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Maples Choose
Their Battles Against Common Insect and Mite Pests

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of the Kentucky Green Industry:
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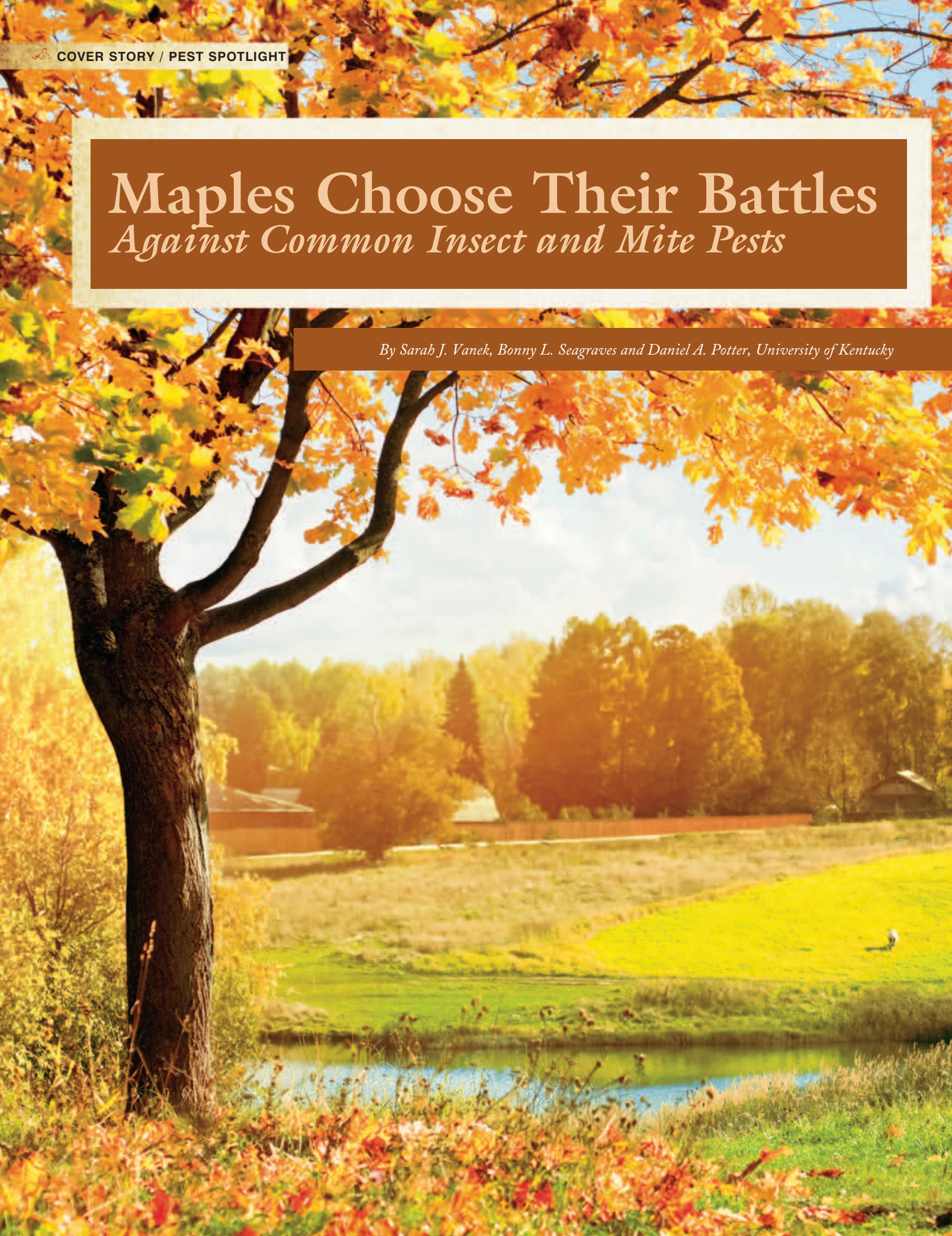
Maples Choose Their Battles
Against Common Insect and Mite Pests

By Sarah J. Vanek, Bonny L. Seagraves and Daniel A. Potter, University of Kentucky



Young maple trees are particularly vulnerable to insect and mite pests, but landscape and nursery managers can use built-in plant defenses to their advantage.

Maples are highly popular trees that represent a significant portion of the market for deciduous shade trees in Kentucky. At any given time, large wholesale tree farms in Kentucky can have thousands of maples in production. In 2009, maples collectively accounted for an estimated 41% of wholesale sales for deciduous shade trees in Kentucky; the most valuable species, red maple, alone accounted for approximately 26% of sales.

