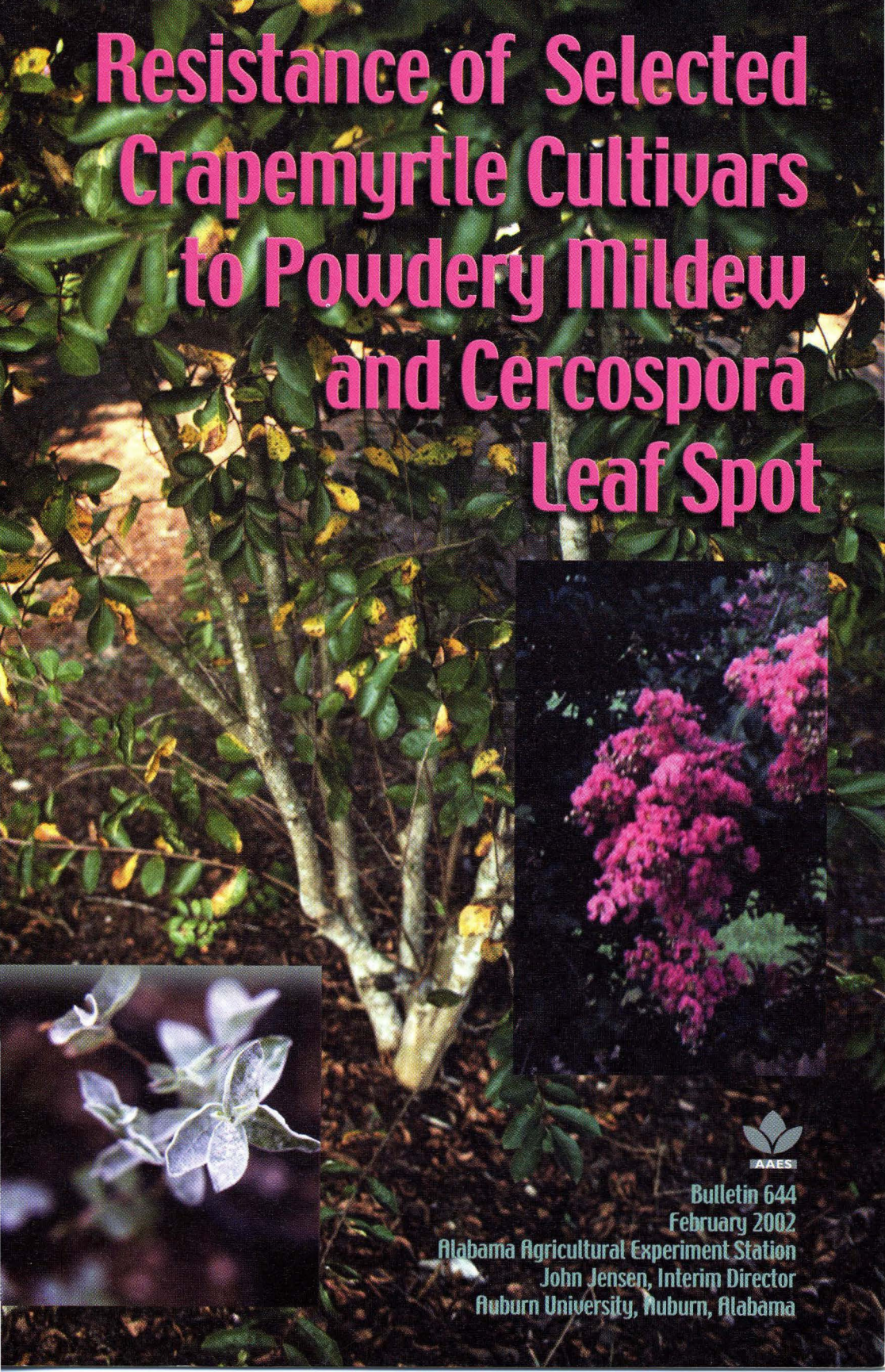


Resistance of Selected Crapemyrtle Cultivars to Powdery Mildew and Cercospora Leaf Spot



