KANSAS DEPARTMENT OF AGRICULTURE—PLANT PROTECTION & WEED CONTROL

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INSECT HIGHLIGHT

Crapemyrtle bark scale (*Acanthococcus lagerstroemiae*)

Figures 1–2. CMBS intercepted at Kansas retailers. Photo courtesy Jennifer Smith.

The exotic crapemyrtle bark scale (*Acanthococcus lagerstroemiae*) was detected for the first time in Kansas at multiple retailers (varieties Miss Francis and Natchez) (Figs. 1–2). Crapemyrtle bark scale (CMBS) was initially detected in Richardson, TX, a Dallas suburb in 2004. Originally, the scale specimens were confused with a related native species (azalea bark scale, *Acanthococcus azaleae*) which attacks azalea (*Rhododendron* spp.). However, *A. azaleae* are not known to attack crapemyrtle, and through a combination of molecular (DNA) and anatomical data comparisons, the specimens were reidentified as *A. lagerstroemiae* (Figs. 3–4).

Due to the popularity of crapemyrtle as a woody ornamental, CMBS has rapidly spread throughout the southern United States via human transportation. As of August 2019, CMBS is known from 12 states according to Early Detection & Distribution Mapping System (Alabama, Arkansas, Georgia, Kansas, Louisiana, Mississippi, New Mexico, North Carolina, Oklahoma, Tennessee, Texas, Virginia) (Fig. 5). In part, due to their rapid spread, CMBS was declared on of the top nine pests in 2015 by *Greenhouse Growers Magazine*.

Crapemyrtle (*Lagerstroemia* spp.) is a widespread subtropical to tropical evergreen woody plant distributed across Asia, Australaisa and Oceana. Crapemyrtle has been cultivated in the US since *ca*. 1790, and despite originating from warm climates, years of cultivation has led to numerous cold hardy varieties. Originally designated as a zone 7 plant, crapemyrtle is hardy in zones 6–10 and thought to be winter hardy in zone 5 (Fig. 6). In colder climates crapemyrtle will die back in winter and re-sprout, therefore never developing into a tree or its unique exfoliating bark. Nonetheless, they are popular for their attractive summer flowers, easy maintenance, adaptability to a wide range of soil types, and limited pest challenges. Until the discovery of CMBS, relatively few pests were known from crapemyrtle: primarily crapemyrtle aphid (*Tinocallis kahawaluokalani*) and Japanese beetle (*Popillia ja-*

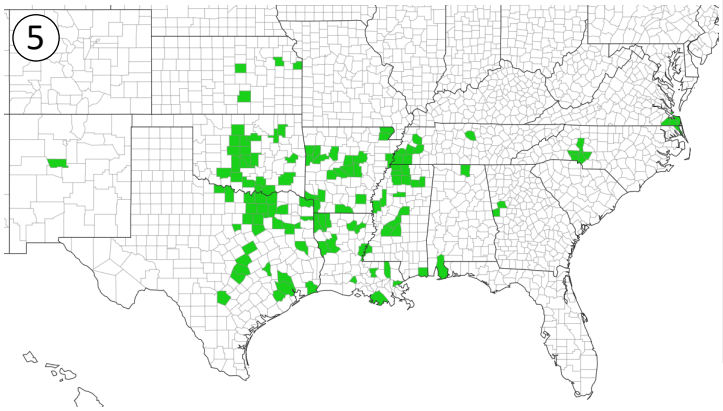
Figures 3–4. CMBS slide mounts. (3) Whole body showing distinctive anal lobes. (4) Antenna showing diagnostic seta.

