Apple and pear breeding in Bulgaria

V. Djouvinov
Fruit Growing Research Institute, 4004 Plovdiv, Bulgaria

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Summary

A new apple and pear breeding programme was started in 1986. The main goal of this programme is to produce very early and late maturing apple and pear cultivars resistant to the main diseases and with range of tree habits - standard, compact or columnar and weeping. Hybrid 142 (Golden Delicious × M. zumi) which is resistant to scab mildew and San José scale is very effective as donor for powdery mildew resistance. To incorporate resistance to scab parents as Prima, Redfree, Liberty, Florina carrying the Vf resistance were included. Hybrid 2350 (Williams × P. ussuriensis) × Clapp’s Favourite is used as donor for scab resistance and will be studied for resistance to Psylla pyricola. Hybrids with columnar habit have been selected from the crosses McIntosh Wijcik × Redfree and McIntosh Wijcik × Liberty, and with weeping habit from progenies Elise Rathke × Prima and Elise Rathke × Florina. Embryoculture is applied to very early ripening apple (early July – Geneva Early and Vista Bella) and pear (second part of June – Ranna bolyarka and Trapezitsa) cultivars.

Introduction

The apple is the main fruit crop in Bulgaria. From 1976 to 1989 the proportion of trees of the major commercial cultivars Golden and Red Delicious decreased from 82 to 72%. During this period the cultivars Melrose, Granny Smith, Prima, Mollie’s Delicious came to occupy 4.2% of the orchards.

During the last 20 years four new apple cultivars have been introduced in Bulgaria, Roumyana (Delicious × Jonathan), Trakijska slava (Golden Delicious × Northern Spy), Chervena jubileyna (Golden Delicious × Jonathan) and Trakijska kasna (Jonathan × McIntosh). These new and two main cultivars are susceptible to scab and usually need 12–16 fungicide treatments from April to the end of July to control the disease. Moreover Melrose, Granny Smith, Mollie’s Delicious and most of the new Bulgarian cultivars are susceptible to mildew, another economically important disease of apples in our country. Many of the scab resistant cultivars originating from USA, Canada, United Kingdom, etc., have been found to be unsuitable under our climatic conditions.

The pears Williams, Curé, Passe Crassane, Beurré Giffard, Beurré Bosc are most commonly grown in orchards. New cultivars are: Trapezitsa (B. Giffard × Tserovka), Hebar (Dr Jules Guyot × B. d’Hardenpont), Kasna Vilyamova (Max Red Bartlett bud sport), Ranna bolyarka (B. Giffard × Tserovka), Kyustendilská maslovka (B. d’Hardenpont × Doyenne d’hiver). During the last several years Pear Psylla is the most important pest of pears on main commercial and new cultivars. These problems prompted a new breeding programme in 1986, apple and pear breeding being discontinued in 1972 (Djouvinov 1989).

Materials and methods

Plovdiv is situated in the middle part of Southern Bulgaria, 160 m above sea level. The average annual temperature is 12 °C, the humidity RH 73%, precipitations 516 mm and frost-free period lasts 184 days, i.e., from 13 April to 15 October.

The apple collection includes 733 accessions, the pear collection 245 accessions. Sources for apple scab (Venturia inaequalis (Cke.) Wint.) resistance are Pri-
ma, Redfree, Liberty and Florina all carrying the Vf resistance gene and Freedom with Vf and polygenic resistance from Antonovka (Lespinasse 1989).

Two other sources of resistance are also included: hybrid 142 (Golden Delicious × M. zumi) and a hybrid from G. Delicious × M. niedzwetzkyana with resistance to scab and mildew (Podosphaera leucotricha (Ell. & Ev.) Salm.) (Baev 1974).

In 1986 and 1987 some of these selection (No. 36) also showed resistance to San José scale (Quadraspidiotus perniciosus, Comstock) in laboratory and field conditions (Mitkov and Baev 1988).

McIntosh Wijcik is used as a source of compact habit (Lapins & Watkins 1973) and Elise Rathke for weeping habit (Malichenko & Roudenko 1972). Apple seedlings are inoculated in the greenhouse with Venturia inaequalis (Brown 1975, R.P. Penev unpublished data).

Two years mildew infection is assessed in the nursery on a scale (0 = no visible symptoms, 1 = very slight infection, 2 = slight infection on leaves and shoots, 3 = moderate, 4 = heavy, and 5 = very heavy infection on leaves and shoots) (Djouvinov & Slavov 1979).

Hybrids from P. ussuriensis are used for resistance to pear scab Venturia pirina Ederh. and some of which (No. 546 (Williams × P. ussuriensis) × Clapp’s Favourite) have also shown resistance to San José scale (Mitkov & Baev 1988).

We used embryoculture, following Kolova (unpublished) for seed from the very early ripening (early July) apple cultivars Geneva Early and Vista Bella and the pears, Ranna Bolyarka, Trapezitsa and hybrid 5932 (Beuré Giffard × Echmenka) which ripen between June 15–30 (Iliev et al. 1984, Komitov et al. 1989).

<table>
<thead>
<tr>
<th>Cross</th>
<th>Number of plants</th>
<th>Scale (in %)</th>
</tr>
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<tbody>
<tr>
<td>Starkrimson × 142</td>
<td>56</td>
<td>44.6, 51.8, 3.6, 2, 1, 0</td>
</tr>
<tr>
<td>Russet free Golden × 142</td>
<td>122</td>
<td>40.9, 36.4, 13.6, 5, 0, 4.1</td>
</tr>
<tr>
<td>Gloster × 142</td>
<td>32</td>
<td>31.9, 59.0, 9.1, 2, 1</td>
</tr>
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</table>

Results and discussion

Apple During the first two seasons in the orchard, eight seedlings of progeny 8642 (Democrat × Melrose) were not attacked by Aphis pomi (De Greer). At the same time four seedlings from 8640 (Democrat × Smoothee) showed some slight attack. Resistance to Green Apple Aphid was found on all 9 plants of progeny 8620 (Krimskoe selektsionnoe × Florina).

Investigations in the nursery on mildew susceptibility in progenies 8930 (Starkrimson × 142), 8912 (Gloster × 142) and 8936 (Russet free Golden × 142) showed a high percentage of resistant seedlings, 44.6, 40.9 and 31.9%, respectively. This result is very close to that of Kopan et al. (1989) using hybrid 142 in Kiev. The ratio of resistant:susceptible seedlings is close to 1:1 (Table 1).

In progenies 9127 (McIntosh Wijcik × Redfree), 9129 (McIntosh Wijcik × Liberty) and McIntosh Wijcik-open polinated, the ratio of seedlings with a normal tree habit to those with a compact habit was about 1:1 (Table 2).

Plants with a weeping habit have been selected from progenies 8805 (Elise Rathke × Prima) and 8806 (E. Rathke × Florina). The inheritance of these characteristic will be studied.