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RESISTANCE OF SELECTED CRAPEMYRTLE CULTIVARS TO POWDERY MILDEW AND CERCOSPORA LEAF SPOT

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INTRODUCTION

Brilliant fall color, handsome exfoliating bark, lush foliage, and large showy flower panicles have made crapemyrtle (*Lagerstroemia indica*) a fixture in landscapes and gardens across Alabama (17). Introduced from China in 1747, crapemyrtles range in size from small shrubs to sizable trees and are widely used in screens, hedges, mass plantings, or as accent or specimen plants. This highly versatile shrub and tree, which blooms throughout much of the summer, is best adapted to well-drained soils on sunny sites in USDA Hardiness Zones 7 to 9 (4,16). In the mid-1950s, *Lagerstroemia fauriei* was introduced from Japan and was later hybridized with *L. indica* to produce a number of highly desirable selections of crapemyrtle. In addition, a number of improved cultivars of crapemyrtle (*L. indica*) have also been released into the nursery market.

Powdery mildew (*Erysiphe lagerstroemia*) is the most widely recognized and common disease on crapemyrtle (1). Although this disease is not a serious threat to the health of established plants, a severe outbreak of powdery mildew can greatly detract from the beauty of crapemyrtle in landscape plantings. Powdery mildew, which usually appears in late spring or early summer, is easily recognized by the appearance of white to buff-colored colonies of *E. lagerstroemia* on leaves, tender shoots, and bud scales on the blooms. On heavily mildewed crapemyrtle, twisting of the leaves, flower bud abortion, and shoot dieback may also be seen (1).

Cercospora leaf spot (*Cercospora lythracearum*), which is not as well known as powdery mildew, may actually be more common than the latter disease (2). Circular to irregular brown spots, which first appear on mature leaves in late June to early July, are not noticeable until August. As

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the spots enlarge, the leaves turn yellow to bright red and quickly fall to the ground. Typically, leaf spotting and defoliation start on the lower limbs and gradually spread upward through the plant canopy until all but the youngest leaves at the shoot tips are lost. The heavy leaf shed associated with damaging disease outbreaks can greatly detract from the brilliant fall color display of leaf spot-susceptible crapemyrtle.

Disease resistance is an effective, inexpensive, and pesticide-free method of producing and maintaining plantings of crapemyrtle in the nursery and landscape. As indicated above, a number of improved cultivars in the three crapemyrtle taxa (*L. indica*, *L. fauriei*, and *L. indica* x *fauriei*) were selected for superior horticultural characteristics as well as tolerance or resistance to powdery mildew (5,6,7,8,9,10,11,12,13,14). In recent studies, Knox *et al.* (16) and Windham *et al.* (18) did not see significant colonization of the leaves of hybrid crapemyrtle cultivars by the powdery mildew fungus. In Louisiana, Holcomb (15) noted that several of the hybrid selections (*L. indica* x *fauriei*) and a number of cultivars of crapemyrtle (*L. indica*) were susceptible to powdery mildew and *Cercospora* leaf spot. In the same study, the hybrid cultivars 'Tonto', 'Tuscarora', and 'Catawba' were resistant to both powdery mildew and *Cercospora* leaf spot (15).

In a landscape planting in Auburn, Alabama, selections in three crapemyrtle taxa (*L. indica*, *L. fauriei*, and *L. indica* x *fauriei*) were screened for their susceptibility to powdery mildew and *Cercospora* leaf spot.

MATERIALS AND METHODS

A field planting of 45 selections of crapemyrtle in the taxa *L. indica*, *L. fauriei*, and *L. indica* x *fauriei* was established on the Alabama Agricultural Experiment Station (AAES) unit on the campus of Auburn University, Alabama (USDA Hardiness Zone 8a). Before planting, soil fertility and pH were adjusted according to the recommendations of a soil fertility assay of the Auburn University Soil Testing Laboratory. In March 1993, bare-root liners were planted in full sun in a Marvyn loamy sand on eight-foot centers in rows spaced 12 feet apart. The test site was sloped slightly to the southeast. The experimental design was a randomized complete block with six, two-tree replications. A trickle irrigation system with

two emitters per tree was installed at the time of tree establishment, and the trees were watered as needed. Twice each spring, approximately six ounces of 13-13-13 analysis fertilizer was uniformly distributed around the base of each plant. A tank-mix of Princep 4L and Surflan A.S. pre-emergent herbicides was applied at label rates in March 1996 and March 1997. Hand weeding and directed applications of label rates of Roundup Pro herbicide were used to control escape weeds. Alleys between the rows were periodically mowed. In 1995, all trees were mulched with two inches of aged pine bark. During the winters of 1995 and 1996, each tree was lightly pruned to enhance form and structure.

