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The Close Relationship between the Careless Production of New Apricot Trees and the Spread of a Causal Agent of Bacterial Canker in Apricot Orchards

Iveta Pánková*, Václav Krejzar and Radka Krejzarová

Crop Research Institute, Drnovská 507, 16106 Praha 6, Czech Republic

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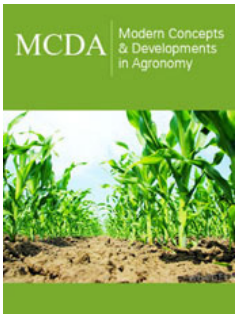

***Corresponding author:** Iveta Pánková, Crop Research Institute, Drnovská 507, 16106 Praha 6, Czech Republic

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Abstract

Bacterial canker and the premature death of young stone fruit trees, caused by different members of the *Pseudomonas syringae* (*Ps*) complex, affects commercially grown apricot orchards. Altogether, 70% of samples of mother apricot tree scion varieties (*Prunus armeniaca* L.) from different European localities consisted of *Pseudomonas* strains which are highly pathogenic to detached apricot twigs in the pathogenicity test. These strains were attributed to phylogroup PG02 and PG03, and *rpoD* sequencing confirmed a similarity to strains of *Pseudomonas syringae* pv. *syringae* and *Pseudomonas amygdali* pv. *morsprunorum* race 1 known to be pathogenic to apricot, respectively.

keywords: Scion, *Pseudomonas amygdali* pv. *Morsprunorum, Pseudomonas syringae* pv. *syringae*

Introduction

For the production of apricot trees, only certified scions of apricot cultivars should be used. Propagating fruit materials are compulsorily tested for the presence of quarantine pests. Although apricot tree losses of up to 80% due to the bacterial canker and premature death have been reported all over the world, scion materials are rarely tested for the presence of disease causal agents.

Methodology

Screening of the causal agents of bacterial canker in mother apricot trees of scion varieties from 8 European localities was carried out in 2019-2021. The internal tissues of 30 buds from each scion variety were analysed using culture-dependent methods. Based on the colony morphology, *Pseudomonas*-like colonies from each sample were cultured on King's B medium and evaluated in a hypersensitive reaction test on tobacco and for ice nucleation activity and determined by the FAME method [1-3]. A subset of strains determined by FAME as belonging to the genus *Pseudomonas* with a similarity index of SimIndex≥0.5 and/or strains with positive HR and INA within (0 °C; -6 °C) were attributed to the phylogroups of *Pseudomonas syringae* (Ps) complex and their pathogenicity on detached apricot twigs was evaluated [4,5]. The strains representing all PGs were selected for phylogenetic characterization based on partial sequences of the housekeeping gene *rpoD* [6]. The results of the screening of apricot scion varieties from different localities and different samples of propagating materials were subjected to ANOVA.

The strict use of healthy propagating materials as the most important preventive measures against the bacterial canker of apricot

Knowledge of various reservoirs of Pseudomonas bacteria and their traits relative to the aptitude to survive and spread in apricot orchards is particularly pertinent for implementing

preventive measures [7]. The results of this survey displayed the necessity to screen all propagating materials of apricot for the causal agent of bacterial canker, and to improve management practices in scion mother orchards. Varying weather conditions in the nurseries where mother apricot trees of scion varieties are grown and the locality where new apricot trees are produced and planted reveal hidden infection and the effect development of bacterial canker disease. Large scale dissemination can occur when apparently healthy but latently infected propagating materials are introduced. *Ps* strains maintain a high level of adaptability, both as a symptomless member of epiphytic populations on the leaf surface and as an endophytic pathogen [8,9]. Within epiphytic microflora, a different size of pathogenic populations which are able to move towards woody plant tissues that provide nutrients and protected niches [10,11] during the dormant period is established according to the agricultural measurements, environmental and seasonal weather conditions. Bacterial control in mother apricot nurseries is the way how to reduce the dramatically premature death of apricot trees.

