

# Evaluating Fungicides for Effective Control of Anthracnose on *Euonymus fortunei*

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## INTRODUCTION

Anthracnose caused by the ubiquitous fungus *Colletotrichum gloeosporioides* is a very serious disease on *Euonymus fortunei*, particularly on cultivars such as 'Emerald Gaiety' and 'Emerald 'n' Gold'. The disease causes leaf spots and stem cankers (Fig. 1), often resulting in leaf drop and stem dieback, and is often confused with low temperature injury (Fig. 2). Ontario nursery growers have reported losses of up to 60% in susceptible cultivars. In Canada, there is only one fungicide (Daconil) registered for anthracnose management on *Euonymus*. In any integrated pest management program, the rotation of fungicides with different modes of action (chemical families) is imperative for long-term disease management.

The purpose of this study was to: 1) follow disease incidence as it progresses throughout the growing season and 2) identify foliar fungicides that reduce the incidence of *Euonymus* anthracnose and can be used in rotation with Daconil.

## BIOLOGY

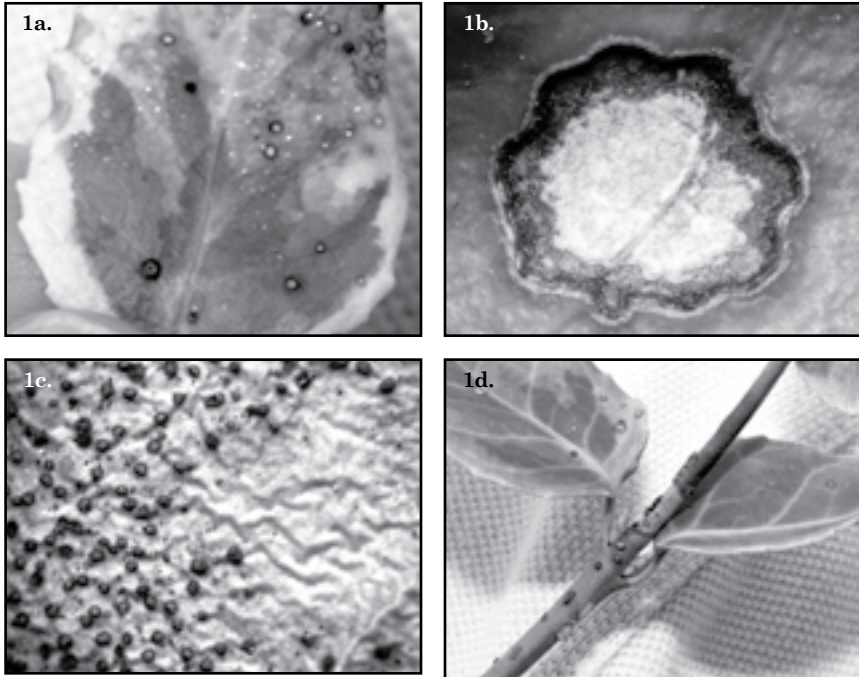
The fungus overwinters as mycelium or fruiting bodies (acervuli) on leaf and stem lesions that remain on plants or in plant debris (Fig. 1). Leaves and stems can be infected during bud break and emergence throughout the growing season. Optimum temperature for spore germination, infection and disease development ranges from 25–30 °C. Recent studies have shown that the disease becomes more severe when night temperatures are warm (28 °C). This supports the observation that disease symptoms are usually most severe on the second flush of growth in late spring and early summer. Symptoms often appear more severe after a prolonged leaf wetness period of 18–24 h.

## MATERIALS AND METHODS

In 2006, Heritage (azoxystrobin), Pristine (pyraclostrobin + boscalid), Senator 70 WP (thiophanate-methyl), and Daconil 2787 Flowable (chlorothalonil) were applied separately, in 2000 L of water/ha to container-grown *E. fortunei*. Fungicide applications took place during the previous autumn and again during new shoot development in spring and summer. In 2007, the efficacy of Pristine was investigated on *Euonymus* 'Emerald 'n' Gold'. The incidence of anthracnose on new shoots and severity on new leaves was recorded throughout the trial in both years. Plants were grown in a naturally infested nursery. Treatment means were separated using Fisher's protected LSD ( $P = 0.05$ ).

## RESULTS AND DISCUSSION

The incidence of anthracnose tended to increase in late June during both years (Fig. 3). This increase in disease incidence coincides with more consistently warm day and night temperatures and high relative humidity, suggesting that fungicide applications may be most imperative during the second and third flush of growth in late spring and summer.



