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## Effect of Crapemyrtle Bark Scale on Crapemyrtle Industry and Consumer Demand

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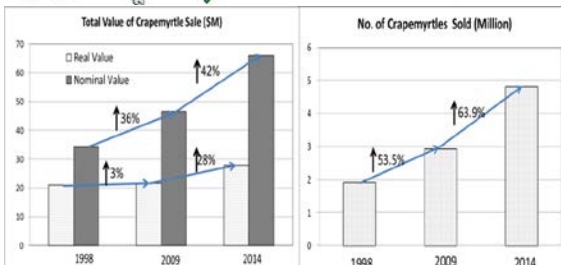
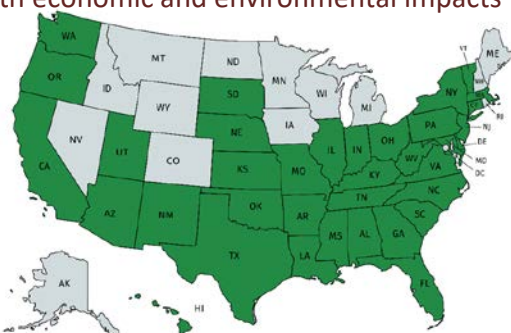
*Selected Poster prepared for presentation at the 2019 Agricultural & Applied Economics Association  
Annual Meeting, Atlanta, GA, July 21-23*

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# Effect of Crapemyrtle Bark Scale on Crapemyrtle Industry and Consumer Demand

## Introduction

- Crapemyrtle is the most popular summer flowering tree in the U.S.
- Crapemyrtle bark scale (*Acanthococcus lagerstroemiae*) has been confirmed in all the Southeastern U.S. except for Florida.
- In its native range in East Asia, CMBS is a serious threat to crapemyrtles, persimmons, and pomegranate plants.
- No biological control of the crape myrtle bark scale is known.
- California Department of Food and Agriculture has rated CMBS as a 14 on a scale of 1 to 15 with 15 being most serious.
- It has “moderate host range,” has “both high reproduction and dispersal potential” and “could cause both economic and environmental impacts”.



Picture Source: <https://agrilife.org/extensiontofiles/2017/10/Crape-myrtle-bark-scale-EHT-049.pdf>; Graph Source: USDA NASS Census of Horticultural Specialties 1998, 2009, 2014

## Objective

- Understand the impact that CMBS has on producers and overall demand of crapemyrtles.
- This study is funded by USDA-Specialty Crop Program with the ultimate goal of increasing knowledge of the scale & control strategies, and minimizing the potential economic loss caused to consumers, growers and the environment.

## Methodology

- Interviewed businesses from Georgia, California, Louisiana, Texas, Florida, Tennessee, and Mississippi, at the 2018 Texas Nursery/Landscape Expo.
- Used MTurk for choice experiments with different attributes of crapemyrtle plants to identify consumers’ demand for crapemyrtles and their preferences for different traits related to CMBS. Participants were asked to choose from two options with all the attributes listed. We had 16 scenarios like these with different combinations.

Both trees described below have attained maturity and will not bloom/flower more than the current state. Now, hypothetically, you have to make a purchasing decision to buy a tree. Which buying option would you choose from each of the scenarios below? (choose one)

Plant A	Plant B	Neither
Leaf color: Dark green	Leaf color: Light green	
Flowering: Dense	Flowering: Sparse	
Bark color: Brown	Bark color: Blackish	
Price: \$350	Price: \$300	
a	b	c

## Model

A linear random utility model (McFadden & Train, 2000) has been used in the past literature (Yin et. al., 2018) with a random parameter logit model (Gao & Schroeder, 2009)

$$U_{ij} = \alpha_i \cdot p_{ij} + \sum_{k=1}^T \beta_{ij} \cdot x_{ijk} + \varepsilon_{ij}$$

