

Breeding of robust peach cultivars for organic production in Austria

A. Spornberger, D. Noll¹

Abstract

Based on long-term observations of peach cultivars under organic production, in 2017 we started with a breeding program at BOKU Vienna in Austria with suitable genitors with a low susceptibility to diseases (e.g. *Taphrina deformans*). The aim is to obtain peach cultivars for organic growers with robustness to diseases, pests and flower frost, as well as high yield capacity and fruit quality (e.g. colour, fruit firmness, taste). First results are presented.

Keywords: peach breeding, robustness, organic, leaf curl, *Taphrina deformans*, shothole blight, *Wilsonomyces carpophilus*, peach aphid

Introduction

The organic peach production is still a developable sector in Austria and in other countries of Central Europe. Since the major challenges for the producers here are the fungal diseases peach leaf curl (*Taphrina deformans*), brown rot on fruits (*Monilinia ssp.*) and coryneum or shothole blight (*Wilsonomyces carpophilus*), and in some years also flower frost, there is a high interest for robust cultivars. Our breeding and selection activities are integrated in the European project InnOBreed (Innovative Organic Fruit Breeding and Uses) with the aim to identify suitable genetic resources for breeding purposes and establish robust cultivars for organic production systems.

Material and Methods

In 2017, on the basis of long-term observations in an organically managed orchard (Spornberger et al., 2022), we started with a breeding program at the Institute using the most suitable cultivars as genitors with desirable characteristics focused on robustness and low susceptibility against leaf curl (*T. deformans*), coryneum or shothole blight (*W. carpophilus*) and aphids (*Myzus persicae*, *Hyalopterus pruni*) as well as fruit quality and high yield capacity. We chose the yellow-fleshed cultivars "Avalon Pride" and Jayhaven" and the white-fleshed "Mireille", and "Weingartenpfirsich Poysdorf" as the main parental genitors, summarized characteristics are shown in table 1.

The different combinations were realised by classical crossing practices. First the flowers of the mother plants were emasculated at the balloon stage (BBCH 59), and about 2-3 days later at full blooming stage (BBCH 65) the pollination was done by hand using the pollen of the chosen father cultivar. After harvest the seeds were immediately separated from the nuts and given into a vermiculite substrate for stratification at a temperature of 4 °C. At the end of December, after germination, they were planted in pots in the greenhouse and then planted in May in the open field for further observations under extensive organic growing conditions.

¹ Institute of Viticulture and Pomology, University of Natural Resources and Life Sciences, AT-1180 Vienna, andreas.spornberger@boku.ac.at

Table 1: Important characteristics and ripening time of the peach cultivars used as genitors in our breeding program

variety	characteristics	time of ripening in Vienna ¹
Avalon Pride	very early flowering time, yellow-fleshed, velvety skin, good flavour, good <i>T. deformans</i> - tolerance	M July
Jayhaven	yellow-fleshed, light hairy skin, good taste, mid susceptibility to shothole on shoots, good tolerance to <i>T. deformans</i>	B August
Mireille	white-fleshed, hairy skin, high fruit-flesh firmness and transportability, high yield, good <i>T. deformans</i> - tolerance	M August
Vineyardpeach Poysdorf	white-fleshed, very hairy skin, good flavour, low susceptibility to <i>Monilinia ssp.</i> , good <i>T. deformans</i> - tolerance	E August/B September

¹ B= Begin; M= Mid; E= End

In 2020, with the first fruit set on the hybrids generated in 2017 and 2018, the evaluation and an ongoing selection process started focusing on fruit quality traits: fruit skin colour, fruit size, overall fruit taste were scored on a rating scale from 1 = very low to 9= very high, as well as robustness to occurring pests and diseases (e.g. *Taphrina deformans*) was scored on a rating scale from 0 (=no infestation) to 9 (=very high infestation). New hybrids with insufficient characteristics (e. g. overall fruit taste ratings lower than 6) were strictly kicked out year by year.

Due to increasing occurrence of late frost in the last years, the flowering time and the flower density connected to the fruit set was also implemented into our evaluations as important factor to figure out a kind of frost tolerance of varieties.

Results, conclusions and outlook

After four years of evaluation, we identified several interesting new hybrids (table 2). The most promising four hybrids were grafted in summer 2023 and are going to be planted in autumn 2024 at three different sites for further observations.

Besides the breeding activities and the selection of the new hybrids we are still evaluating peach cultivars in our orchards to identify useful genitors for our breeding program. Within the InnOBreed project we benefit in sharing experiences and knowledge in the breeding and evaluation process among the partners.

Table 2: Results (mean values of 2021-2023) of some evaluated traits including the ripening time from some of our best performing peach hybrids

hyrid number	parent genitors (mother x father)	planted in	Time of ripening ⁴				fruit size ¹	fruit skin colour ¹	overall fruit taste ¹	fruit flesh colour ²	Taphrina deformans on leaves ³	shothole on leaves ³
			E July	B Aug	M Aug	E Aug						
1/1	Mireille x Jayhaven	2019					4	7	7,5	y	3	4
1/3	Mireille x Jayhaven	2019					3,5	7,5	7,5	y	4	4
1/8	Mireille x Jayhaven	2019					5,5	5-7	7,5	y	3	4
1/11	Mireille x Jayhaven	2019					6	7,5	7	w	3	4
1/21	Poysdorf x Mireille *	2019					7,5	7	7,5	y	2	3,5
1/39	Poysdorf x Mireille	2019					6	8	7	w-y	3	3
1/42	Poysdorf x Mireille *	2019					5	7,5	7,5	w	3	3
2/10	Poysdorf x Poysdorf *	2019					7	5,5	7,5	y	3	2
2/27	Poysdorf x Avalon Pride	2019					4,5	7,5	7	y	4	3
2/30	Poysdorf x Avalon Pride	2019					7	8	7,5	y	4	2
2/33	Poysdorf x Avalon Pride	2019					5	8	7	w	4	3
2/35	Poysdorf x Avalon Pride	2019					7	6	7	w	3	4
4/7	Mireille x Peach almond bastard *	2018					7,5	7,5	7	w	4	3

¹ 1= very low to 9= very high score

² w= white, y= yellow

³ 0= no infestation to 9=very high infestation

⁴ B= Begin, M= Mid, E= End

* most promising hybrids grafted for planting 2024 on different sites

References

Spornberger, A., Lieber, M., Locher, J., Noll, D. (2022). Selection of appropriate genitors for organic peach breeding in Austria. Proceedings of the 20th International Conference on Organic Fruit-Growing, online 2022.02.21-23. Ed. FOEKO e.V. 2022: 171-172