Susceptibility of Crape Myrtle, *Lagerstroemia indica* L., to the Crapemyrtle Aphid (Homoptera: Aphididae) in North Florida[1]

Russell F. Mizell III and Gary W. Knox

North Florida Research and Education Center, Route 4, Box 4092
Monticello, FL 32344-9302

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ABSTRACT Thirty seven cultivars of the crape myrtle, *Lagerstroemia* spp., were evaluated in a two year study in north Florida for susceptibility to the crapemyrtle aphid, *Tinocallis kahawaluokalani* (Kirkaldy). Numbers of crapemyrtle aphids per leaf were monitored each week from June to October in 1990 and 1991. Peak aphid numbers occurred in both years during the last week in July. Cultivars with *L. fauriei* parentage, and cultivars that are susceptible to or those with resistance to powdery mildew had significantly higher aphids per leaf than cultivars considered tolerant of powdery mildew. Aphid numbers were not related to flower color or leaf area, but tall and semi-dwarf cultivars had significantly more aphids than dwarf or medium-sized cultivars. Mean number (± SE) of aphids per leaf per sample date varied from a low of 6.2 ± 1.7 on 'Centennial Spirit' to 84.8 ± 19.1 on 'Biloxi'.

KEY WORDS *Lagerstroemia,* crapemyrtle aphid, *Tinocallis kahawaluokalani,* cultivar, susceptibility.

Crape myrtle, *Lagerstroemia indica* L., is native to China and has become one of the most important woody landscape plants in the southern U.S. Crape myrtle's attractive bark and showy flowers in mid-summer make it a year-round, landscape favorite from Maryland to California. Crape myrtle has few insect and disease pests. Outside the present range of the Japanese beetle, *Popillia japonica* Newman, only powdery mildew, *Erysiphe lagerstroemiae* E. West, and the crapemyrtle aphid, *Tinocallis kahawaluokalani* (Kirkaldy) (CMA) (Smith and Parron 1978) with its associated sooty mold, *Capnodium* spp. are significant pests (Egolf and Andrick 1978). However, in Florida and along the Gulf Coast of the U.S., a metallic blue chrysomelid, *Altica* spp. (nr. *foleacea*) is a significant pest in May-June (R. Mizell, personal observation).

Crapemyrtle aphid is host specific to *L. indica* in the U. S. and apparently was introduced to the U. S. mainland along with the plant. It is reported to infest henna, *Lawsonia alba* L., in India (Agarwala et al. 1989) and pomegranate, *Punica granatum* L., in the Philippines (V. J. Calilung, personal communication 1988). During feeding, the aphids produce large amounts of honeydew which serve as a substrate for sooty mold, *Capnodium* spp. Sooty mold turns all plant parts an unsightly black, while aphid feeding damage often causes defoliation in late season.

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Since the original introduction of *L. indica* germplasm, a selective breeding program (Egolf and Andrick 1978) has developed many new cultivars with various horticultural and pest management characteristics (Egolf 1986a,b, 1987a,b, 1990). Crosses with *L. fauriei* have produced cultivars with tolerance or resistance to powdery mildew. Other selections from *L. indica* backcrosses and *L. indica* crosses with *L. subcosta* × *L. fauriei* germplasm have produced cultivars of dwarf, semi-dwarf and medium height. These advances were instrumental in the development and sustained popularity of crape myrtle in the landscape (Egolf and Andrick 1978).

Because of crape myrtle's importance in high value landscapes and nurseries, management of aphid populations which diminish the appearance of the plants is important. Limited research on the CMA is available. Mizell and Schiffhauer (1987) reported the seasonal abundance of CMA and its many predators in north Florida on the cultivar 'Carolina Beauty'. They suggested that the crape myrtle and CMA might be very important to the conservation and augmentation of generalist predators that attack a variety of other pest species. Alverson and Allen (1991) discussed the life history and bionomics of the aphid in South Carolina. Knox and Norcini (1991) reported data on several horticultural characteristics of cultivars in this same experimental planting. The objective of this paper was to evaluate 37 crape myrtle cultivars for their susceptibility to CMA in north Florida in relation to flower color, ultimate or mature plant size, leaf size, *L. fauriei* parentage, and powdery mildew resistance.

Materials and Methods

The planting of the 37 cultivars (Table 1) was established in 1988 and 1989 at the NFREC-Monticello, Florida (Knox and Norcini 1992). Two plants per cultivar were planted in each of two blocks separated by approximately 800 m of woods and pecan plantings. Cultivars in the plantings were grouped by mature height as dwarf, semidwarf, medium and tall, as classified in Egolf and Andrick (1978). Plants were 3 m apart within the row and 4 m apart between rows. Plants were grown as multi-stemmed shrubs and trees in a simulated low-maintenance landscape. Plants were not irrigated except for the first few weeks after planting. The areas received minimal fertilization of 0.9 kg of actual nitrogen per 304.8m^2 per year in 1989 and 1990. Plants were mulched within the row with 7.5-10 cm of course pine bark. Centipede/bahia grass was maintained between rows. Aphids developed to high levels in only one of the blocks and only those data are reported here.