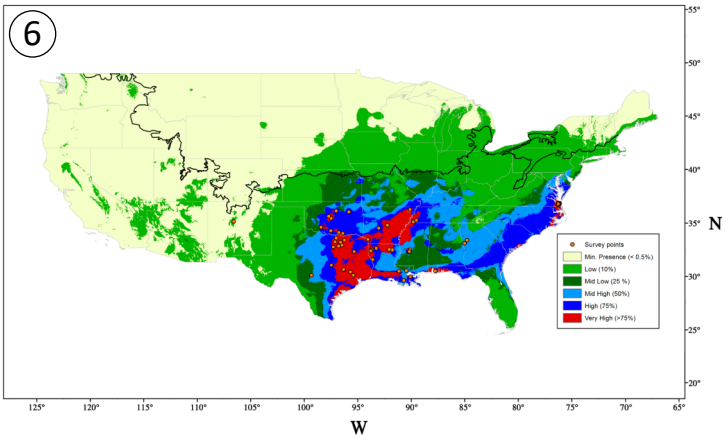
ponica) with flea beetles (*Altica* spp.) and granulate ambrosia beetle (*Xylosandrus crassiusculus*) being secondary pests. Several varieties have been successfully grown in Kansas' Extension Master Gardener Demonstration Garden, including a variety developed by Kansas State University (Velma's Royal Delight), demonstrating crapemyrtle's ability to grow and thrive in Kansas.

Biology

CMBS is a felt scale (Eriococcidae) originally from China, Korea and Japan. In the US they are currently almost exclusively restricted to crapemyrtle (recently observed feeding on American beautyberry in an open field [*Callicarpa americana*]), but in their native range and introduced Hungary, they have been documented from additional hosts (Table 1) of which several are economically important both abroad and in the United States. No-choice tests have shown CMBS are able to develop and reproduce successfully feeding on winged loosestrife (*Lythrum alatum*) and American beautyberry, which is troubling because these two species are common in the environment and may potentially play a role in CMBS spreading naturally through the environment (Fig. 7).

As with other scale insects (superfamily Coccoidea), CMBS develops via incomplete metamorphosis, adult females paedomorphic (i.e. females reach reproductive maturity while maintaining the form of an immature stage), and adult males are winged and





Figures 5–6. (5) Confirmed detections of CMBS in the U.S. Source: eddmaps.org. (6) Projected distribution of *Acanthococcus lagerstroemiae* in the U.S. Warmer colors indicate higher climatic suitability. Orange points indicate reported infestations. The black line indicates the northern limit of Plant Hardiness Zone 6. Source: Wang *et al.* 2016.

Table 1. Known hosts of CMBS.

	Scientific Name	Common Name	Country
1.	*Anogeissus latifolia*	Axlewood	Korea
2.	*Anogeissus sp.*	–	China
3.	*Buxus microphylla*	Korean boxwood	Korea
4.	*Celtis sinensis*	Chinese hackberry	Korea
5.	*Dalbergia eremicola*	Indian rosewood	Korea
6.	*Diospyros kaki*	Japanese persimmon	Korea
7.	*Ficus carica*	Edible fig	Korea
8.	*Glochidion puberum*	Needlebush	China
9.	*Glycine max*	Soybean	China
10.	*Ligustrum obtusifolium*	Border privet	–
11.	*Malus pumila*	Paradise apple	China
12.	*Mallotus japonicus*	Food wrapper plant	Korea
13.	*Myrtus* sp.	Myrtle	Hungary
14.	*Punica granatum*	Pomegranate	China & Korea
15.	*Pseudocydonia sinensis*	Chinese-quince	Korea
16.	*Rubus* sp.	Brambles	Hungary
17.	*Ternstroemia japonica*	Cleyera	–

do not feed. CMBS is highly fecund and females can lay 114–320 eggs in a lifetime. First instars are mobile and commonly referred to as “crawlers” and will disperse to a new location to begin feeding (Fig. 8). After the first moult immatures become sessile and begin to develop a whiteish filamentous waxy covering (“scale”). Development is completed within the wax cover and while males will disperse by flight to seek out a mate, females will remain within their soft scale through egg laying and eventual death (Figs. 9–10).