Within two years of planting, the causal fungi of powdery mildew (*E. lagerstroemia*) and Cercospora leaf spot (*C. lythracearum*) were well established in this planting of crapemyrtle. Powdery mildew ratings were recorded on July 28, 1995; June 4, 1996; and June 25, 1997 using a scale of 0 to 4 (0 = no disease, 1 = 1 to 25%, 2 = 26 to 50%, 3 = 51 to 75%, and 4 = 76 to 100% of the leaves, shoots, and buds damaged or colonized by *E. lagerstroemia*). The severity of Cercospora leaf spot was evaluated on September 15, 1995; September 4, 1996; and August 29, 1997 using the Barratt and Horsfall Rating System (1 = 0%, 2 = 0 to 3%, 3 = 3 to 6%, 4 = 6 to 12%, 5 = 12 to 25%, 6 = 25 to 50%, 7 = 50 to 75%, 8 = 75 to 87%, 9 = 87 to 94%, 10 = 94 to 97%, 11 = 97 to 100%, and 12 = 100% of the leaves exhibiting characteristic symptoms or prematurely lost due to this disease).

RESULTS

By mid-May each year, the typical fluffy white colonies of the powdery mildew fungus were seen on the young leaves and shoots of the mildew-susceptible crapemyrtle cultivars. Generally, the occurrence of powdery mildew peaked between mid-June and late July. The fungal colonies persisted on leaves of susceptible cultivars until early fall. Although symptoms of Cercospora leaf spot first appeared on highly susceptible cultivars as early as June, spotting of the leaves and premature leaf shed usually were not noticeable on most cultivars until mid-August to early September. Spotting of the leaves and leaf shed continued through the fall until the first hard frost in late October or early November.

As a group, the cultivars of crapemyrtle (*L. indica*) were more susceptible to powdery mildew than were the hybrid crapemyrtles (*L. indica* x *fauriei*) and *L. fauriei* 'Fantasy' (Tables 1 and 2). Powdery mildew ratings for all of the hybrid crapemyrtle cultivars and *L. fauriei* 'Fantasy' were similar in all three years. In 1995 and 1996, the severity of *Cercospora* leaf spot averaged across all cultivars of *L. indica* and *L. indica* x *fauriei* did not differ. *Cercospora* leaf spot damage levels for *L. fauriei* 'Fantasy' were lower than the averaged ratings for the other two crapemyrtle taxa.

Considerable differences in the incidence of powdery mildew were seen among the 20 cultivars of *L. indica* (Table 1). Also, disease incidence differed considerably from year to year on many of these cultivars, especially on those highly susceptible to powdery mildew. In two of three years, heavy colonization of the leaves and shoots, as indicated by disease ratings of 2.0 or above, was seen on 'County Red' crapemyrtle (Table 2). High levels of disease also were seen in one of three years on 'Carolina Beauty', 'Raspberry Sundae', 'Wonderful White', 'Gray's Red', 'Orbin Adkins', and 'Seminole'. Noticeable mildewing of the leaves and shoots, which was indicated by disease ratings between 1.0 and 2.0, was seen in at least one year on an additional 11 selections of *L. indica* crapemyrtle. 'Cherokee' remained mildew-free, while low levels of powdery mildew were seen each year on 'Glendora White'.