Crapemyrtle aphids were monitored each week beginning in early summer of 1990 and 1991 by counting the number of aphids on ten leaves per plant selected randomly to represent the entire plant. Statistical analyses were performed using the Statistical Analysis System (SAS 1985). The analysis of the effects of plant characteristics on aphid numbers used only a main effects model which assumed no interaction. This was necessary, because all possible combinations of the plant factors were not represented by each tested cultivar. The relationship of mean leaf area to mean CMA numbers per leaf was assessed by linear regression (SAS 1985).

Table 1. Horticultural characteristics and incidence of crapemyrtle aphid on crape myrtle cultivars in North Florida 1990 and 1991.

Cultivar	Size*	Flower Color	*L. fauriei* Parentage*	Mildew Resistance*	Leaf Area (cm^2) 1991 $\bar{X} \pm SE$	Crapemyrtle Aphids 1990 & 1991 $\bar{X} \pm SE$/leaf	Peak Number Crapemyrtle Aphids (1991) $\bar{X} \pm SE/leaf^2$
Centennial Spirit	Medium	Red	No	Unknown	8.91 ± 0.3	6.2 ± 1.7	4.4 ± 4.0
Victor	Dwarf	Red	No	Resistant	6.92 ± 0.2	7.2 ± 1.5	11.6 ± 6.8
Bourbon Street	Dwarf	Red	No	Unknown	4.60 ± 0.6	11.4 ± 3.5	22.3 ± 13.8
Baton Rouge	Dwarf	Red	No	Unknown	6.03 ± 0.3	14.1 ± 5.2	18.4 ± 11.8
Lafayette	Dwarf	Lavender	No	Unknown	7.79 ± 0.3	14.5 ± 5.2	43.5 ± 6.9
New Orleans	Dwarf	Purple	No	Unknown	6.89 ± 0.7	15.3 ± 5.2	28.8 ± 16.9
Potomac	Tall	Pink	No	Tolerant	11.30 ± 0.8	15.4 ± 4.1	32.5 ± 19.8
Snowbaby	Dwarf	White	No	Susceptible	9.57 ± 0.6	15.7 ± 6.0	32.4 ± 18.8
Cordon Bleu	Dwarf	Lavender	No	Unknown	8.90 ± 0.4	16.4 ± 5.0	26.9 ± 16.9
Bayou Marie	Dwarf	Pink	No	Unknown	8.20 ± 0.5	18.3 ± 6.5	31.3 ± 21.0
Delta Blush	Dwarf	Pink	No	Unknown	8.00 ± 0.7	21.0 ± 7.9	27.3 ± 16.4
Near East	Medium	Pink	No	Susceptible	13.05 ± 0.6	24.3 ± 5.0	26.0 ± 15.2
Royalty	Dwarf	Purple	No	Susceptible	8.27 ± 0.7	24.7 ± 6.2	32.6 ± 20.1
Seminole	Medium	Pink	No	Susceptible	15.10 ± 1.4	26.5 ± 5.6	10.7 ± 7.0
Miami	Tall	Pink	Yes	Tolerant	19.75 ± 1.2	26.7 ± 5.1	20.6 ± 12.2
Twilight	Tall	Purple	No	Susceptible	10.91 ± 0.8	28.4 ± 6.4	48.5 ± 28.5
Hope	Semi-dwarf	Pink	No	Resistant	10.62 ± 0.3	32.6 ± 7.0	99.9 ± 8.9
Pecos	Semi-dwarf	Pink	Yes	Resistant	19.76 ± 0.8	33.4 ± 6.3	46.3 ± 26.7
Natchez	Tall	White	Yes	Tolerant	28.93 ± 2.5	34.7 ± 7.0	48.9 ± 28.1
Sioux	Medium	Pink	Yes	Resistant	21.59 ± 1.6	34.8 ± 6.5	40.0 ± 22.9
Tuskegee	Tall	Pink	Yes	Resistant	22.63 ± 2.4	39.6 ± 8.3	35.6 ± 20.3
Osage	Medium	Pink	Yes	Resistant	20.73 ± 1.5	40.3 ± 8.2	52.7 ± 30.6
Regal Red	Tall	Red	No	Susceptible	15.07 ± 0.7	40.4 ± 9.6	66.7 ± 38.5
Tuscarora	Tall	Pink	Yes	Tolerant	16.14 ± 0.8	42.5 ± 9.0	55.9 ± 32.8
Carolina Beauty	Medium	Red	No	Susceptible	11.26 ± 0.6	44.7 ± 10.8	73.5 ± 42.4
Lipan	Medium	Lavender	Yes	Resistant	15.03 ± 0.7	46.5 ± 12.0	99.7 ± 60.1
Tonto	Semi-dwarf	Red	Yes	Resistant	15.38 ± 0.9	47.3 ± 9.5	37.6 ± 21.9
Yuma	Medium	Lavender	Yes	Resistant	15.07 ± 0.7	50.8 ± 11.3	71.7 ± 45.0