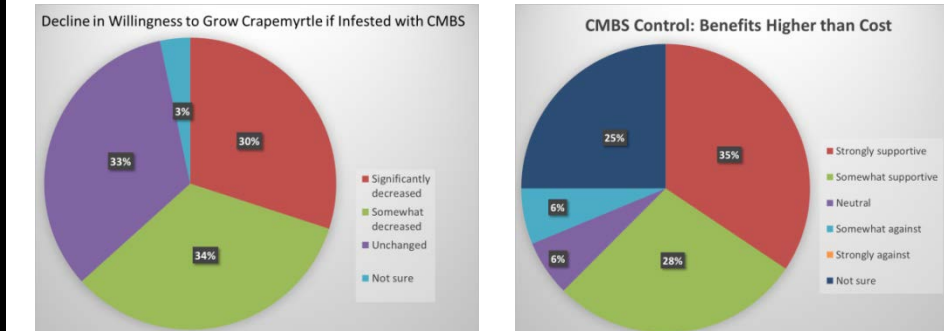
Where  $U_{ij}$  is the utility of individual  $i$ ,  $p_{ij}$  is the price of alternative  $j$  for individual  $i$ ,  $k$  is the  $k^{\text{th}}$  attribute of alternative  $j$ , and  $\alpha_i$  and  $\beta_{ij}$  are marginal utilities for price and  $k^{\text{th}}$  attribute respectively. So the following equality holds

$$\alpha_i \cdot p_{ij} + \sum_{l=1}^T \beta_{il} \cdot x_{ijl} + \beta_{ik} \cdot x_{ij(k=0)} + \varepsilon_{ij} = \alpha_i \cdot (p_{ij} + \text{WTP}^k) + \sum_{l=1}^T \beta_{il} \cdot x_{ijl} + \beta_{ik} \cdot x_{ij(k=1)} + \varepsilon_{ij}$$

So the WTP can be calculated by the following

$$\text{WTP}^k = -\beta_k / \alpha$$

## Results



Variable	Mean (Std Dev)	Income	T
Age	34.35 (8.974)	Average Income	\$62,721.52 (43,693.33)
Household Size	4.05 (2.262)	Less than \$20,000	6.33%
No. of Children	1.97 (2.620)	\$20,000 to \$29,999	9.49%
Female	39.87%	\$30,000 to \$39,999	13.29%
Education		\$40,000 to \$49,999	10.13%
Master's degree, Professional degree or Doctorate degree	24.69%	\$50,000 to \$59,999	19.62%
Some College, Associate's degree, or Bachelor's degree	65.82%	\$60,000 to \$69,999	11.39%
Regular High School Diploma, GED or equivalent	8.86%	\$70,000 to \$79,999	11.39%
No schooling completed	0.63%	\$80,000 to \$89,999	3.16%
Employment		\$90,000 to \$99,999	5.70%
Full Time	84.18%	\$100,000 to \$149,999	5.70%
Part Time	10.13%	\$150,000 to \$199,999	1.90%
Do Not Work	3.80%	\$200,000 to \$249,999	0.63%
Other	1.90%	\$250,000 to \$299,999	0.63%
Race		\$300,000 to \$349,999	0.63%
White	81.01%	\$350,000 to \$399,999	0%
Black or African American	12.03%	\$400,000 to \$449,999	0%
Asian	1.90%	\$450,000 to \$499,999	0%
American Indian or Alaska Native	5.06%	\$500,000 or more	0%
Hispanic			
Yes	24.05%		
No	75.95%		
No. of Respondents	158	No. of Respondents	158

	coef	exp(coef)	se(coef)	z	p	Leaf	Δ WTP
Leaf	0.2066	1.2295	0.1075	1.9200	0.0550	Leaf	99.34 *
Flower	0.2360	1.2662	0.1055	2.2400	0.0250	Flower	113.47 *
Bark	-0.0471	0.9540	0.0731	-0.6500	0.5190	Bark	-22.66
Price	-0.0021	0.9979	0.0010	-2.0600	0.0400	Total	190.14 **

## Conclusions

- Producers anticipated a decline in willingness to grow crapemyrtle when infested with bark scale.
- We found industry demand for systemic and scientific CMBS control.
- Consumer WTP for crapemyrtle significantly decreased due to CMBS infestation, with dense flowering being the most important attribute (highest WTP).