Maples are popular trees because of their aesthetic qualities, which include attractive fall colors and uniform shape. They also tend to be relatively pest-free trees once established in the landscape. Young maple trees, however, are particularly vulnerable to certain pest attacks, leading to disfigurement, stunted growth or even death. Tree loss and distorted tree growth cost nursery and landscape managers time and money.

Plants have adopted various methods for defending themselves against insect and other pest attacks. These defenses include chemical and physical defenses, and they vary between plant species and cultivars. Information about host-plant resistance can benefit landscape and tree farm managers in several ways. Plants can be selected, in part, by a cultivar's resistance to a pest of particular concern, perhaps one that has regularly caused economic loss in past years. By selecting a cultivar that exhibits a high level of resistance to one or more key pests, costs associated with pest management or tree removal and replacement can be reduced.

Another benefit that comes from understanding cultivar resistance is increased efficiency in pest-management activities. Landscape and nursery managers can focus scouting and control measures on cultivars that are more prone to certain pest attacks. This saves both time and money.

Maples, like other host groups, vary in their abilities to defend themselves against herbivores. A study conducted at the University of Kentucky (by Seagraves et al.) evaluated 17 maple species, hybrids and cultivars for resistance to 6 important arthropod pests. These pests and the results of the study are discussed on the following pages.

Adult calico scales in the landscape. Photo by Sarah Vanek.

Maple shoot borer caterpillar burrowing inside a shoot. Photo by Bonny Seagraves.

Flagging caused by maple shoot borer. Photo by Bonny Seagraves.

Trunk girdling caused by flatheaded appletree borer. Photo by Daniel A. Potter.

The six pests

Calico scale *(Eulecanium cerasorum)*

A single calico scale female can produce several thousand eggs, allowing a small population to reach damaging levels relatively quickly. This pest also has a very broad host range, making it a top priority in pest-management efforts. Adult females are found on the branches and trunks of trees (Photo 1), whereas the immature scales feed on the leaves until shortly before natural leaf-drop occurs in the fall. Feeding removes plant nutrients and causes cell death, leading to twig dieback, stress and foliar chlorosis. Soft scales also produce large amounts of honeydew that promotes the growth of unsightly sooty molds. Sooty mold blackens leaves, branches and trunks and inhibits photosynthesis, which further reduces plant quality.

Maple shoot borer *(Proteoteras aesculana)*

This moth lays its eggs on or near maple buds in the spring. Upon hatching, the tiny caterpillars tunnel into young growing shoots (Photo 2) and cause tip dieback and flagging (Photo 3). Destruction of the terminal leader causes undesirable forking and requires establishment of a new central leader. This increases labor costs and leaves an unattractive crook in the tree, even when re-establishment of a central leader is performed successfully. Chemical control of this pest can be very effective, but it must be done preventively and with proper timing.

Flatheaded appletree borer *(Chrysobothris femorata)*

This beetle is a severe pest in the nursery and landscape; a single borer can girdle and kill a young tree (Photo 4). The flatheaded appletree borer attacks trees that have become stressed by mechanical injury, drought, soil compaction, sunscald or defoliation. Stresses associated with transplanting make trees especially vulnerable during the first two years after transplanting in the nursery or landscape.

Potato leafhopper *(Empoasca fabae)*

The potato leafhopper (Photo 5) does not overwinter in Kentucky but instead migrates from the southern United States each spring. Adults and nymphs have piercing-sucking mouthparts that allow them to pierce young, expanding leaves and remove plant sap. They also inject salivary phytotoxins while feeding. Damage includes stunted shoot growth and stunted, downward-curled leaves with brown margins (Photo 6). This type of leaf damage is often referred to as "hopperburn."

Japanese beetle *(Popillia japonica)*

Adult Japanese beetles are leaf skeletonizers, meaning they consume foliar tissues between leaf veins while leaving the veins behind. This type of feeding gives the leaves a lace-like appearance until they wither and die soon afterward. Damage can be extensive on individual trees because Japanese beetles release an aggregation pheromone that attracts other individuals. This pheromone allows the beetles to sometimes gather in masses on an individual plant (Photo 7, page 15).

Maple spider mite *(Oligonychus aceris)*

Maple spider mite has multiple, overlapping generations each year, with populations reaching their peak in late summer. Mites can easily go unnoticed until populations reach damaging levels. Maple spider mite feeding causes unattractive stippling and bronzing on foliage (Photo 8, page 15).

Potato leafhopper on the underside of a leaf.
Photo by Frank Peairs, Colorado State Univ., Bugwood.org.

