# SHORT COMMUNICATION

# Evaluation of BC Williams and PI1/6 pear cultivars for their compatibility with 49 quince genotypes and their susceptibility to fire blight

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**ABSTRACT**: In this study, the compatibility of the pear cultivars PI1/6 and BC Williams with 49 quince genotypes was evaluated. The results showed that the cv. PI1/6 had a good compatibility with several of the quince genotypes, and the cv. BC Williams only with a few of them. Differences were also found in their susceptibility to fire blight (*Erwinia amylovora*). The cultivar PI1/6 was very susceptible, while the cultivar BC Williams was relatively tolerant.

**Keywords**: compatibility; fire blight; pear; PI1/6; quince; Williams

The pear cultivar PI1/6 (Greek hybrid originated from Kontoula × Kristali) is very popular among the Greeks because of its delicious taste and its fruits available in the Greek market very early (the first days of July). The cultivar BC Williams is also very popular and matures during the period between August and November. In addition, the fruits of BC Williams can be industrially processed to obtain jams and fruit juices. The most important problems that arise in pear cultivation are:

a) the compatibility of cultivars with the common rootstocks used. In Greece, the most important pear rootstocks are quince rootstocks due to their compatibility with many pear cultivars; the most important rootstocks used in Greece are the quince clones BA 29 and OHF. The compatibility of the cultivar BC Williams with some quince clones was reported earlier (Rivalta et al. 1989a,b; Sansavini et al. 1980). No evidence is however available for the compatibility of the cultivar PI1/6 with quince rootstocks although many Greek growers have already used this combination (unpublished data);
b) infection disease 'fire blight' . Over the last few years the pear cultivation has been limited in Greece because of fire blight, which is a very destructive disease caused by the bacterium *Erwinia amylovora*. Some researchers reported that the cultivar BC Williams is moderately susceptible to fire blight (Al-Dahmashi, Khlaif 2004; Severin et al. 1999), while others described it as susceptible (Bagnara et al. 1994).

The aim of this study was to evaluate the compatibility of the pear cultivars BC Williams and PI1/6 with 49 quince genotypes. In addition, the susceptibility of both cultivars to fire blight (*Erwinia amylovora*) was examined.

## MATERIAL AND METHODS

Forty-nine quince genotypes (clones with unknown parents) were planted (planting distance was 5 × 3 m) in the experimental orchard of the Pomology Institute Naoussa in 1991. These genotypes were collected from different parts of Greece (used mainly as fruit species in small gardens). The pear cultivars PI1/6 and BC Williams were budded on each quince genotype one year later. All cultural practices were carried out following commercial practice (pruning, spraying, thinning, irrigation, etc.). Results were collected for 5 consecutive years (1993–1997) by measuring the diameter of scion, the diameter of rootstock, the total height of each tree and its productivity. Recordings of the susceptibility of both cultivars to fire blight *(Erwinia amylovora*) were made by visual observations (determined by field ratings, a scale of 0–10 was used: 0 = healthy tree and 10 = dead tree). Natural inoculum was abundant as fire blight infected and destroyed many pear orchards in surrounding areas. To confirm the pathogen, *Erwinia amylovora* was isolated on "*Erwinia amylovora* Differential Medium".

The experimental design was a completely randomized block with three replications of two trees each. Data were analyzed by one-way analysis of variance (ANOVA). To combine experiments, Bartlett's test of homogeneity of variance was used and treatment means were separated by the method of Least Significant Difference ($P = 0.05$).