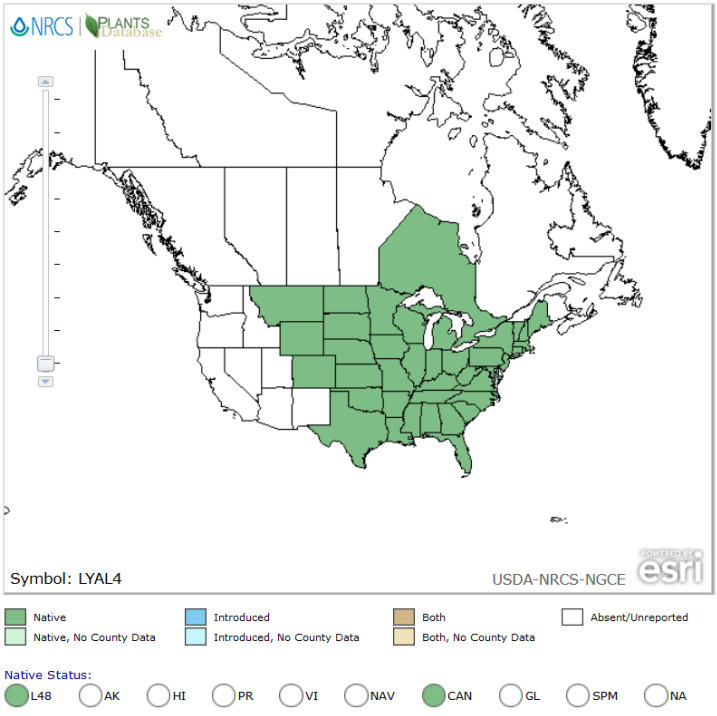


Figure 7. Figure 7. Distribution of winged loosestrife (Lythrum alatum). Source: plants.sc.egov.usda.gov

The scales themselves are light red in color and living scales will bleed red when crushed, serving as a method to determine if present scales are viable.

CMBS completes a generation in approximately 4 months at a constant 25°C (77°F) and 3.5 months at 30°C (86°F), and immatures remained quiescent at 20°C (68°F). Furthermore, having a subtropical native range, CMBS is limited by cold temperatures and is thought to only survive south of the 43°N latitude. This northern limit includes the entire state of Kansas (Fig. 6), and based on average temperatures in Kansas, it is thought that CMBS will experience two life cycles in a year (at least three generations annually have been observed in Texas and up to four in its native range in China). In KS, temperatures typically increase above 20°C beginning in late April and into late October. In neighboring Arkansas, crawlers and late stage nymphs have been observed to overwinter under loose bark and tight interspaces. Therefore, a second generation of crawlers can likely be expected to emerge sometime in August in Kansas. However, without adequate growing degree days data for CMBS and their development in KS, it is not entirely clear when certain life stages and life cycle turnaround can be expected in KS.

