Effect of Rootstock Clones on Fire Blight Susceptibility in Scion Apple Cultivars

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Abstract

This study was performed on 24 clonal rootstocks and 4 scion apple cultivars to evaluate rootstock/cultivar combinations for susceptibility to fire blight (*Erwinia amylovora*). For this aim, the clonal rootstocks were planted in plastic greenhouse in 1992 and grafted with 4 cultivars (Golden Delicious, Dulcit, Domino and Dione) in 1998. A total of 96 rootstock/cultivar combinations were tested during 1998–2001. Each year, 10 to 30 actively growing shoots per one combination were inoculated with the pathogen. The shoots were inoculated by cutting through first unfolding leaves with scissors dipped into inoculum (10^9 cfu/ml). The trees were misted to create a high relative humidity. The susceptibility of the test roostock/cultivar combinations was evaluated by calculating the length of necrosis to the total shoot length 40 days after inoculation. The degree of susceptibility of cultivar tested varied depending on the rootstocks and years. In order of decreasing to increasing levels of fire blight susceptibility of four cultivars tested, the pattern observed was Dulcit, Golden Delicious, Domino (moderately susceptible) and Dione (very susceptible). The lowest susceptibility of four cultivars tested was observed on TE 52 rootstock (on average, the cultivars were evaluated as intermediate), the highest susceptibility was on JTE-E and M9 rootstocks (the cultivars were very susceptible). The influence of 21 remaining rootstocks on susceptibility in scion cultivars was not marked. Thus some rootstocks can render the scion cultivars more fire blight susceptible or more resistant.

Keywords: *Erwinia amylovora*; fire blight; apple tree; resistance; scions; roostocks

INTRODUCTION

Fire blight, caused by *Erwinia amylovora*, was first observed in the Czech Republic in 1986 (KŮDELA 1988). Sixteen years later, in 2002, the disease is occurring in one-half of apple and pear production area. Rootstock or collar blight of apple is an important phase of fire blight, but only when susceptible trees are grown on highly susceptible rootstocks (VAN DER ZWET & BEER 1995).

Growing resistant and less susceptible apple and pear cultivars is the most effective measure in fire blight prevention. Evaluation of fire blight susceptibility of potential apple rootstocks is an objective of many breeding programmes in early all countries doing rootstock breeding. The goal of the research is to increase the resistance of apple rootstocks to fire blight by genetic engineering (NORELLI *et al*. 1996). New dwarfing apple rootstocks are continuously being introduced by breeders and planted by growers. Several clonal apple rootstocks, such as the European dwarfing rootstocks M9, M26 and M29, are highly susceptible to *Erwinia amylovora* (VAN DER ZWET & BEER 1995; FISHER 1996; CUMMINS & ALDWINCKLE 1973). Rootstock influences the growth habit of the scion. It may also affect scion susceptibility to fire blight (VANNESTE *et al*. 2000) and vice versa, however, factual information about this interaction between scion and rootstock cultivars is scant.

This study was performed on clonal rootstocks and scion apple cultivars to evaluate rootstock/cultivars combinations for susceptibility to *Erwinia amylovora*.

MATERIALS AND METHODS

In all 27 clonal rootstocks were planted in plastic greenhouse in 1992 and grafted with 4 cultivars (Golden Delicious, Dulcit, Domino and Dione) in 1998.