In at least one year, considerable *Cercospora* leaf spot-related spotting of the leaves and early leaf shed were observed on nearly all cultivars of *L. indica* (Table 2). By early fall, 'Orbin Adkins' and 'Wonderful White' consistently suffered severe defoliation and heavy spotting of the few remaining leaves found near the shoot tips. As indicated by disease ratings above 5.0 in at least two years, 'Raspberry Sundae', 'Powhatan', 'Majestic Beauty', 'Hardy Lavendar', and 'Carolina Beauty' also proved highly susceptible to *Cercospora* leaf spot. In contrast, leaf spotting and early leaf shed, though noticeable, were limited to the lower quarter of the canopy of 'Glendora White', 'Gray's Red', and 'Velma's Royal Delight'.

As expected, the occurrence of powdery mildew on many of the hybrid (*L. indica* x *fauriei*) crapemyrtle was generally very low (Table 2). Light to moderate outbreaks of this disease, as indicated by disease ratings between 0.5 and 1.0, were recorded in two years for 'Zumi' and in one year for 'Hopi' and 'Pecos'. Of all the cultivars of hybrid crapemyrtle, only 'Caddo' remained free of powdery mildew in all three years. In two of

TABLE 1. SUSCEPTIBILITY OF CrapeMyrtle (*L. indica*) CULTIVARS TO POWDERY MILDEW AND CERCOSPORA LEAF SPOT

Cultivar	Blossom color	Growth habit ¹	Powdery mildew ²			Cercospora leafspot ³		
			1995	1996	1997	1995	1996	1997
<i>L. indica</i>								
Carolina Beauty	Red	LT	2.3	1.6	1.2	5.8	6.3	5.8
Catawba	Purple	ST	0.7	0.1	1.2	3.6	4.6	3.0
Centennial Spirit	Red	ST	1.6	0.0	0.8	2.2	4.8	5.0
Cherokee	Red	SD	0.0	0.0	NR ⁴	2.3	4.0	NR
Country Red	Red	ST	2.8	2.5	0.9	4.0	4.6	5.0
Glendora White	White	SD	0.4	0.4	0.5	2.3	3.7	3.8
Gray's Red	Red	ST	2.2	0.8	1.0	3.5	3.9	4.3
Hardy Lavender	Lavender	LT	1.1	1.1	1.8	4.2	5.1	5.0
Majestic Beauty	White	SD	1.7	1.0	1.0	3.7	5.3	5.0
Near East	Light pink	ST	0.3	0.0	1.3	5.0	5.4	4.7
Orbin Adkins	White	ST	2.4	0.7	1.2	5.7	6.8	6.8
Peppermint Lace	Pink/ white edges	D	1.7	1.0	1.6	4.0	5.6	4.9
Potomac	Pink	ST	1.8	0.3	0.9	2.7	4.5	3.6
Powhatan	Purple	ST	1.3	1.1	1.8	3.4	5.5	5.5
Raspberry Sundae	Deep red	SD	3.1	1.5	1.5	4.6	5.7	5.3
Regal Red	Red	ST	0.6	1.2	1.3	2.1	4.0	4.2
Seminole	Pink	ST	0.8	0.3	2.2	3.3	5.6	4.5
Velma's Royal								
Delight	Purple	D	1.2	0.6	1.4	2.0	3.3	3.7
William Toovey	Pink/red	ST	1.9	1.3	1.8	3.7	4.4	3.6
Wonderful White	White	LT	2.4	1.5	1.3	5.0	6.8	6.8

¹D = dwarf form (3-5 feet), SD = semi-dwarf (5-10 feet), ST = small tree (10-20 feet), LT = large tree (20 feet or larger).

²Powdery mildew was rated on a scale of 0 to 4 where 0 = no disease, 1 = 1 to 25%, 2 = 26 to 50%, 3 = 51 to 75%, 4 = 76 to 100% of the leaves damaged or colonized *E. lagerstroemia*.

³Cercospora leaf spot was evaluated using the Barratt and Horsfall System: 1 = 0%, 2 = 0 to 3%, 3 = 3 to 6%, 4 = 6 to 12%, 5 = 12 to 25%, 6 = 25 to 50%, 7 = 50 to 75%, 8 = 75 to 87%, 9 = 87 to 94%, 10 = 94 to 97%, 11 = 97 to 100%, 12 = 100%.

three years, the characteristic white colonies of the fungus *E. lagerstroemia* were not seen on the leaves, flower buds, or shoots of 'Sarah's Favorite', 'Comanche', 'Osage', 'Acoma', 'Tonto', 'Souix', 'Lipan', or 'Natchez'. On the remaining hybrid crapeMyrtle cultivars, as well as on *L. fauriei* 'Fantasy', the incidence of powdery mildew was limited to a single or a few widely scattered colonies of the fungus on the leaves, tender shoots, and flower buds.