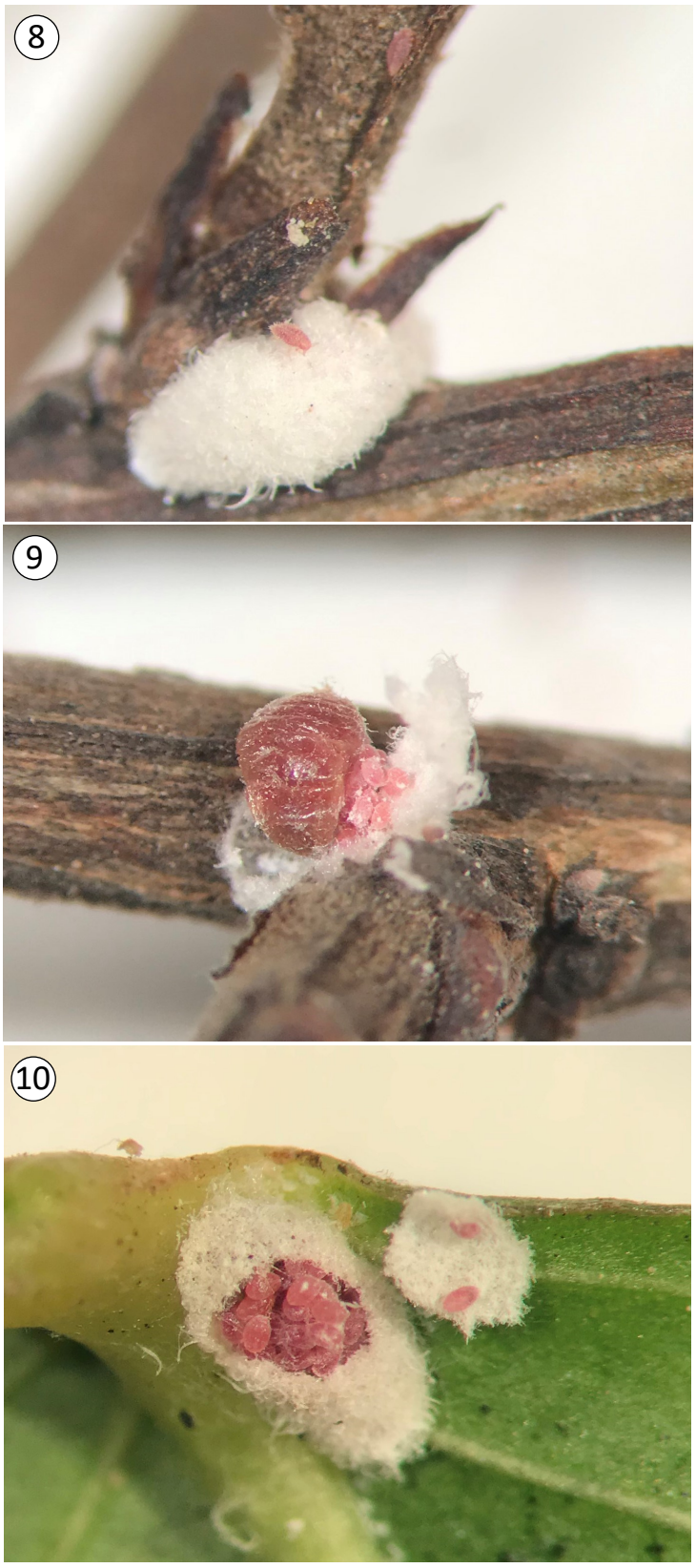
Management

Although CMBS will rarely kill a plant, it is known to be associated with significant damage to crapemyrtle. Heavy infestation has been linked to branch dieback, stunted growth and reduced flowering. The most immediately apparent effect of CMBS infestation is the growth of sooty mold due to the production of honeydew by the insects. Sooty mold can contribute to a reduction in photosynthetic productivity and landscape aesthetic value. Furthermore, as with other honeydew producing Homoptera, the sweet secretion can attract ants which in turn guard the scales as a resource for the colony, reducing the efficacy of naturally occurring enemies. In China, numerous parasitoids and predators were observed to attack CMBS; in Louisiana and Texas, several species of native ladybeetles (Coccinellidae) and lacewings (Chrysopidae & Hemerobiidae) have been

seen predating and a couple of parasitoids (Encyrtidae & Pteromalidae) were reared from the scales. The list of potential parasitoids for management demonstrates potential for classical and/or augmentative biological control in the future.

Similar to other pestiferous scale insects, management of CMBS is challenging and success is tightly linked to timing of practices. Because the waxy scale of older insects act as a protective barrier, the young crawlers (first instar nymphs) are the most vulnerable and susceptible to control efforts. Preliminary estimates (see above under Biology) suggest crawler activity in Kansas will likely take place beginning in late April and again in late October. However, these estimates are based on very limited data, none of which was collected in KS, and should therefore be interpreted as crude approximations. For accurate and precise timing, plants should be physically monitored using sticky tap traps which can be easily fashioned with double-sided tape (https://edis.ifas.ufl.edu/pdffiles/IN/IN110300.pdf).