Table 1. Compatibility of the pear cultivars BC Williams and PI1/6 with 49 quince genotypes

| Genotypes | BC Williams | | | | PI1/6 | | | |
|---|---|---|---|---|---|---|---|---|
| | Diameter (cm) of scion | Diameter (cm) of rootstock | Total height (cm) of tree | Productivity (kg) | Diameter (cm) of scion | Diameter (cm) of rootstock | Total height (cm) of tree | Productivity (kg) |
| 1 | 10.8[a] | 14.2 | 74.2 | 14.2 | 14.5 | 16.0 | 135.5 | 28.5 |
| 2 | 10.0 | 14.3 | 83.0 | 15.1 | 10.2 | 12.5 | 125.3 | 26.3 |
| 3 | 8.58 | 12.9 | 68.2 | 13.3 | 8.0 | 11.8 | 104.0 | 22.1 |
| 4 | 11.0 | 13.7 | 100.7 | 18.9 | 17.2 | 18.2 | 180.6 | 35.8 |
| 5 | 10.2 | 16.0 | 103.4 | 19.4 | 15.0 | 17.2 | 176.2 | 34.9 |
| 6 | 13.0 | 15.0 | 91.5 | 17.9 | 17.1 | 17.8 | 201.8 | 36.3 |
| 7 | 11.3 | 14.2 | 109.3 | 19.6 | 8.3 | 11.7 | 127.7 | 26.5 |
| 8 | 6.8 | 9.1 | 50.5 | 12.2 | 9.5 | 12.0 | 107.5 | 21.8 |
| 9 | 8.8 | 11.6 | 70.0 | 14.7 | 14.1 | 15.6 | 165.0 | 31.5 |
| 10 | 12.3 | 18.7 | 101.7 | 18.5 | 15.0 | 18.0 | 160.5 | 30.0 |
| 11 | 13.0 | 14.5 | 104.7 | 18.7 | 17.0 | 16.0 | 192.3 | 35.8 |
| 12 | 12.5 | 12.5 | 97.0 | 18.1 | 14.7 | 17.3 | 157.7 | 30.8 |
| 13 | 5.3 | 13.3 | 32.8 | 9.2 | 12.0 | 13.0 | 144.6 | 29.6 |
| 14 | 9.5 | 10.5 | 63.3 | 13.6 | 11.0 | 11.8 | 118.8 | 22.8 |
| 15 | 8.5 | 13.6 | 75.0 | 14.2 | 11.0 | 14.3 | 118.3 | 23.2 |
| 16 | 14.0 | 14.3 | 106.7 | 19.3 | 16.0 | 16.8 | 151.5 | 29.6 |
| 17 | 12.2 | 16.4 | 106.8 | 19.5 | 13.8 | 16.5 | 150.8 | 29.5 |
| 18 | 11.0 | 12.8 | 96.5 | 18.0 | 13.0 | 13.5 | 142.3 | 28.6 |
| 19 | 15.0 | 14.0 | 110.0 | 20.1 | 17.6 | 17.2 | 146.6 | 29.0 |
| 20 | 9.2 | 12.7 | 83.0 | 15.8 | 17.9 | 18.3 | 209.2 | 36.9 |
| 21 | 11.2 | 17.2 | 104.0 | 19.0 | 13.8 | 15.3 | 144.5 | 29.4 |
| 22 | 9.4 | 13.8 | 75.0 | 14.7 | 13.2 | 15.0 | 134.2 | 28.2 |
| 23 | 8.0 | 15.4 | 71.0 | 14.6 | 12.6 | 14.4 | 164.6 | 30.1 |
| 24 | 6.5 | 16.3 | 49.5 | 12.4 | 14.8 | 17.0 | 160.2 | 29.6 |
| 25 | 10.7 | 16.3 | 76.0 | 14.3 | 14.3 | 13.4 | 150.4 | 28.6 |
| 26 | 14.7 | 13.7 | 110.7 | 20.4 | 14.0 | 15.3 | 140.3 | 29.1 |
| 27 | 15.4 | 16.2 | 126.2 | 22.5 | 15.5 | 18.0 | 128.5 | 24.6 |
| 28 | 10.7 | 13.7 | 85.3 | 17.1 | 14.3 | 14.7 | 148.0 | 28.1 |
| 29 | 16.5 | 14.5 | 101.0 | 18.5 | 18.9 | 15.2 | 152.0 | 29.5 |
| 30 | 12.0 | 14.2 | 75.8 | 15.0 | 12.5 | 13.5 | 113.5 | 22.5 |
| 31 | 13.0 | 18.0 | 100.3 | 18.2 | 14.7 | 15.3 | 125.0 | 25.1 |
| 32 | 10.4 | 14.8 | 93.0 | 17.7 | 10.7 | 10.0 | 103.3 | 20.9 |
| 33 | 12.4 | 14.0 | 95.2 | 17.5 | 15.0 | 13.0 | 147.0 | 28.5 |
| 34 | 4.0 | 11.0 | 66.0 | 13.6 | 10.0 | 12.3 | 101.2 | 20.4 |
| 35 | 15.3 | 17.0 | 121.0 | 23.1 | 29.0 | 24.0 | 300.0 | 42.8 |
| 36 | 9.0 | 11.0 | 102.0 | 18.2 | 13.3 | 12.5 | 152.2 | 29.6 |
| 37 | 12.4 | 16.8 | 84.0 | 16.3 | 10.0 | 11.5 | 96.5 | 19.7 |
| 38 | 11.6 | 17.3 | 106.8 | 18.9 | 11.5 | 14.0 | 137.0 | 26.9 |
| 39 | 10.3 | 14.7 | 83.0 | 16.1 | 14.0 | 17.0 | 148.0 | 28.3 |
| 40 | 16.0 | 18.0 | 111.0 | 19.5 | 17.5 | 18.5 | 172.5 | 29.1 |
| 41 | 15.5 | 15.0 | 120.5 | 21.8 | 18.3 | 15.2 | 165.0 | 28.5 |
| 42 | 14.0 | 15.0 | 109.5 | 19.3 | 17.4 | 15.0 | 160.3 | 29.0 |

