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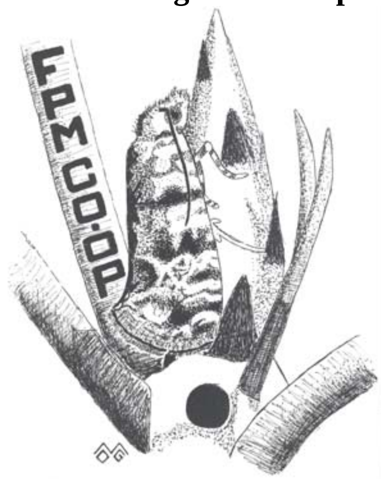
Vol. 15 No. 3 Sept. 2010

Quarterly Newsletter on Forest Pest Management Issues

Forest Pest Management Cooperative



Nantucket Pine Tip Moth, *Rhyacionia frustrana* (Comstock)

Texas Forest Service, Forest Pest Management,
P.O. Box 310, Lufkin, Texas 75902-0310

PEST is a quarterly newsletter that provides up-to-date information on existing forest pest problems, exotic pests, new pest management technology, and current pesticide registrations in pine seed orchards and plantations. The newsletter focuses on, but is not limited to, issues occurring in the Western Gulf Region (including, Arkansas, Louisiana, Mississippi, Oklahoma, and Texas).

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Announcement:

Entomology Seminar - All FPMC executive and contact representatives, industry, and TFS foresters are invited to attend the fall session of the East Texas Forest Entomology Seminar scheduled for October 14-15, 2010. The meeting will held from 1:00 PM – 8:30 PM on Thursday at Liberty Hall, 805 East main in Nacogdoches, and continue from 8:00 AM until noon on Friday at the Arthur Temple College of Forestry and Agriculture (Room 117) at SFASU also in Nacogdoches. Registration is $30, which includes an evening meal. For additional information and/or an agenda, contact Ron Billings at 979/458-6650 or rbillings@tfs.tamu.edu.

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Summary of 2009 FPMC Research Projects

In 2009, three research project areas – tip moth, leaf-cutting ant, and systemic injection - were continued from 2008. Results from leaf-cutting ant, fire ant and weevil studies were presented in the March 2010 *PEST* newsletter and results from systemic injection studies were presented in the most recent *PEST* newsletter (June 2010). Results from tip moth impact, hazard-rating and control studies are presented below.

The FPMC established a multi-faceted research project directed at pine tip moth in 2001 to: 1) evaluate the impact of pine tip moth on tree height and diameter growth, 2) identify site and factors that influence the occurrence and severity of tip moth damage, and 3) evaluate the potential use of systemic insecticides to protect pine seedlings for one or more years after planting. All facets of this project were continued and expanded upon in 2009.

Pine Tip Moth Impact

From 2001 to 2009, 106 study plots were established in Texas, Louisiana, Arkansas and Mississippi. Treatments were continued on 15 second-year sites established in 2008. Three additional (first-year) study plots were established in 2009. In each plantation, one area was selected and divided into two plots each; each plot contained 126 trees (9 rows X 14 trees). Treatments were randomly assigned to a plot in each area. The treatments included: 1) Mimic® 2F applied once per generation at 0.08 oz / gal. on 2nd year plots established in 2008 or PTM™ dilution applied just after planting (60 ml per seedling) on 1st year plots established in 2009, and 2) Check (untreated).

For the 15 plots established in 2008, Mimic® was applied by backpack sprayer to all trees within the plot (treatment area). Application dates were based on the optimal spray periods predicted by Fettig et al, 2003.

Continued on Page 2

Table 39: Mean percent of pine shoots (in top whorl) infested by Nantucket pine tip moth on one- and two-year old loblolly pine trees following treatment with Mimic® after each generation in Year 1 and 2, or PTM™ in Year 1 (2009); Arkansas, Lousiana, Mississippi and Texas sites, 2001 - 2009.

