

# Evaluation of pear rootstocks in an orchard

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**ABSTRACT:** This study was conducted in the Research and Breeding Institute of Pomology in Holovousy in order to test some new pear rootstocks under the conditions of the Czech Republic. In a rootstock trial planted in spring 1996 five clonal rootstocks (OH × F 69, OH × F 87, OH × F 230, OH × F 333 and standard Quince BA-29) were compared with Red Bartlett, Conference and Lucas as test cultivars. In comparison with Red Bartlett, the cumulative yield per tree from 1996 to 2002 was the highest on OH × F 69 and the lowest on OH × F 333. The yield efficiency (kg/cm<sup>2</sup>) was best on BA-29. The cultivar Conference had the highest total yield and yield efficiency on OH × F 87. The lowest yield was on OH × F 333. The cultivar Lucas was the most productive on OH × F 87. In the sixth year after planting no difference was observed in growth vigour (indicated by trunk cross-sectional area) between OH × F clones with the cultivar Red Bartlett. The trees on BA-29 grew less. The tree size of Conference was largest for OH × F 230 and smallest for OH × F 333. The cultivar Lucas grew vigorously on OH × F 69. Small trees were observed on the rootstock OH × F 87. Fruit weight was higher on BA-29 than on OH × F rootstocks with all cultivars. The production of suckers proved to be small with all cultivars on all rootstocks. The anchorage of all trees was adequate. No graft incompatibility has been detected yet. The results were processed statistically.

**Keywords:** pear; rootstock; growth vigour; yield; suckering

In the new orchards presently being established in the Czech Republic, pears are planted on quince rootstocks. Using these rootstocks has become rather hazardous recently because fire blight has spread in some parts of the country. A solution would be the use of new OH × F rootstocks, which are resistant to fire blight (HUMMER 1998). Rootstocks seem to be important for influencing the sensitivity of the scion cultivar to fire blight infection (KORBA pers. commun. 2002). OH × F clones have not been tested in climatic and soil conditions of the Czech Republic yet. The aim of this work is to investigate the behaviour of these rootstocks here and evaluate their yield performance using varieties which are common in the Czech Republic.

## MATERIAL AND METHODS

Pear cultivars Red Bartlett, Conference, Alexander Lucas on OH × F 69, OH × F 87, OH × F 230, OH ×

F 333 rootstocks and Quince BA-29 as a control were planted in an experimental orchard at Holovousy in spring 1996. The trees were planted using spacing dimensions of 2.1 × 5 m and were trained as spindle without support. Soil management and pest and disease control followed standard practices. The experiment was conducted in a random block design with three replications, each with two trees. The following characteristics were recorded annually: trunk cross-sectional area, yield, fruit weight and number of root suckers. The results were further measured statistically by the analysis of variance.

## RESULTS AND DISCUSSION

Growth and yield characteristics of trees from 1999 to 2002 are given in Tables 1–3. Tree size of Red Bartlett cv. was quite similar on all OH × F rootstocks. The smallest were trees on Quince BA-29 (23.3 cm<sup>2</sup>).

Table 1. Tree size, yield, fruit weight and suckering of Red Bartlett cv. (1999–2002)

Rootstock	Trunk cross-sectional area (cm <sup>2</sup> , 2001)	Cumulative yield per tree (kg, 1992–2002)	Cumulative yield efficiency (kg/cm <sup>2</sup> TCA)	Mean fruit weight (g, 2001–2002)	Total number of suckers per tree (1999–2002)
BA-29	23.3	49.9	2.1	191	1.3
OH × F 69	28.1	52.7	1.9	172	0.0
OH × F 87	28.3	46.7	1.7	181	0.0
OH × F 230	28.4	47.7	1.7	155	0.0
OH × F 333	27.5	37.2	1.4	177	1.0
LSD <sub>(0.05)</sub>	2.1	3.2	0.4		

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Table 2. Tree size, yield, fruit weight and suckering of Conference cv. (1999–2002)

Rootstock	Trunk cross-sectional area (cm <sup>2</sup> , 2001)	Cumulative yield per tree (kg, 1999–2002)	Cumulative yield efficiency (kg/cm <sup>2</sup> TCA)	Mean fruit weight (g, 2001–2002)	Total number of suckers per tree (1999–2002)
BA-29	41.6	56.5	1.4	146	2.8
OH × F 69	45.3	56.3	1.2	117	0.7
OH × F 87	41.9	68.5	1.6	135	0.4
OH × F 230	48.9	46.1	0.9	110	0.0
OH × F 333	34.5	34.8	1.0	111	0.3
LSD <sub>(0.05)</sub>	3.8	4.3	0.4		

Table 3. Tree size, yield, fruit weight and suckering of Alexander Lucas cv. (1999–2002)

