

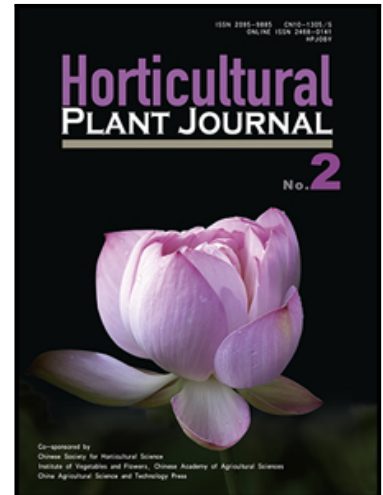
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Analysis of the Fungal Community in Apple Replanted Soil Around Bohai Gulf

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Abstract

Apple replant disease (ARD) is a frequently occurring plant disease in replanted orchards around Bohai Gulf, which causes growth inhibition and even death of plants. The aim of this study was to investigate the etiology of ARD around Bohai Gulf. In this study, the primary growth inhibition of apple seedlings was evaluated in ten replanted soils, sampled around Bohai Gulf. A fungal clone library was used to identify changes in the structure and composition of the soil fungal community. The results revealed that the Simpson diversity indices of Laizhou and Pulandian orchards were higher than others, presenting severe ARD. *Ascomycota* dominated around Bohai Gulf at the phyla level. *Fusarium* and *Saccharomyces* were abundant in all replanted soils. In addition, correlations between the relative abundance of fungal genera in soils and the severity of ARD were analyzed. The results showed that *Fusarium* was correlated positively with the severity of ARD, but *Mortierella* was negatively correlated. Furthermore, the quantitative PCR of *Fusarium oxysporum*, which was regarded as a factor of ARD, was performed. Overall, this study demonstrated that ARD was strongly associated with an unbalanced microbial ecosystem with more pathogenic fungi, while *Fusarium* in the apple replanted soil was the key factor for ARD around Bohai Gulf.

Keywords: apple; replanted disease; fungi clone library; *Fusarium*; fungal community

1. Introduction

Bohai Gulf is one of the main apple production areas in China; however, most of the orchards were established in the 1980s and 1990s, and many orchards exhibit serious ageing (Chen et al., 2010). Apple trees cannot be replanted due to the limitation of land resource. Diseases develop in apple seedlings when they are planted on a site that has a previous history of apple cultivation (or closely related species), usually causing huge economic losses. In the absence of control, the effects of ARD can exist over the entire lifetime of the orchard in the form of decreased fruit yields (Zhu et al., 2014).

Many factors have been reported to cause the decline of apple yield and quality under replanted condition, such as soil nutrient deficiency, root exudate autotoxicity and imbalances in the soil microbial community (Tewoldemedhin et al., 2011b; Yin et al., 2016a; Yin et al., 2017). However, recent research suggests that

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