Curled leaves caused by potato leafhopper.
Photo by Eric R. Day, Virginia Tech, Bugwood.org.

Table 1. Relative resistance ratings (0-6, where 0 = little or no damages, and 6 = severe damage) for 17 maple species, hybrids and cultivars to multiple pest species.

Acer species	Cultivar name	Relative resistance ratings						Average (all pests)
		SB	LH	JB	FB	SM	CS	
A. rubrum (red maple)	Autumn Flame	2	6	0	0	2	2	2.0
	Brandywine	5	5	0	2	1	2	2.5
	Burgundy Belle	2	5	0	6	2	3	3.0
	Northwood	3	3	0	4	3	5	3.0
	October Glory	5	6	0	4	2	1	3.0
	Red Sunset	5	6	0	4	2	0	2.8
	Somerset	4	6	0	3	2	1	2.7
	Sun Valley	4	6	0	3	2	1	2.7
A. saccharum (sugar maple)	Commemoration	3	1	3	3	0	4	2.3
	Crescendo	3	1	6	3	1	3	2.8
	Green Mountain	2	3	3	4	1	5	3.0
	Legacy	3	0	2	0	1	6	2.0
Acer × freemanii (Freeman maple)	Autumn Blaze	5	1	0	0	6	4	2.7
	Autumn Fantasy	6	1	0	2	4	4	2.8
	Sienna Glen	4	4	0	1	3	2	2.3
A. truncatum × platanoides	Pacific Sunset	0*	0	2	3	1	4	1.7
Acer campestre (hedge maple)	None	1	1	2	1	1	6	1.8

Pest abbreviations:
SB: maple shoot borer, *P. aesculana*
LH: potato leafhopper, *E. fabae*
JB: Japanese beetle, *P. japonica*
FB: flatheaded appletree borer, *C. femorata*
SM: maple spider mite, *O. aceri*
CS: calico scale, *E. cerasorum*

Table adapted from Seagraves et al. 2012

* Low incidence was attributed to damage caused by early leaf flush and freeze.

Maple comparisons — University of Kentucky research

Seventeen maples, representing various species and cultivars, were established in replicated plots in western (Princeton) and central (Lexington) Kentucky. The trees were planted as nursery liners and maintained by standard nursery practices. They were evaluated for pest densities and damage several times per growing season for two to three years.

Of the 17 maple species, hybrids and cultivars evaluated in the study, nearly all were relatively free of some pests while also highly susceptible to other pests. The relative resistance ratings are shown in Table 1.

Levels of resistance varied both among the hosts and pests evaluated. For example, 'Autumn Flame', a red maple cultivar, appeared to be resistant to flatheaded appletree borer, while 'Burgundy Belle' of the same species was highly susceptible. Calico scale populations were evaluated following an artificial inoculation of all trees. Scale densities declined to very low levels in several red maple cultivars, whereas densities in 'Northwood' red maples remained high. Damage caused by Japanese beetle was greatest among sugar maples, particularly 'Crescendo', while red and Freeman maples had little to no damage.

Maples exhibiting the greatest overall resistance to pests were 'Pacific Sunset' and hedge maple. However, both were

Japanese beetles feeding in a group.
Photo by Daniel A. Potter.

Stippling caused by maple spider mite.
Photo by Daniel A. Potter.

BBN021

BKW022

References

Seagraves, B.L, C.T. Redmond, and D.A. Potter. 2012. Relative resistance or susceptibility of maple (Acer) species, hybrids and cultivars to six arthropod pests of production nurseries. Pest Management Science.

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still moderately to highly susceptible to calico scale. Of the red maples, 'Autumn Flame' had the best overall rating but was still highly susceptible to potato leafhopper. Of the sugar maples, 'Legacy' and 'Commemoration' had the best overall ratings. However, 'Legacy' was still highly susceptible to calico scale and moderately susceptible to maple shoot borer, while 'Commemoration' was moderately susceptible to several pests.

Final thoughts

Landscape and tree farm managers can use the information presented here to select maples that are more resistant to pests of greatest concern. For example, 'Autumn Flame' red maple, 'Legacy' sugar maple and 'Autumn Blaze' Freeman maple are much less likely to be attacked by flatheaded appletree borer than many of the other maples evaluated in the study.

The results of this study can also be used to focus scouting and treatment activities on maples that are highly susceptible to damaging pests. For instance, results indicate that scouting and control of potato leafhopper in the spring should focus on red maples; Japanese beetle management in the summer should focus on sugar maples; and scouting for spider mite buildup in the late summer should focus on Freeman maples.