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## **ANTHRACNOSE ON AZALEA AND ITS CONTROL IN PRODUCTION NURSERIES**

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Anthracnose, which is caused by the fungus *Colletotrichum gloeosporides*, is a widespread and destructive disease on container-grown azalea. This disease is especially common in container nurseries, which are located near the Gulf of Mexico in Florida, Alabama, Mississippi, Louisiana, and Texas. Anthracnose is a hot, wet weather disease. This year, frequent showers and daily cloud cover throughout much of July and August across the Gulf Coast region of Alabama incited a severe outbreak of this disease in container-grown azaleas. While Kurume-type azaleas are considered to be most susceptible to attack by causal fungus *C. gloeosporides*, extensive damage was also seen this summer on the more resistant Indica-type azaleas.

### **Symptoms**

Unlike some other leaf spot diseases, symptoms of anthracnose often first appear on the newer leaves just below the shoot tip. Small olive to rusty brown spots appear either on the upper or lower leaf surface. Since the larger leaf veins often limit growth of the fungus, the spots are usually angular in shape. Later, spotted leaves turn yellow and are prematurely shed. Under ideal conditions for disease, the level of defoliation on new shoot growth may be quite extensive. In contrast, older leaves formed the previous year are resistant to attack by *C. gloeosporides* and rarely suffer serious damage. While susceptible azalea cultivars rarely succumb to anthracnose, damaged plants are often unmarketable.

Fruiting bodies of *C. gloeosporides* (acervuli) usually form on the surface of the leaf spot after the diseased leaves fall to the ground. When the leaf surface is wet, masses of spores (conidia) ooze from the fruiting body and are spread to nearby healthy leaves by splashing rain or irrigation water. A film of water on the leaf surface is required for spore germination and infection of the leaves. Frequent showers along with overcast skies favor the rapid spread of the causal fungus through a block of azalea and extensive symptom expression. The host range of the causal fungus *C. gloeosporides* includes a wide variety of other container-grown woody shrubs and trees. The fungus survives between azalea crops not only on fallen leaves and other debris but is easily transmitted from crop to crop on diseased liners and cuttings.

## Control

Typically, softwood cuttings taken from diseased azaleas in production blocks are the most likely source of anthracnose in Alabama nurseries. The risk of spreading this disease from crop to crop can be greatly reduced by taking cuttings from fungicide-protected disease-free stock. When rooting azalea cuttings in a mist bed, a recommended fungicide should be applied to suppress disease spread through the block of liners. Flats of diseased liners should be discarded. Sanitation practices such as cleaning propagation areas of debris between crops and cleaning pruning tools with a surface disinfectant such as rubbing alcohol will also help slow disease spread.

In production blocks during the summer, set irrigation timers to water anthracnose-susceptible azaleas for mid-day or between midnight and dawn. Irrigating in the later afternoon or early evening, particularly in July and August, will increase the length of time that free water is present on the leaf surface; thereby increasing the chance that the causal fungus will successfully infect the plant.

As previously mentioned, azalea selections differ considerably in their sensitivity to anthracnose. Overall, Kurume type azaleas, especially 'Mother's Day', 'Prize', and 'Gloria' are highly susceptible to this disease and are often severely damaged. Under ideal conditions for pathogen spread and infection, however, all types of azaleas, including the more resistant Indica azaleas, may suffer heavy anthracnose-related defoliation. Additional information needs to be generated concerning the susceptibility of azalea cultivars to *C. gloeosporides*.

Protective fungicide applications are often needed to produce salable anthracnose-susceptible azaleas. Since anthracnose outbreaks are usually limited to the months of June, July, August, and depending on weather patterns September, fungicide applications only need to be made during the above time frame and at no other time during the production cycle. In addition, applications made during this time frame will also control another common and very damaging disease on dwarf-type azaleas, Rhizoctonia web or aerial blight. For best results, fungicides should be applied every 10 to 14 days. During periods of frequent showers and overcast conditions, the interval between applications should be reduced to 7 to 10 days. To control anthracnose and Rhizoctonia web blight, fungicides must be applied with enough pressure to wet the innermost leaves and stems of the target plants.

Recent field trials in Alabama and Florida show that registered fungicides differ in their activity against anthracnose. When applied at preventative treatments, excellent control of anthracnose on 'Glory' azalea was provided by recommended rates of Zyban 79W, Protect T/O, Kocide 101 77W, and Daconil Weather Stik 6F in a 1997 Alabama study (Table 1). Heritage 50W also controlled anthracnose but the 1.0-lb/100 gal application rate is 3X that of the highest rate on the current product label. On all plants treated with the above fungicides, damage was restricted to the loss of a few leaves. Surprisingly, Domain 50W and 3336 4.5F, which both contain the active ingredient thiophanate-methyl, provided relatively little protection from anthracnose. Banner Maxx, Consyst, and Systech reduced disease damage, when compared to defoliation levels on the unsprayed plants but were not as effective in controlling anthracnose as several other fungicides.

Table 1. Protective control of anthracnose on 'Glory' azalea in 1997, OHS, Mobile AL.