Table 1. Continued.

Cultivar	Size*	Flower Color	*L. fauriei* Parentage*	Mildew Resistance*	Leaf Area (cm^2) 1991 $\bar{X} \pm SE$	Crapemyrtle Aphids 1990 & 1991 $\bar{X} \pm SE$/leaf	Peak Number Crapemyrtle Aphids (1991) $\bar{X} \pm SE$/leaf†
Acoma	Semi-dwarf	White	Yes	Resistant	9.14 ± 1.2	53.4 ± 11.0	66.1 ± 42.6
Country Road	Tall	Red	No	Resistant	11.87 ± 0.3	53.2 ± 12.9	73.0 ± 10.4
Byers Wonderful White	Tall	White	No	Susceptible	22.40 ± 1.1	54.1 ± 10.7	70.8 ± 41.9
Dallas Red	Tall	Red	No	Resistant	18.54 ± 1.2	54.7 ± 12.6	94.1 ± 54.3
Hopi	Semi-dwarf	Pink	Yes	Resistant	17.59 ± 1.2	62.3 ± 13.0	95.0 ± 55.9
Apalachee	Medium	Lavender	Yes	Resistant	22.39 ± 7.8	66.1 ± 15.1	126.7 ± 74.0
Zuni	Semi-dwarf	Lavender	Yes	Resistant	14.31 ± 1.1	71.8 ± 15.9	193.0 ± 27.5
Comanche	Medium	Pink	Yes	Resistant	18.18 ± 2.2	74.2 ± 18.7	215.9 ± 3.1
Biloxi	Tall	Pink	Yes	Resistant	23.68 ± 2.3	84.8 ± 19.1	96.0 ± 55.4

* Egolf and Andrick (1978), Egolf (1986a, 1986b, 1987a, 1987b, 1990).
† First peak from July 20 - 31.

Results and Discussion

Crapemyrtle aphid appeared initially in early June and began to increase by mid June in 1990 and by early July in 1991. Crapemyrtle aphid numbers were high during the month of July, peaking in both years during the final week (Fig. 1). Crapemyrtle aphid numbers rapidly decreased following peak numbers and mean numbers per leaf were low by the end of August. In 1990, unlike 1991, a second smaller peak in CMA was observed on most cultivars in early September (Fig. 1). 'Tuskegee', 'Tonto', 'Tuscarora' and 'Seminole' also exhibited a second peak of CMA, but in these cultivars the second peak was higher than the first. This second (late season) peak in aphid numbers was the only difference in aphid phenology observed that was related to specific cultivars. By contrast, the occurrence of peak populations of CMA has been reported to be location and year-dependent. Mizell and Schiffhauer (1987) reported seasonal abundances of the CMA from two other locations within 5 km of the current location. They found that CMA peak numbers occurred in mid August and late September in 1984 and in late July and early August in 1985. Mizell (unpublished data 1989-91) observed CMA on 'Carolina Beauty' in a location within a pecan orchard ca. 0.5 km away from our primary location. Crapemyrtle aphids on the 'Carolina Beauty' site peaked on June 27, 1989, on July 26, 1990 and on July 13, 1991. Since these counts are based on weekly samples, there is the possibility of a 3-4 day error in peak dates.

While peak populations of CMA exhibit year and location variations, CMA could be successfully managed in most years by initiating controls the first week of July. Doughty et al. (1992) reported that a slurry of acephate (Orthene 75 S) banded on the trunks of crape myrtle successfully controlled CMA in the field for up to four weeks. Other conventional pesticides, and soaps and summer oils are also effective (Mizell, unpublished data 1988).

Crapemyrtle aphid numbers were not related to flower color (Table 2). Plants with *L. fauriei* parentage averaged ca. twice as many aphids as those cultivars without. Egolf (1986a,b, 1987a,b, 1990) crossed *L. fauriei* with *L. indica* to include resistance to powdery mildew in *L. indica*. However, mildew resistance appeared associated with susceptibility to CMA (Table 2). Differences in biochemistry/physiology between the mildew resistant and tolerant cultivars are not known.