Although most hybrid crapeMyrtle selections are highly resistant to powdery mildew, only a handful were resistant to *Cercospora* leaf spot



Fig. 1 Cottony white growth or hyphae of powdery mildew fungus on leaves of crapemyrtle.



Fig. 2 Heavy powdery mildew outbreak on 'Raspberry Sundae' crapemyrtle.



Fig. 3 In a *Cercospora* leaf spot infection, circular to irregular brown spots appear on the older leaves near the base of the plant. Later, these spotted leaves begin to turn yellow to bright red before they fall to the ground.



Fig. 4 Symptoms of *Cercospora* leaf spot include yellowing and premature loss of the spotted leaves near the base of the tree or shrub.

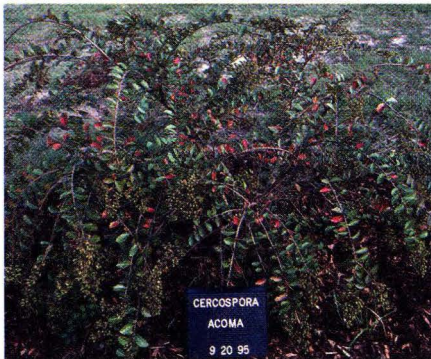


Fig. 5 *Cercospora* leaf spot-susceptible crapemyrtles such as 'Acoma' may be heavily defoliated and have poor fall color.

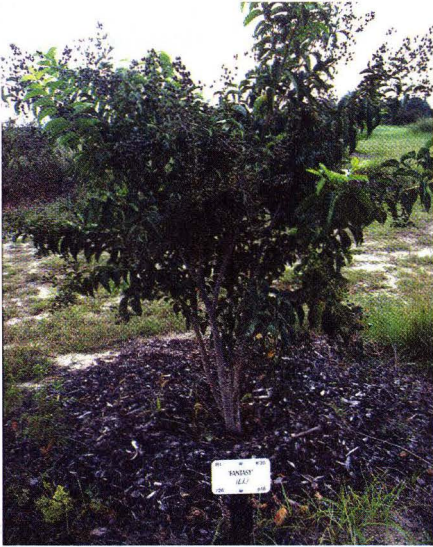


Fig. 6 Of the 45 selections of crapemyrtle screened, 'Fantasy' was the most disease resistant.

Fig. 7 Other powdery mildew and Cercospora leaf spot resistant selections of crapemyrtle included: clockwise from top right (a) 'Tonto', (b) 'Tuscarora', (c) 'Tuskegee', and (d) 'Velma's Royal Delight'.



(Table 2). Of the 22 selections of hybrid crapemyrtle, 'Tonto', 'Tuskegee', and 'Tuscarora' have the highest level of resistance to this disease. In each area, damage on these cultivars and *L. fauriei* 'Fantasy' was confined to light, inconspicuous spotting of the leaves around the base of the plants. Light to moderate spotting of the leaves along with a low level of early leaf shed, as indicated by disease ratings of 2.5 to 3.8, was seen on 'Basham's

TABLE 2. SUSCEPTIBILITY OF CRAPEMYRTLE (*L. INDICA* X *FAURIEI* ND *L. FAURIEI*) CULTIVARS TO POWDERY MILDEW AND *CERCOSPORA* LEAF SPOT