There is still no consensus on best management practices for CMBS. However, some cultivars/varieties have been shown to demonstrate resistance relative to others (Fig. 11). Heavy infestations may be initially controlled physically by gently brushing the bark to dislodge scales. In a study comparing the greatest diversity of pesticides against CMBS crawlers, dinotefuran as a drench and bifenthrin (spray) + dinotefuran (drench) were found to provide the most immediate and longest control of crawlers. Additionally, as sprays, dinotefuran, pyriproxyfen, and flupyradifurone demonstrated appreciable control of crawlers. Drenches should be applied early in the season as plants begin to bud and transportation becomes more active. Several weeks are necessary for systemic insecticides to spread throughout the plant. Bark sprays should be timed with peak crawler activity and a follow-up application two weeks later will target crawlers that have emerged after the initial application. Horticultural oils may provide an effective alternative to chemical treatments, but their relative efficacy is presently unclear. Dormant oils when leaves are not present and summer oils during the growing season should be applied throughout the plant, making sure not to miss small interspaces and crotches. Applications should be followed up every two weeks as needed. The oils will act to suffocate the insects and are safer for natural enemies and pollinators.



Figures 8–10. CMBS intercepted at Kansas retailers. (8) Crawlers and mature female. (9) Exposed mature female and eggs. (10) Exposed scale showing eggs; female of this scale is spent and shrunken compared to Fig. 9.

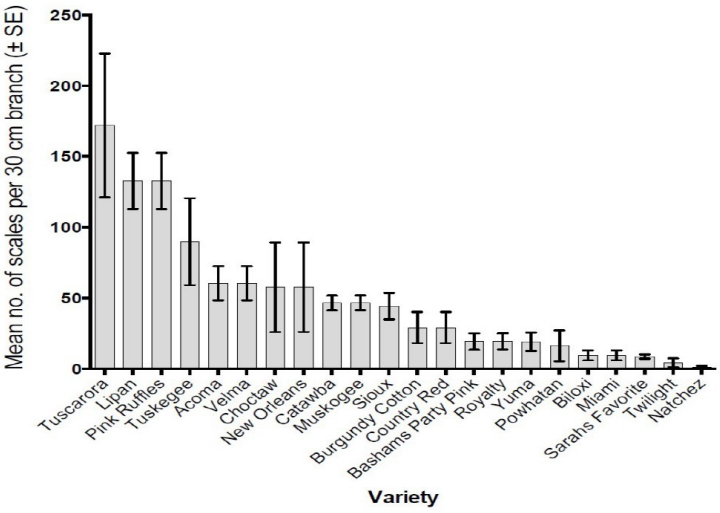


Figure 11. Mean number of CMBS (all life stages on 3 branches per tree) for 22 varieties of crapemyrtle in Texas. Source: Merchant *et al*. 2014.

A common practice with crapemyrtle owners is the act of cutting plants down to stubs in the late fall and winter. This practice, also known as "crape murder" (a term credited to a 1997 article in *Southern Living*), is widely thought to promote better blooms in the following season. However, this aggressive form of pruning can facilitate the introduction of disease and has been qualitatively linked to increased CMBS infestations in Arkansas and should probably be avoided.

NOTE: Licensed live plant distributors in the state of Kansas must comply with pest freedom standards set forth by the Plant Pest and Agriculture Commodity Certification Act which mandates a zero tolerance policy for "scale insects" (https://agriculture.ks.gov/docs/default-source/statutes-ppwc/plantpestact.pdf?sfvrsn=55d8320f_14). Above management practices were aggregated from available literature and are not official recommendations by the Kansas Department of Agriculture. As with all pesticide applications, it is extremely important to read and follow label instructions and state regulations. Timing applications appropriately is important in protecting valuable pollinators. Questions concerning pest management should be directed to your local extension specialists.