Crapemyrtle aphid numbers were influenced by plant size category as specified for the Washington, D. C. area by Egolf and Andrick (1978). Plant growth was sufficient to allow size categories to be manifested during this study. Tall plants had the highest infestations while dwarf and medium plants had the lowest. Crape myrtle of the smaller size classes were developed by back crosses of *L. indica* selections independent of powdery mildew status, e. g. *L. fauriei* parentage. All of the plants that averaged <25 CMA per leaf, with the exception of 'Potomac', are considered dwarf or medium cultivars. However, cultivars averaging between 25 and 50 CMA per leaf represented all size classes.

Lagerstroemia indica cultivars vary widely in leaf size from the dwarf cultivar 'Bourbon Street' with a mean leaf area of 4.6 cm^2 to 'Pecos' with a mean leaf area of 28.9 cm^2 (Table 1). Despite the observed variation in leaf size, CMA numbers were unrelated to leaf area either with respect to mean CMA/leaf or

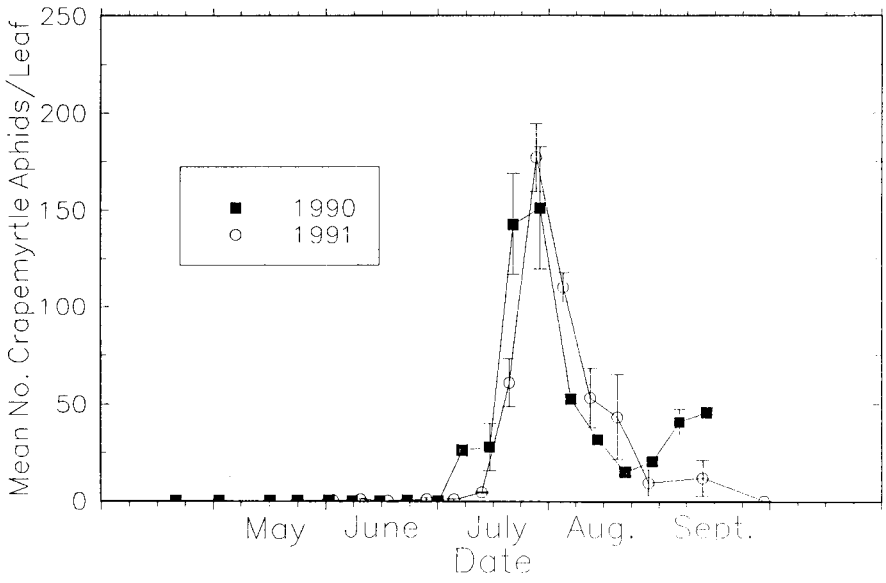

Fig. 1. Mean number (bars equal one S.E.) of crapemyrtle aphids, *T. kahawaluokalani* (Kirkaldy), per leaf on 'Carolina Beauty' in 1990 and 1991 in north Florida.

Table 2. Effects of flower color, *L. fauriei* L. parentage, plant size category and mildew resistance of crape myrtle, *L. indicia*, L. on the mean number per leaf (± S. E.) of crapemyrtle aphids, *T. kahawaluokalani* (Kirkaldy).

1. Flower Color:	Purple	29.3 ± 6.9 a*
	Pink	31.2 ± 3.1 a
	Red	31.3 ± 4.6 a
	White	34.0 ± 5.7 a
	Lavender	38.4 ± 5.2 a
2. *L. fauriei* Parentage:	Without	24.1 ± 3.9 b
	With	41.5 ± 4.3 a
3. Plant Size:	Dwarf	20.1 ± 4.8 b
	Medium	30.4 ± 4.7 b
	Semidwarf	34.3 ± 5.7 ab
	Tall	46.5 ± 3.7 a
4. Mildew Resistance:	Tolerant	12.8 ± 6.7 b
	Unknown	35.2 ± 6.0 a
	Susceptible	41.5 ± 5.0 a
	Resistant	41.7 ± 3.5 a

* Means not followed by same letter are significantly different, $P < 0.05$, as determined by t-test on least square means (see text).

mean number observed over the dates populations peaked in late July (Table 1). Leaf dry weight was also unrelated to aphid numbers (data not shown).

Crapemyrtle aphids are host specific on *L. indica* in the U. S., and only two other host species are reported. Apparently, CMA are closely linked physiologically and/or behaviorally to the chemical and/or physical properties of the host plant. The results of this study suggest that plant breeders, nurserymen and landscapers may have available crape myrtle cultivars which have reduced susceptibility to CMA in all plant sizes and flower colors.

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