## RESULTS AND DISCUSSION

The compatibility between rootstock and cultivar is a crucial factor that should be considered before making the decision to establish a pear orchard. The quince rootstocks are widely used in pear orchards, because of their good adaptation in Greek soil and climate conditions; they are also suitable

Table 1 to be continued

| Genotypes | BC Williams | | | | PI1/6 | | | |
|---|---|---|---|---|---|---|---|---|
| | Diameter (cm) of scion | Diameter (cm) of rootstock | Total height (cm) of tree | Productivity (kg) | Diameter (cm) of scion | Diameter (cm) of rootstock | Total height (cm) of tree | Productivity (kg) |
| 43 | 13.8 | 20.8 | 113.5 | 19.9 | 16.5 | 21.1 | 171.0 | 30.3 |
| 44 | 9.7 | 13.3 | 92.0 | 18.3 | 15.0 | 14.0 | 180.0 | 30.8 |
| 45 | 13.0 | 14.5 | 112.2 | 19.4 | 12.0 | 13.0 | 104.0 | 22.6 |
| 46 | 15.8 | 14.8 | 102.8 | 18.4 | 20.5 | 16.0 | 177.5 | 28.9 |
| 47 | 9.4 | 10.5 | 60.5 | 12.7 | 11.0 | 11.0 | 100.0 | 21.2 |
| 48 | 10.2 | 13.3 | 88.0 | 16.8 | 12.3 | 13.0 | 105.2 | 20.6 |
| 49 | 15.0 | 16.0 | 102.0 | 18.6 | 18.9 | 15.9 | 120.2 | 23.7 |
| LSD (< 0.05) | 4.22 | 5.17 | 25.9 | 3.31 | 9.55 | 7.56 | 50.89 | 6.91 |

Values are the mean of 5 consecutive years

for establishing high-density plantations due to their dwarfing rootstocks (Sansavini, Musacchi 1994). However, the quince rootstocks used do not show a good compatibility with all the commercial pear cultivars (Tsipouridis, unpublished data). Finding new quince genotypes that could be used as pear rootstocks is thus the aim of many researchers. The results showed that the cv. PI1/6 had a good compat-

