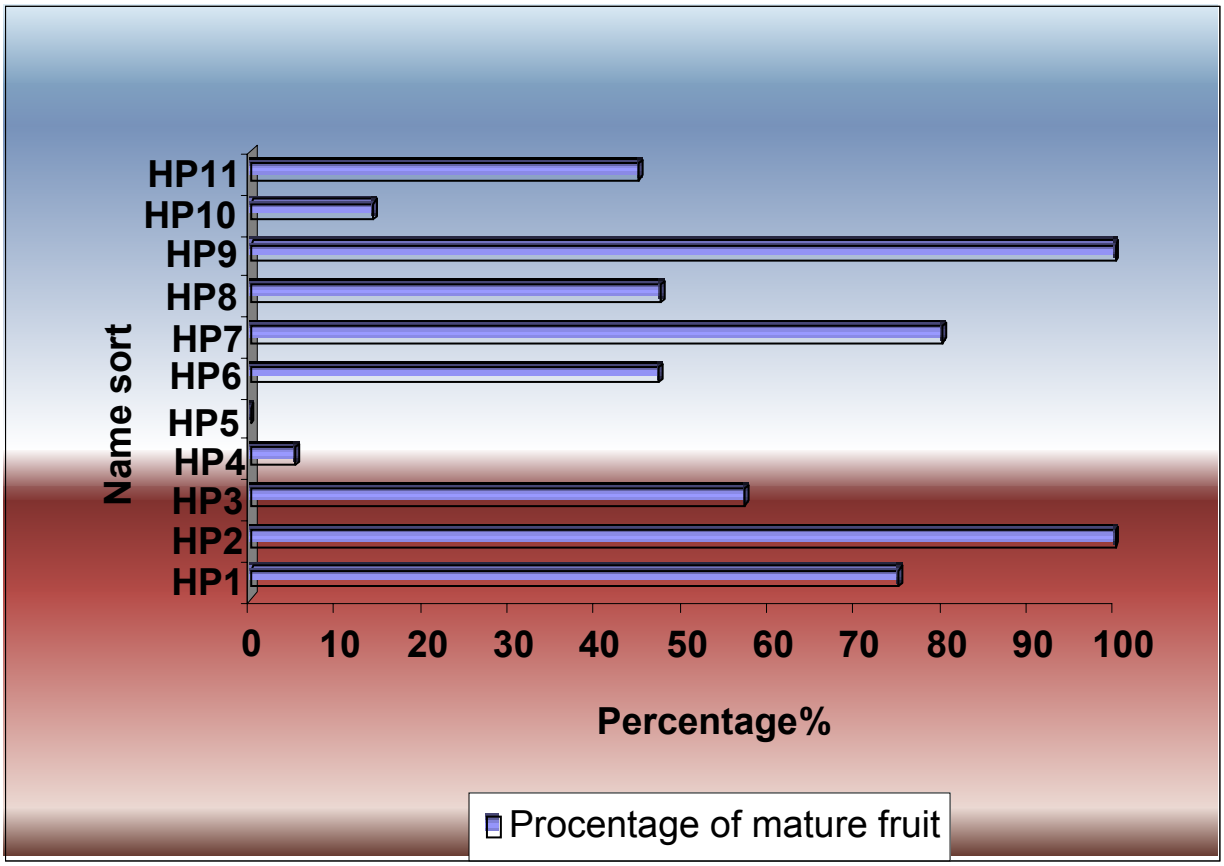

Fig. 3. Percentage of mature fruit.

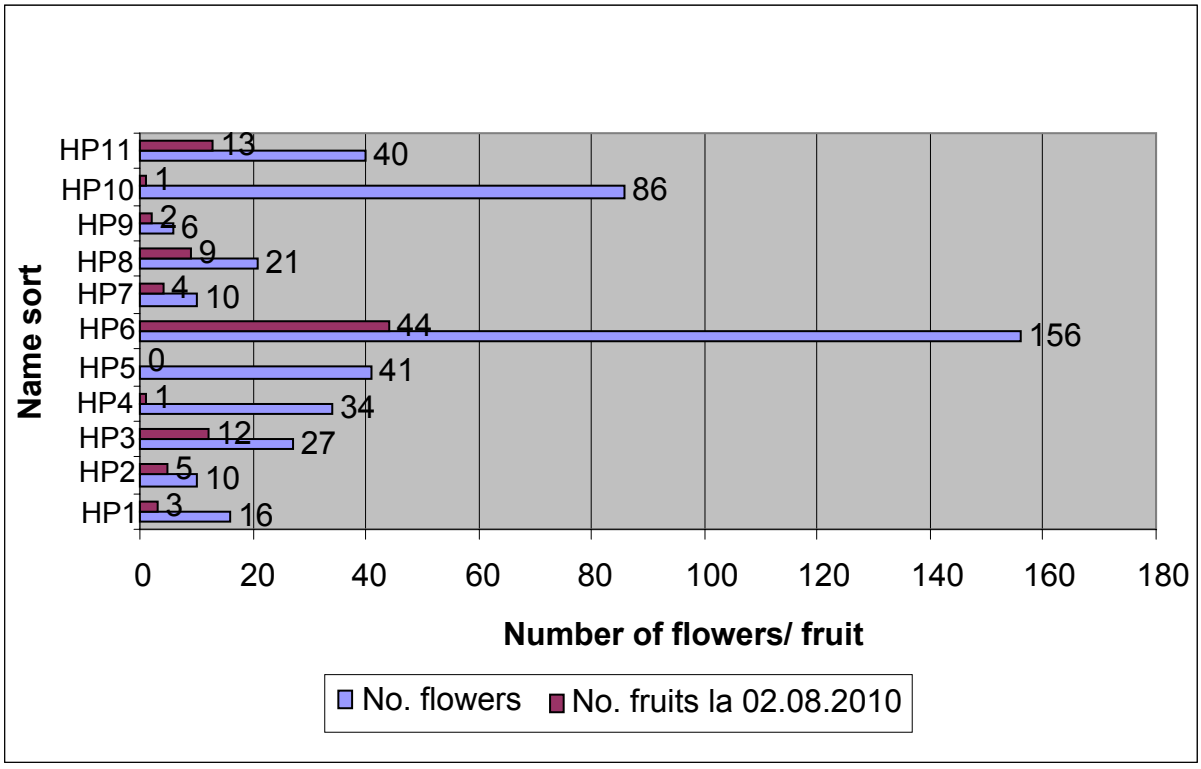

Fig. 4. Graphic comparison between flowering and fruit setting.

CONCLUSIONS

As a priority, breeders have to combine genes coding for resistance to the main diseases and pests and traits related to the tree habit to lower costs of production. Combining scab, mildew and fire blight resistance is well advanced. Plant breeding experience assured that recovery of fruit quality will be accomplished, whereas disease-resistance breeding experience was not so reassuring with respect to obtaining permanent disease resistance.

The molecular genetics offers the promise of improving our understanding of the nature of plant resistance genes.

Meanwhile, breeders will have to use conventional breeding methods to produce new cultivars suitable for growers, dealers and consumers and with durable resistance to the principal diseases.

A recently initiated collaborative project involving apple breeders in many European countries was started this year, "Fruit Breedomics" and coordinated by INRA Angers. The objective is to improve the European apple crop by molecular-aided breeding to increase efficiency and reduce the time-scale in breeding for resistance, tree habit and quality. It will be the next step where molecular biologist will combine their knowledge with the art of conventional plant breeders.

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