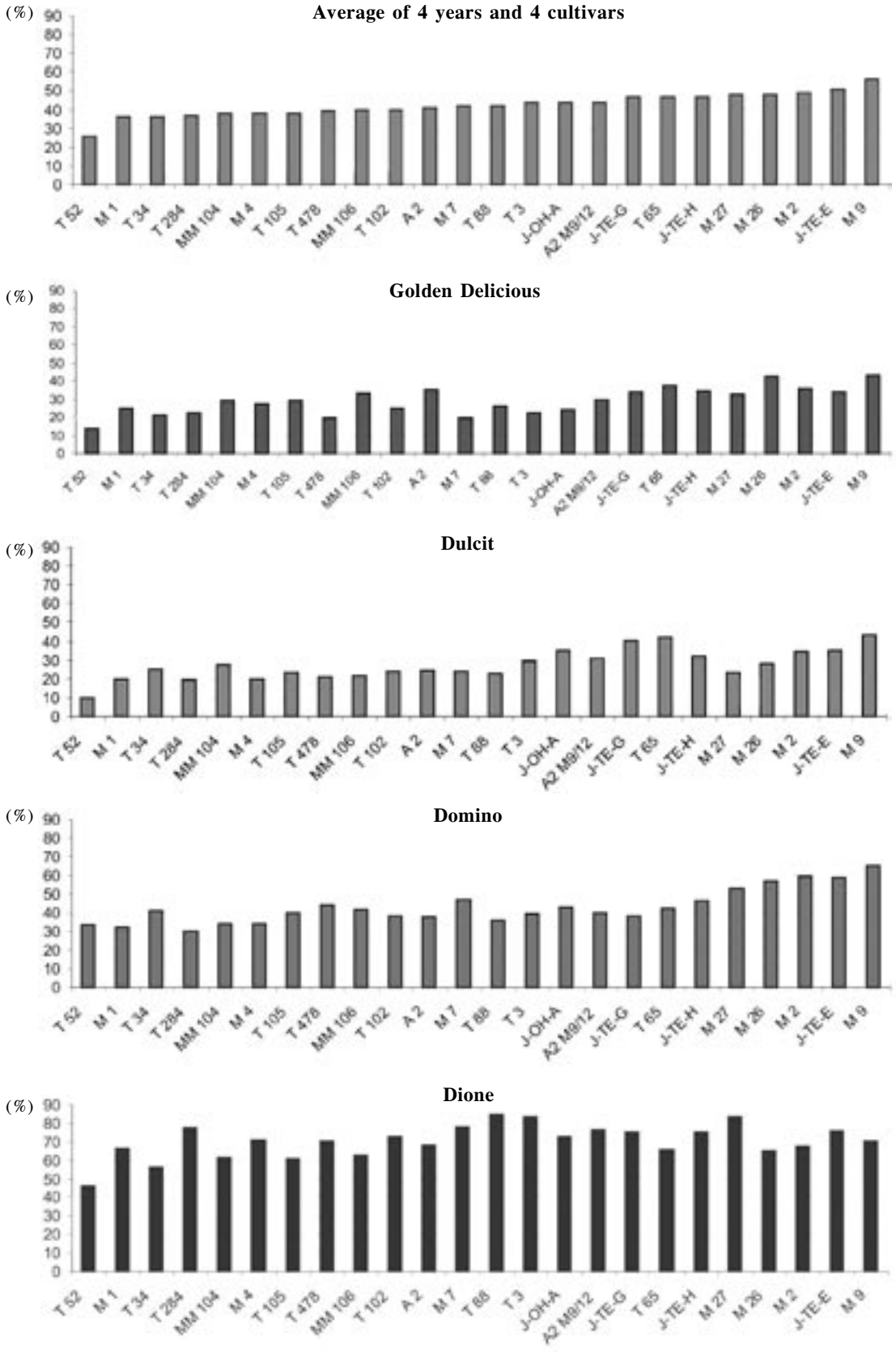

Figure 1. The fire blight susceptibility of rootstock/cultivar combinations according to the length of necrosis (in %) to the total shoot length

A total of 96 rootstock/cultivar combinations were tested during 1996–2001. Each year, 10 to 30 actively growing shoots per one combination were inoculated with the pathogen. The shoots were inoculated by cutting through the first unfolding leaves with scissors dipped into inoculation (10^9 cfu/ml). The trees were misted to create a high relative humidity. The susceptibility of the test rootstock/cultivar combinations was calculating the length of necrosis to the total shoot length 40 days after inoculation.

RESULTS AND DISCUSSION

The degree of susceptibility of cultivars tested varied depending on the rootstocks and years. In order of decreasing to increasing levels of fire blight susceptibility of the four cultivars tested, the pattern observed was Dulcit, Golden Deluicious, Domino (which can be considered as moderately susceptible) and Dione (very susceptible) (Figure 1).

The lowest susceptibility of four cultivars tested was observed on TE 52 rootstock (on average, the cultivars were evaluated as intermediate). The highest susceptibility was recorded on JTE-E and M9 rootstocks (the cultivars were very susceptible). The influence of 21 remaining rootstocks on susceptibility in scion cultivars was not marked.

In assessing the degree of fire blight resistance of various rootstocks, we should distinguish between the blight resistance of the rootstock itself and the effect of the rootstock on the level of susceptibility in the grafted scion cultivar. It follows from our experiments that the TE-52 rootstock can render the scion apple cultivars more resistant but on the other hand, the JTE-E and M9 rootstocks can render the scions apple cultivars more susceptible.

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