References

- Chappell, M.R., S.K. Braman, J. Williams-Woodward, G. Knox. 2012. Optimizing plant health and pest management of *Lagerstroemia* spp. in commercial production and landscape situations in the southeastern United States: a review. *Journal of Environmental Horticulture*, 30(3): 161–172.
- Merchant, M.E., M. Gu, J. Robbins, E. Vafaie, N. Barr, A.D. Tripodi, A.L. Szalanski, J. Hopkins, G. Evans. 2014. Discovery and spread of *Eriococcus lagerstroemiae* Kuwana (Hemiptera: Eriococcidae), a new invasive pest of crape myrtle, *Lagerstroemia* spp. *Entomological Society of America Annual Meeting* poster presentation.
- Vafaie, E., M.E. Merchant, K.M. Heinz, K. Gilder, M. Gu, X. Cai, Y. Chen. 2017. Spread and management of *Acanthacoccus* (=*Eriococcus*) *lagerstroemiae* Kuwana (Hemiptera: Eriococcidae) on crapemyrtle (*Lagerstroemia* spp.) in the USA. *Entomological Society of America Annual Meeting* poster presentation.
- Wang, Z., Y. Chen, M. Gu, E. Vafaie, M. Merchant, R. Diaz. 2016. Crapemyrtle bark scale: a new threat for crapemyrtles, a popular landscape plant in the U.S. *Insects*, 7(78).
- Wang, Z., Y. Chen, R. Diaz. 2019. Temperature-dependent development and host range of crapemyrtle bark scale, *Acanthococcus lagerstroemiae* (Kuwana) (Hemiptera: Ericococcidae). *Florida Entomologist*, 102(1): 181–186.
- Wang, Z., Y. Chen, R. Diaz. Thermal tolerance and prediction of northern distribution of the crapemyrtle bark scale (Hemiptera: Eriococcidae). *Environmental Entomology*, 48(3): 641–648.

Further Reading

- Louisiana State University Ag Center. (https://www.lsuagcenter.com/profiles/lbenedict/articles/page1491329582045)
- Texas A&M AgriLife Entomology Extension: about CMBS (https://agrilife.org/extensionento/insects/crapemyrtle-bark-scale/ & https://agrilifecdn.tamu.edu/citybugstest/files/2010/05/EHT-049-Crape-myrtle-bark-scale.pdf); management of CMBS (https://ipm.tamu.edu/2017/03/crape-myrtle-bark-scale-study-reveals-tree-treatments-to-fight-pest/)

Federally funded surveys—CAPS & Plant Protection Act

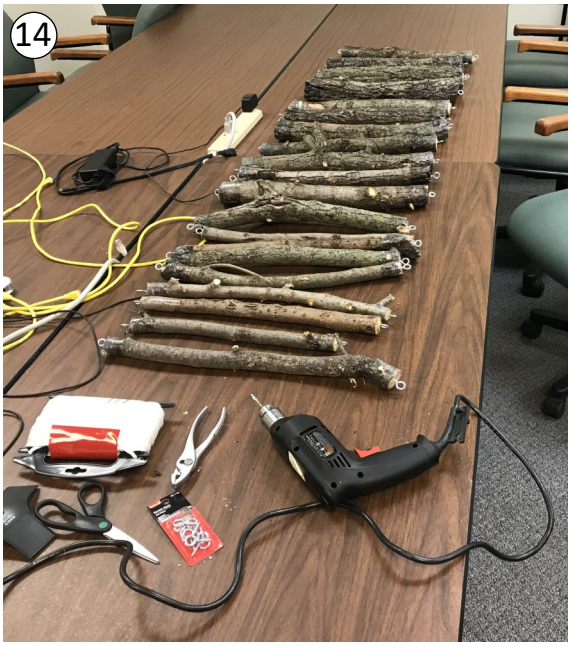
Figures 12–13. (12) Pheromone baited bucket trap. (13) Yellow sticky card trap

CAPS (Cooperative Agricultural Pest Survey)—small grains pest survey

The Cooperative Agricultural Pest Survey (CAPS) is a program that coordinates and funds states to survey for exotic pests with the aim to detect introductions and establishments early for rapid response. This year, we will continue surveying for exotic insects that are known to be serious pests of small grains outside of the U.S. Four pests are being targeted: (1) sunn pest (Hemiptera: Scutelleridae: *Eurygaster integriceps*); (2) small brown planthopper (Hemiptera: Delphacidae: *Laodelphax striatellus*); (3) Old World bollworm (Lepidoptera: Noctuidae: *Helicoverpa armigera*); (4) Egyptian cottonworm (Lepidoptera: Noctuidae: *Spodoptera littoralis*).