Fungicide	Rate per 100 gal	Defoliation <sup>1</sup>
Banner Maxx	6 fl oz	3.4 c <sup>2</sup>
Consys	1.5 lb	3.4 c
Daconil Weather Stik 6F	1.3 pt	2.8 cd
Domain 50W	1.0 lb	4.7 b
Heritage 50W	1.0 lb	2.3 d
Kocide 101 77W	1.5 lb	2.7 d
Protect T/O	1.5 lb	2.5 d
Systech WDG	0.8 lb	3.4 d
Zyban 79W	1.5 lb	2.6 d
3336 4.5F	20 fl oz	4.5 b
Unsprayed Control	---	5.4 a

<sup>1</sup>Defoliation was rated using a 1 to 12 Horsfall and Barratt rating scale where 1 = no disease, 2 = 0-3%, 3 = 3-6%, 4 = 6-12%, 5 = 12 to 25%, 6 = 25-50%, 7 = 50-75%, 8 = 75-87%, 9 = 87-94%, 10 = 94-97%, 11 = 97-100%, and 12= 100% of leaves prematurely lost due to anthracnose.

<sup>2</sup>Mean separation within columns was according to Fisher's protected least significance (LSD) test,  $P=0.05$ .

Reference: Hagan, A. K, J. W. Olive, and L. C. Parrott, Jr. 1998. Screening fungicides for the control of anthracnose on azalea, 1997. Fungicide and Nematicide Tests 53:474.

In the first Florida study, Heritage 50W at rates of 4.3 to 17.2 oz/100 gal proved equally effective in controlling anthracnose on 'Red Ruffles' and 'Prize' azalea (Table 2). On both cultivars, Daconil Weather Stik was less effective against anthracnose than all rates of Heritage. Significantly less damage was noted on the Heritage 50W and Daconil Weather Stik-treated azaleas than on the unsprayed controls of each cultivar.

Table 2. Evaluation of fungicides for the control of anthracnose on 'Prize' and 'Red Ruffles' azalea in 1997, Bradenton, FL.

Treatment	Rate per 100 gal	% Leaves Diseased <sup>2</sup>	
		'Red Ruffles'	'Prize'
Unsprayed Control	---	4.6 a <sup>3</sup>	37.2 a <sup>3</sup>
Daconil Weather Stik 6F	1.4 pt	3.2 b	19.2 b
Heritage 50W <sup>1</sup>	4.3 oz	1.6 c	3.1 c
Heritage 50W <sup>1</sup>	8.6 oz	1.8 c	3.0 c
Heritage 50W <sup>1</sup>	17.2 oz	1.8 c	3.0 c

<sup>1</sup>The non-ionic surfactant Induce 0.06 % v/v was tank-mixed with Heritage 50W.

<sup>2</sup>Anthracnose severity (% foliage affected) was rated using the 1 to 12 Horsfall and Barratt rating scale. Untransformed means presented.

<sup>3</sup>Different letters following means indicate that they are significantly different ( $P=0.05$ ) according to LSD.

Reference: McGovern, R. J. 1998. Evaluation of fungicides for the control of anthracnose on azalea, 1997. Fungicide and Nematicide Tests 53:475.

In the 1998 study, disease ratings were considerably higher on both ‘Red Ruffles’ and ‘Prize’ than were noted in the previous year. As was noted in 1997, all fungicide treatment significantly reduced the severity of anthracnose (Table 3). However, the disease ratings recorded on the Daconil Weather Stik 6F, Heritage 50W, Phyton 27, and Cleary’s WAC-72-treated azaleas did not significantly differ.

Table 3. Evaluation of fungicides for the control of anthracnose on azalea in 1998 at the Gulf Coast Research & Education Center in Bradenton, FL.

Treatment	Rate per 100 gal	% Diseased Leaves	
		‘Red Ruffles’	‘Prize’
Unsprayed Control	---	18.4 a <sup>3</sup>	66.8 a <sup>3</sup>
Daconil Weather Stik 6F	1.4 pt	6.3 b	13.8 b
Heritage 50W <sup>1</sup>	8.6 oz	2.8 b	6.6 b
Phyton 27	25 fl oz	8.2 b	21.8 b
Cleary’s WAC-72	2.5 lb	7.0 b	13.7 b

<sup>1</sup>The non-ionic surfactant Induce 0.06 % v/v was tank-mixed with Heritage 50W.

<sup>2</sup>Anthracnose severity (% foliage affected) was rated using the 1 to 12 Horsfall and Barratt rating scale. Untransformed means presented.

<sup>3</sup>Different letters following means indicate that they are significantly different ( $P=0.05$ ) according to LSD.

Reference: McGovern, R. J. 1999. Evaluation of fungicides for the control of anthracnose on azalea, 1998. Fungicide and Nematicide Tests 54:531.

## Summary

While additional studies must be conducted to identify the most effective fungicides, some preliminary conclusions concerning fungicide selection for control of anthracnose can be made from available data. In all three studies, Heritage 50W demonstrated excellent activity against anthracnose. However, the rates evaluated were often well above the current 1 to 4 oz/100 gal rate for Heritage 50W. As a result, additional studies must be conducted to assess the impact of lower application rates and treatment interval on the efficacy of Heritage 50W for the control of anthracnose on azalea.

In the 1997 Alabama study, Zyban 79W, Protect T/O, Kocide 101 77W, and Daconil Weather Stik 6F, when applied at label rates and treatment intervals, controlled anthracnose on azalea. In the two Florida studies, Daconil Weather Stik also greatly reduced anthracnose-related damage on azalea. If applied every 10 to 14 days during the window for outbreaks of anthracnose, all four of the above fungicides should protect azalea from significant disease-related defoliation.

The relatively poor activity of 3336 4.5F and Domain 50W noted in the Alabama study was unexpected. These fungicides are used to control anthracnose on a variety of other crops. As was the case with Heritage 50W, the efficacy of the latter two fungicides for the control of this disease will have to be further evaluated. In the interim, the fungicides identified in the previous paragraph as having good activity against anthracnose should be chosen for use on azalea.