Rootstock	Trunk cross-sectional area (cm <sup>2</sup> , 2001)	Cumulative yield per tree (kg, 1999–2002)	Cumulative yield efficiency (kg/cm <sup>2</sup> TCA)	Mean fruit weight (g, 2001–2002)	Total number of suckers per tree (1999–2002)
BA-29	54.9	73.3	1.3	246	1.2
OH × F 69	62.8	70.4	1.1	188	0.0
OH × F 87	54.3	96.6	1.8	228	0.0
OH × F 230	61.0	79.4	1.3	176	0.0
OH × F 333	62.2	56.5	0.9	169	0.0
LSD <sub>(0.05)</sub>	3.9	4.9	0.4		

The cumulative yield per tree (1999–2002) was high on OH × F 69 and BA-29 (52.7 and 49.9 kg). The yield efficiency using TCA was the highest on BA-29 (2.1 kg/cm<sup>2</sup>). Fruit weight was highest with this cultivar on BA-29 (191 g). The smallest fruit weight was on OH × F 230 (155 g). Tree size of Conference cv. was largest on OH × F 230 (48.9 cm<sup>2</sup>) and the smallest on OH × F 333 (34.5 cm<sup>2</sup>). Trees grafted on OH × F 333 grew weaker than those on Quince. The same results were obtained by WERTHEIM and BALKHOVEN-BAART (1994).

This cultivar had highest yield on OH × F 87 (68.5 kg) and the lowest on OH × F 333 (34.8 kg). The yield efficiency was highest on OH × F 87 (1.0 kg/cm<sup>2</sup>). The cultivar Conference had the highest fruit weight on Quince BA-29 (146 g), whereas all OH × F rootstocks induced smaller fruit weight (110–135 g).

The cultivar Alexander Lucas was the most productive on OH × F 87 (96.6 kg). A low yield was observed on BA-29 (73.3 kg) and OH × F 333 (56.5 kg) rootstocks. Trees on OH × F 87 (54.3 cm<sup>2</sup>) and BA-29 (54.9 cm<sup>2</sup>) were the least vigorous, whereas OH × F 69 (62.8 cm<sup>2</sup>) and OH × F 333 (62.2 cm<sup>2</sup>) were the most vigorous. The mean fruit weight was highest on rootstock BA-29 (246 g) and lowest on OH × F 333 (169 g). The production of suckers proved to be negligible with all the cultivars on all rootstocks. Rather only trees on Quince BA-29 tended to suckering.

This is very important since trees can be infected with *Erwinia amylovora* through suckers (RICHTER 1999). The anchorage of trees on all rootstocks was

sufficient. No graft incompatibility has been detected yet. Any trees have not died yet. Contrary to a report by DIETZ (1997) none of the trees on OH × F rootstocks showed colour changes of leaves since the beginning of August. In this trial, the rootstock OH × F 333 proved to be unsuitable for commercial orchards due to its low productivity and small fruit weight. The clone OH × F 87 is promising among all the tested rootstocks especially with both cultivars Conference and Alexander Lucas.

## References

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## Hodnocení hrušňových podnoží v sadu

**ABSTRAKT:** Cílem práce bylo stanovit hospodářské vlastnosti některých nových hrušňových podnoží v podmínkách České republiky. Pokus byl vysazen na jaře 1996 ve Výzkumném a šlechtitelském ústavu ovocnářském Holovousy, s. r. o., a je v něm hodnoceno pět vegetativních podnoží (OH × F 69, OH × F 87, OH × F 230, OH × F 333, BA-29 – kontrola) spolu s odrůdami Williamsova červená, Konference a Lucasova. Celkový výnos z jednoho stromu u odrůdy Williamsova červená v období 1996 až 2002 byl nejvyšší na OH × F 69 a nejnižší na OH × F 333. Specifický výnos (kg/cm<sup>2</sup>) byl nejlepší na BA-29. Odrůda Konference měla nejvyšší celkový i specifický výnos na klonu OH × F 87. Nejnižší výnos byl na OH × F 333. Odrůda Lucasova byla nejproduktivnější na OH × F 87. V šestém roce po výsadbě nebyly zjištěny rozdíly v intenzitě růstu klonů OH × F u odrůdy Williamsova červená. Stromy na BA-29 byly u této odrůdy nejmenší. Odrůda Konference rostla nejbujněji na OH × F 230 a nejslaběji na OH × F 333. Odrůda Lucasova rostla silně na OH × F 69, malé stromy byly pozorovány s podnoží OH × F 87. Hmotnost plodů byla vyšší na BA-29 než na podnožích OH × F. Tvorba kořenových výmladků byla zanedbatelná u všech odrůd a podnoží. Pevnost ukotvení stromů v půdě byla dostatečná. Nebyly pozorovány příznaky špatné afinity mezi roubem a podnoží.

**Klíčová slova:** hrušeň; podnož; intenzita růstu; plodnost; tvorba podrostru

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