30 counties throughout central KS are being surveyed: 110 fields of wheat and 28 fields of sorghum. At each field, Brian Brunkow, our long-time seasonal staff member will set up two pheromone baited bucket traps targeting each moth species (Fig. 12), set up a yellow sticky card trap for the planthopper (Fig. 13), and sweep the field with a net for the sunn pest.

Wheat and sorghum are extremely important agricultural commodities in Kansas. The state is the 3rd largest producer of wheat in the U.S. at 7,600,000 acres and $1,334,400,400 worth of product annually. Similarly, KS is the 4th largest producer of sorghum at 2,600,000 acres and $624,397,000 produced annually. Due to the importance of these grains to Kansas' agriculture and economy, it is paramount we protect growers by preventing the establishment of additional crop pests, which can lead to yield loss and increase in spending on pest control. Not only do these insect species feed on wheat and sorghum, but the small brown planthopper (SBP) is a known vector for a multitude of diseases, adding to the negative effects the establishment of new exotic pests can have on KS agriculture (SBP is a known vector of: barley yellow striate mosaic virus, maize rough dwarf virus, northern cereal mosaic virus, wheat rosette stunt virus, rice stripe virus, rice black-streaked dwarf virus, wheat chloratic streak virus).



Figures 14–15. (14) Walnut bolt assembly. (15) Pheromone baited Lindgren funnel trap and walnut bolt set up on a walnut tree at Council Grove Lake in Morris county.

Plant Protection Act survey—walnut twig beetle

The Plant Protection Act 7721 (formerly called the Farm Bill) financially supports surveys, research and management of pests and other topics related to the agricultural interested of the United States. This year we are continuing our survey for the walnut twig beetle (*Pityophthorus juglandis*). Walnut twig beetle (WTB) is native to southwestern North America and northern Mexico but has been introduced to other states due to human activity. Like other bark beetles (Scolytinae), WTB bores into wood and feed underneath the bark of various walnuts. WTB is a vector of *Geosmithia morbida*, a fungal agent responsible for thousand canker disease, which has been responsible for walnut mortality in California, Colorado, Idaho, Oregon, Utah, and Washington. *Geosmithia* spp. fungi are commonly associated with various species of bark beetles. Bark beetles often purposely carry fungi to inoculate wood that they bore into for reproduction, feeding on the fungi. It has been demonstrated that *G. morbida* is a common fungal species in the environment in Missouri and does not cause TCD unless WTB physically inoculates walnut.

Walnut is an important commodity in KS where many people grow and harvest it for its wood, much of which is exported to China. The introduction and establishment of WTB in KS is of concern because TCD leads to walnut mortality and reduced quality and value of walnut wood in infected trees.

This year, we hired a freshman masters student from Wichita State University, Morgan Trible, to trap for WTB. 44 pheromone baited Lindgren funnel traps and 21 walnut bolts (Figs. 14–15)were set up in 15 counties throughout central Kansas (Fig. 15). Traps were serviced every two weeks. Walnut bolts were collected at the end of the survey and are being kept in mesh bags to rear out WTB, if present. If WTB is identified from the walnut bolts, the wood and beetles will be tested for the presence of *G. morbida*.

Our mission:

- Exclude or control harmful insects, plant diseases and weeds.
- Ensure Kansas plants and plant products entering commerce are free from quarantined pests.
- Provide customers with inspection and certification services.

Author:

K. Taro Eldredge
State Entomologist
1320 Research Park Dr.
Manhattan, KS66502
taro.eldredge@ks.gov
(785) 564-6796

Visit us at: agriculture.ks.gov

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