Table 2. Susceptibility of quince genotypes to *Erwinia amylovora*

| Genotypes | BC Williams | PI1/6 | Genotypes | BC Williams | PI1/6 |
|---|---|---|---|---|---|
| 1 | 5 | 9 | 26 | 5 | 7 |
| 2 | 4 | 6 | 27 | 6 | 8 |
| 3 | 5 | 8 | 28 | 4 | 7 |
| 4 | 7 | 10 | 29 | 4 | 10 |
| 5 | 3 | 5 | 30 | 7 | 6 |
| 6 | 2 | 7 | 31 | 3 | 8 |
| 7 | 5 | 9 | 32 | 4 | 10 |
| 8 | 6 | 10 | 33 | 6 | 7 |
| 9 | 6 | 8 | 34 | 3 | 8 |
| 10 | 5 | 6 | 35 | 2 | 10 |
| 11 | 7 | 6 | 36 | 2 | 6 |
| 12 | 3 | 8 | 37 | 4 | 9 |
| 13 | 3 | 9 | 38 | 5 | 8 |
| 14 | 2 | 10 | 39 | 3 | 6 |
| 15 | 6 | 10 | 40 | 4 | 5 |
| 16 | 7 | 8 | 41 | 2 | 9 |
| 17 | 5 | 6 | 42 | 2 | 8 |
| 18 | 4 | 8 | 43 | 6 | 5 |
| 19 | 6 | 9 | 44 | 3 | 10 |
| 20 | 5 | 9 | 45 | 5 | 8 |
| 21 | 3 | 7 | 46 | 3 | 7 |
| 22 | 4 | 6 | 47 | 4 | 5 |
| 23 | 2 | 10 | 48 | 6 | 6 |
| 24 | 7 | 6 | 49 | 5 | 9 |
| 25 | 3 | 10 | | | |

a – values are the mean of 5 consecutive years; b – mean of index for BC Williams = 4.3; c – mean of index for PI1/6 = 7.8; d – genotypes with value 10 died

ibility with some of the quince genotypes and the cv. BC Williams with only a few of them (Table 1). Psarras (1994) used interstems to graft the incompatible cv. BC Williams on two clonal rootstocks (East Malling A and Provence Quince BA29). However, in other works, quince rootstocks grafted with cv. BC Williams had a good compatibility (Rivalta et al. 1989a,b; Sansavini et al. 1997).

The results also showed that the cultivar PI1/6 was very susceptible (mean of index = 7.8), while the cultivar BC Williams was rather tolerant (mean of index = 4.3) (Table 2). Ten of the PI1/6 trees died during the experiments; in contrast, no BC Williams tree died. The susceptibility of PI1/6 to fire blight was probably due to its parent Kontoula which is very susceptible to this disease (unpublished data). BC Williams has been reported as a moderately susceptible cultivar to fire blight (Al-Dahmashi, Khlaif 2004; Severin et al. 1999).

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## Hodnocení afinity odrůd hrušní BC Williams a PI1/6 se 49 genotypy kdouloní a jejich citlivosti ke spále růžokvětých


**ABSTRAKT**: Práce je zaměřena na hodnocení roubové snášenlivosti odrůd BC Williams a PI1/6 se 49 genotypy kdouloní. Část těchto genotypů měla dobrou afinitu s novou řeckou odrůdou PI1/6 a několik z nich i s odrůdou BC Williams. Rozdíly mezi těmito odrůdami byly nalezeny i po stránce jejich citlivosti ke spále růžokvětých (*Erwinia amylovora*). Odrůda PI1/6 byla velmi citlivá, zatímco odrůda BC Williams byla vůči této chorobě relativně tolerantní.



**Klíčová slova**: roubová afinita; spála růžokvětých; hrušeň; PI1/6; kdouloň; Williams



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