Cultivar	Blossom color	Growth habit ¹	-Powdery mildew ² -			Cercospora leafspot ³		
			1995	1996	1997	1995	1996	1997
<i>L. indica</i> x <i>fauriei</i>								
Acoma	White	SD	0.0	0.0	0.1	5.3	6.3	6.2
Apalachee	Lavender	ST	0.2	0.0	0.2	2.7	2.8	1.3
Basham's Party	Pink	LT	0.2	0.2	0.4	2.8	2.5	1.7
Pink								
Biloxi	Light pink	LT	0.4	0.3	0.8	4.4	5.3	4.0
Caddo	Bright pink	SD	0.0	0.0	0.0	2.4	2.9	4.6
Choctaw	Bright pink	LT	0.0	0.1	0.3	4.5	4.6	3.5
Comanche	Coral	ST	0.0	0.0	0.4	5.6	6.6	4.9
Hopi	Pink	SD	0.2	0.0	1.7	3.9	5.7	5.4
Lipan	Lavender	ST	0.3	0.0	0.0	2.9	5.1	2.6
Miami	Dark pink	LT	0.1	0.0	0.7	3.5	4.7	3.2
Muskogee	Lavender	LT	0.2	0.0	0.6	4.7	4.8	4.2
Natchez	White	LT	0.0	0.1	0.0	4.3	4.6	2.6
Osage	Light pink	ST	0.0	0.0	0.4	2.8	4.0	1.3
Pecos	Pink	SD	0.4	0.1	1.3	2.8	5.1	2.6
Sarah's Favorite	Pink	LT	0.0	0.0	0.1	3.5	3.8	3.3
Souix	Dark pink	ST	0.1	0.0	0.0	4.3	5.2	1.3
Tonto	Red	SD	0.1	0.0	0.0	2.3	1.3	1.2
Tuscarora	Coral pink	LT	0.5	0.0	0.4	1.7	2.4	1.8
Tuskegee	Dark pink	ST	0.1	0.4	0.2	1.8	1.5	1.3
Wichita	Lavender	LT	0.3	0.0	0.8	2.8	3.6	2.6
Yuma	Lavender	SD	0.4	0.0	0.4	4.9	5.0	5.2
Zumi	Lavender	SD	1.3	0.3	1.8	4.8	4.4	3.5
<i>L. fauriei</i>								
Fantasy	White	LT	0.4	0.0	0.2	1.4	1.1	1.7

¹D = dwarf form (3-5 feet), SD = semi-dwarf (5-10 feet), ST = small tree (10-20 feet), LT = large tree (20 feet or larger).

²Powdery mildew was rated on a scale of 0 to 4 where 0 = no disease, 1 = 1 to 25%, 2 = 26 to 50%, 3 = 51 to 75%, 4 = 76 to 100% of the leaves damaged or colonized *E. lagerstroemia*.

³Cercospora leaf spot was evaluated using the Barratt and Horsfall System: 1 = 0%, 2 = 0 to 3%, 3 = 3 to 6%, 4 = 6 to 12%, 5 = 12 to 25%, 6 = 25 to 50%, 7 = 50 to 75%, 8 = 75 to 87%, 9 = 87 to 94%, 10 = 94 to 97%, 11 = 97 to 100%, 12 = 100%.

Party Pink', 'Apalachee', and 'Wichita'. Conversely, the heaviest spotting of the leaves and premature defoliation were noted in at least two of three years on 'Acoma' and 'Comanche'. *Cercospora* leaf spot ratings of 5.0 or higher were recorded in at least one year for another five cultivars of hybrid crapemyrtle.

DISCUSSION

Resistance to powdery mildew was one of the major selection criteria used to identify clones of hybrid crapemyrtle for release as part of the U.S. National Arboretum breeding program (5, 6, 7, 8, 9, 10, 11, 12, 13, 14). Beginning with 'Natchez' and 'Muskogee', a total of 22 hybrid cultivars have been released (7,8,9,10,11,12,13,14). Resistance of the cultivars of hybrid crapemyrtle and *L. fauriei* 'Fantasy' to powdery mildew is far superior to that shown by the selections of *L. indica*. With the exception of 'Zuni', 'Pecos', and 'Hopi', the cultivars of hybrid crapemyrtle proved highly resistant or immune to powdery mildew. Typically, similar results have been obtained when the releases from the U.S. National Arboretum were evaluated in the field (15,16,18).