Result

Given the age of dying saplings between 2-5-years-old and the absence of severe external symptoms of the bacterial canker disease, the possibility of the presence of systemic infection in apricot orchards was considered. The pathogens can be transmitted by bud grafting and, ultimately even the small size of the pathogen population results in 20-50 % losses of trees in new apricot plantings within three years. The occurrence of causal agents of premature death in mother apricot trees scion varieties grown in the nurseries in eight European localities was screened in 2019-2021 (Figure 1).

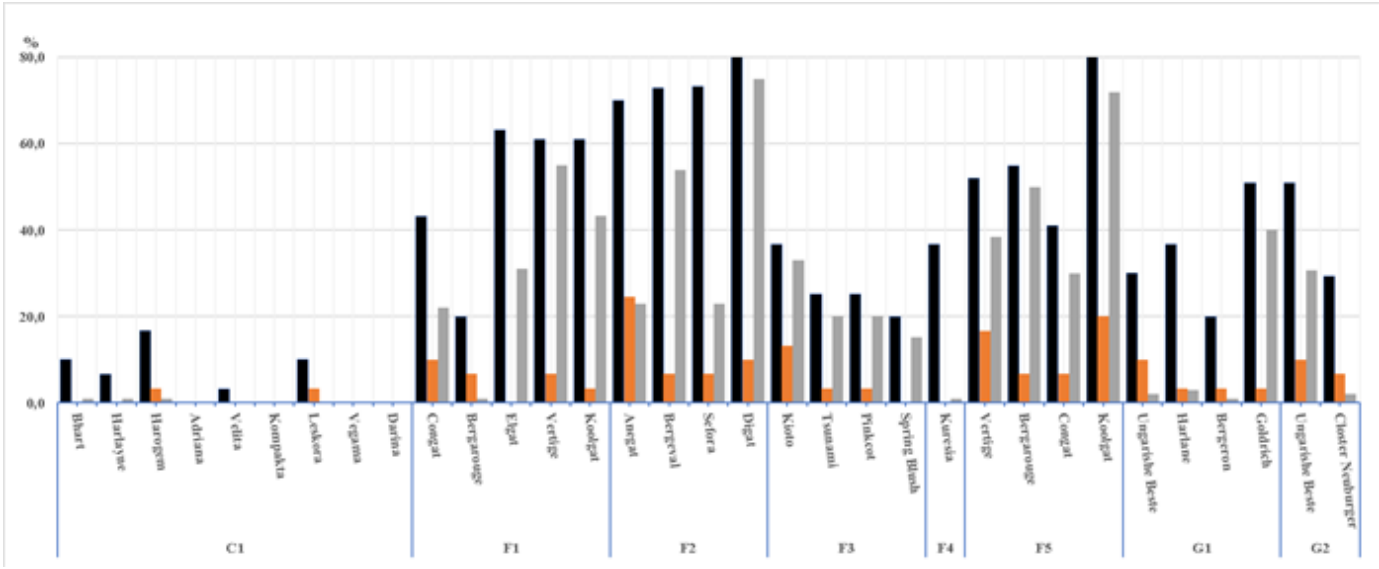

Figure 1: The incidence of strains from the Pseudomonas syringae complex, with an emphasis on strains pathogenic to apricot and ice nucleation active strains in mother apricot trees scion varieties grown in the nurseries in eight European localities in 2019-2021.

Values of $p \leq 0.05$ (0.01; 0.05) showed the significant effect of the locality on the incidence of strains from Ps complex (black bars), Ps strains positive in ice nucleation activity (yellow bars) and strains pathogenic to detached apricot twigs (grey bars). The three-year survey revealed that the most aggressive strains, accounting for 5% of Pseudomonas strains, were attributed to the phylogroup PG03 within the Ps complex and their rpoD sequences showed a high similarity to sequences of the PG03 reference strain P. amygdali pv. morsprunorum race 1 FTRS_U7805. Regardless of the locality and scion variety, the most abundant were Ps strains attributed to the phylogroup PG02 (44%), slightly pathogenic to apricot, positive in ice nucleation activity and showed a high similarity (≥99%) to rpoD partial sequences of Ps pv. syringae strains.

Acknowledgement

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