

Sensitivity of *Colletotrichum* Species, Associated to Glomerella Leaf Spot in Apple, to Mancozeb and Thiophanate Methyl

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INTRODUCTION

Glomerella Leaf Spot (GLS) is caused by species of the genus *Colletotrichum*, mostly by species of the *C. acutatum* complex and the *C. gloeosporioides* complex (Velho *et al.* 2015). This disease occurs in all producing regions in Brazil causing symptoms on fruits and leaves, but the main damage is the premature defoliation. Disease control is carried out preventively with protective fungicides (10 to 21 sprays per season), such as dithiocarbamates (mancozeb, maneb and propineb) and also systemic fungicides (5 to 8 sprays per season) such as methyl benzimidazole carbamates (thiophanate-methyl). The aim of this study was to test the sensitivity of *Colletotrichum* spp. isolates, collected from different orchards of Brazil, to mancozeb and thiophanate-methyl fungicides and to classify the isolates by comparing EC₅₀ values.

MATERIAL AND METHODS

In total, 39 isolates were obtained and exposed to different concentrations of fungicides *in vitro*. The concentrations of thiophanate-methyl for mycelial growth assays were: 0, 12.5, 50, 200, 400, 800 and 1,600 µg mL⁻¹; and of mancozeb for spore germination assays were: 0; 0.03; 0.10; 0.30; 1.0; 3.0; 10.0; 30.0 µg mL⁻¹. The EC₅₀ value was calculated for all isolates. For mancozeb the isolates were classified according to Ishii (2015), for thiophanate-methyl the isolates were classified according to Chung *et al.* (2006).

RESULTS AND DISCUSSION

For mancozeb 21.4% of the isolates were classified as resistant or highly resistant and 35.7% of isolates were moderately resistant based on EC₅₀ (Figure 1). The high EC₅₀ of the isolates for mancozeb demonstrates the importance of adjustments in plant management system carried out by the producers, as this fungicide is one of the most widely used in controlling the disease in the field, especially in the most critical moments of GLS (Katsurayama *et al.* 2009). *Colletotrichum* resistance to mancozeb has been previously reported in citrus, rubber and in post-harvest apples (Cai *et al.* 2008; Ling *et al.* 2010). Regarding thiophanate-methyl the main part of the selected samples (73.6%) appeared resistant or highly resistant (Figure 1). Low

thiophanate-methyl efficiency in inhibiting mycelial growth was previously reported for *Colletotrichum* isolated from mango, apple and pear (Chung et al. 2006; Hamada et al. 2009; Suvarna et al. 2009).

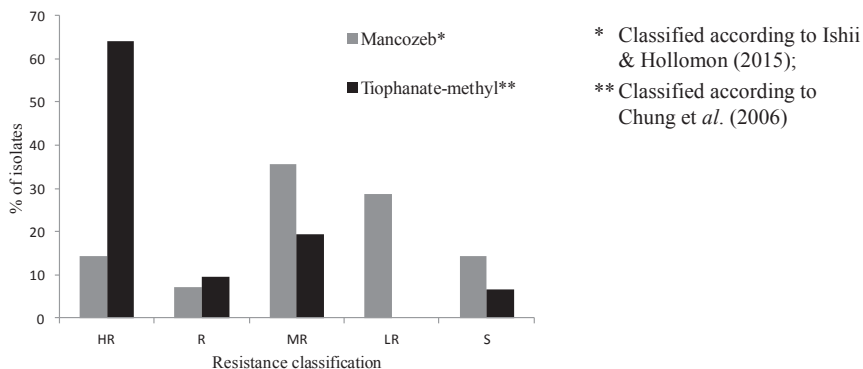


Figure 1 Number of isolates (%) of *Colletotrichum* species according to the sensitivity classification for mancozeb and thiophanate-methyl. HR = highly resistant, LR= low resistance, R = resistant, MR = moderately resistant, S = sensitive.

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