Many cultivars of crapemyrtle (*L. indica*) were moderately or highly susceptible to powdery mildew, while others like 'Glendora White', and 'Cherokee' were highly resistant to nearly immune to this disease. Of the five mildew tolerant cultivars of *L. indica* released by the U.S. National Arboretum, light to moderate mildew development was recorded in at least one year on 'Powhatan', 'Seminole', 'Potomac', and 'Catawba'. As observed in previous trials, 'Wonderful White' (18), 'Carolina Beauty' (16), and 'Seminole' (16) were highly susceptible to powdery mildew.

Far more cultivars of hybrid crapemyrtle were resistant to powdery mildew than to *Cercospora* leaf spot. In Louisiana, Holcomb (15) also noted similar differences in the sensitivity of cultivars of hybrid crapemyrtle to *Cercospora* leaf spot. In both the AAES and Louisiana studies, 'Tonto', 'Tuskegee', and 'Tuscarora' were the most *Cercospora* leaf spot and powdery mildew resistant. A few cultivars of *L. indica* along with *L. fauriei* 'Fantasy' also suffered relatively light damage from *Cercospora* leaf spot and powdery mildew.

Surprisingly, compared to powdery mildew, *Cercospora* leaf spot proved to be an equally if not more, damaging disease on two of the three crapemyrtle taxa. Previously, powdery mildew garnered far more atten-

tion from professionals than did *Cercospora* leaf spot. Cultivars resistant to powdery mildew were found in all three taxa of crapemyrtle. Among the cultivars of *L. indica*, 'Glendora White' and 'Cherokee' were among the most disease resistant. Hybrid crapemyrtle cultivars highly resistant to powdery mildew were 'Tonto', 'Tuskegee', 'Tuscarora', 'Basham's Party Pink', 'Apalachee', and 'Caddo'.

The one cultivar of *L. fauriei*, 'Fantasy', also suffered little damage from either disease. When horticultural characteristics and disease resistance were both considered, the superior white-flowered cultivars were 'Natchez', 'Sarah's Favorite', and 'Fantasy', while 'Basham's Party Pink', 'Tuscarora', and 'Tuskegee' were the top rated pink-flowered crapemyrtles (3). All of the above crapemyrtles can be easily produced in a nursery or maintained in a landscape without protective fungicide treatments. Those cultivars that were badly damaged by either powdery mildew, *Cercospora* leaf spot, or in some cases both diseases, may not suffer serious damage in the nursery but would be poor choices for commercial and residential landscapes across Alabama.

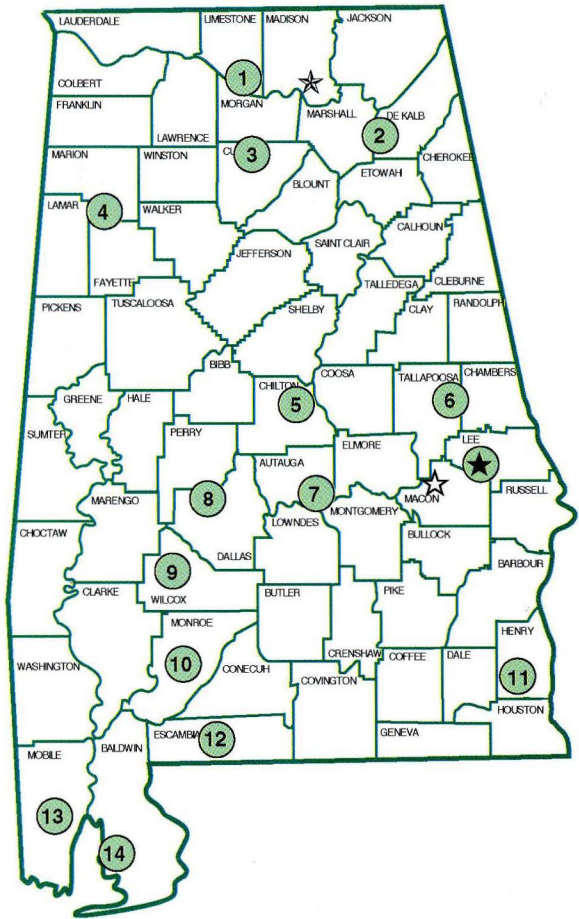
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With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the state has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



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- ☆ Alabama A&M University
- ☆ E. V. Smith Research Center, Shorter.

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