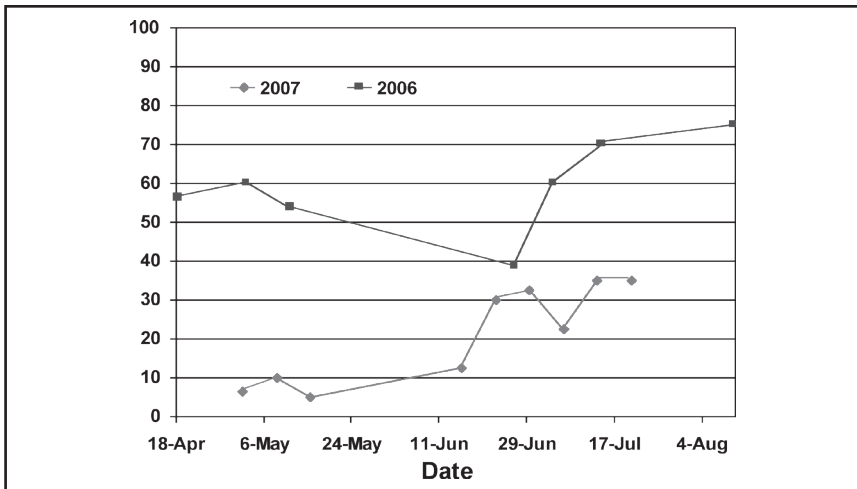
**Figure 1.** Symptoms of anthracnose on *Euonymus fortunei*. Leaf spot (a). Close up of leaf spot (b). Close up of fruiting bodies (acervuli) inside leaf spot (c). Stem canker (d).



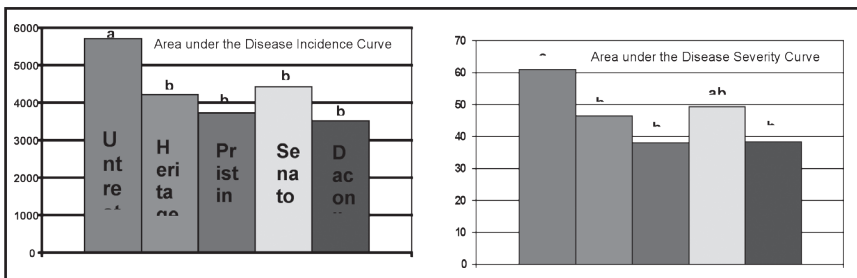
**Figure 2.** Symptoms of low temperature injury on *Euonymus fortunei* 'Sungold'. This is often misdiagnosed as anthracnose.

In 2006, all fungicides applied at the end of April resulted in an initial reduction of disease incidence of shoots and severity on leaves in early May. Two applications of either Pristine or Daconil, 7 days apart in late June, resulted in a significant reduction in anthracnose incidence and severity 7 and 14 days after application compared to untreated plants. Although the incidence and severity of disease increased in both nontreated and treated plants throughout July, the incidence and severity of disease remained significantly lower on plants treated with Pristine up to 45 days after application compared to the untreated plants. The incidence of infected shoots and the severity of leaf symptoms appeared to initially increase on plants treated with Heritage, however, disease severity and incidence was significantly lower than on untreated plants 14 and 45 days after application.

Analysis of the area under the disease incidence and severity curves for 2006 data indicates that all fungicides provide some reduction in the incidence of anthracnose-infected shoots (Fig. 4). However, Pristine, Daconil, and Heritage also provide significantly less leaf spot severity. Pristine and Daconil were selected for further study in 2007.



**Figure 3.** Incidence of anthracnose on new shoot growth of untreated *Euonymus fortunei* throughout the 2006 and 2007 growing season.



**Figure 4.** The effect of four fungicides applied to *Euonymus fortunei* ‘Sungold’ represented by the area under the disease incidence and severity curves for 2006 data.

## CONCLUSIONS

Pristine, Heritage, and Daconil appear to be very effective fungicides for managing anthracnose on euonymus. However, the active ingredient in Heritage (azoxystrobin) and the pyraclostrobin component of Pristine have a similar mode of action and if used sequentially and repeatedly, could result in resistance developing to these products. Therefore, either Heritage or Pristine should be pursued for registration with the Minor Use program in Canada. Daconil is registered to manage euonymus anthracnose and has been demonstrated as an effective fungicide to use in rotation with either Heritage or Pristine in a resistance management strategy for this disease.