	Planted 2001 (N =16)		Planted 2002 (N=7) (N=4)		Planted 2003 (N=10) (N=9)		Planted 2004 (N= 8) (N= 5)		Planted 2005 (N= 6)	
Treatment	Yr 1	Yr 2	Yr 1	Yr 2	Yr 1	Yr 2	Yr 1	Yr 2	Yr 1	Yr 2
Mimic®	1.8	3.8	1.5	3.8	1.2	1.2	1.4	1.8	3.0	7.2
Check	23.0	21.9	7.5	15.5	12.2	12.0	10.3	15.6	13.2	15.7
% Reduction	92	83	80	75	90	90	87	88	78	54

	Planted 2006 (N=29) (N=22)		Planted 2007 (N= 13)		Planted 2008 (N=15)		Planted 2009 (N= 3)		Mean Year 1	Mean Year 2
Treatment	Yr 1	Yr 2	Yr 1	Yr 2	Yr 1	Yr 2	Yr 1	Yr 2	(N=106)	(N=91)
Mimic®	5.0	13.2	15.5	17.1	4.4	7.7	0.6		3.8	7.0
Check	14.0	26.0	24.0	47.9	24.0	25.0	20.6		16.6	22.4
% Reduction	65	49	35	64	82	69	97		**77**	**69**

For the 3 plots established in 2009, PTM™ was applied by PTM™ Injection Probe (Enviroquip Inc.) to all trees within the plot (treatment area). Plots established from 2001 - 2007 were not protected in 2009. Just prior to each spray date, the tip moth damage level was determined in each plot by surveying the internal 50 trees. Each tree was ranked on the extent of tip moth damage. Trees also were surveyed a final time in December 2009. At this time, data also were collected on tree height and diameter.

Tip moth infestation levels decreased in 2009. They were somewhat lower overall (21% of shoots) on first-year check trees in 2009 compared to first-year check trees in 2008 (24%) (Table 1). Tip moth damage was considerably lower (25% of shoots) on two-year old check plots in 2009 compared to 2nd-year sites in 2008 (48%). The Mimic® treatments provided moderate protection against tip moth on most second-year sites in 2009. Thus, spray applications reduced overall infestation levels by only 69%. The use of PTM™ provided better protection, reducing damage on first-year sites by 97%.

The good protection provide by Mimic sprays has resulted in significantly greater tree growth compared to the neighboring untreated trees on the majority of sites (25 of 30) planted from 2001 to 2004 and monitored for at least five years (Table 2). The mean difference in height growth between protected and unprotected trees continues to expand even when protection was discontinued at the end of the second year. Overall, the exclusion of tip moth damage on treated trees for the first two years improved tree height, diameter and volume index by 5%, 6% and 16%, respectively, compared to untreated trees.

To determine if there is a threshold of tip moth damage that significantly impacts tree growth, 76 three-year-old sites were divide into three groups based on level of mean shoots infested over the first two years (i.e., $\leq$ 10%, 11 – 20%, and > 20%). By the end of year 3, the Mimic® treatment had significantly improved height growth at all tip moth pressures; by 5% at low ($\leq$ 10%) levels, by 10% at moderate (11 – 20% shoots infested) levels, and by 16% at high (>20%) levels (Figure 1).

Pine Tip Moth Hazard Rating

FPMC members have selected from 1 to 12 first-year plantations (many were the same as those used in the impact study). A plot area within each plantation was selected; each plot contained 50 trees (5 rows X 10 trees). One hundred and thirty-eight (138) Western Gulf sites have been used to collect site characteristic data that included:

Continued on Page 3

P**ine Tip Moth** (continued from Page 2)

Table 2: Mean tree height, diameter and volume index and percent growth gain and actual difference in growth of one-, two-, three- and five-year old loblolly pine following treatment with Mimic® after each generation in Years 1 and 2; Arkansas, Lousiana, Mississippi and Texas.

Treatment	Year 1	Year 2	Year 3	Year 5	
		Height (cm)		(cm)	(ft)
Mimic® spayed (protected)	56.2	155	272	553	18.1
Check (unprotected)	51.6	141	246	526	17.3
Actual Diff. In Growth (cm)	5	14	26	27	0.9
Pct. Gain Compared to Check	**9**	**10**	**11**	**5**	**5**
		Diameter (cm)			
	at 6"	at 6"	at DBH	DBH (cm)	DBH (in)
Mimic® spayed (protected)	1.16	3.18	3.42	8.53	3.36
Check (unprotected)	1.07	2.93	2.91	8.08	3.18
Actual Diff. In Growth (cm)	0.09	0.25	0.51	0.45	0.18
Pct. Gain Compared to Check	**8**	**9**	**18**	**6**	**6**
		Volume Index (cm^3)		(cm^3)	(ft^3)
Mimic® spayed (protected)	130	2412	5557	46674	1.85
Check (unprotected)	101	1951	4966	40066	1.59
Actual Diff. In Growth (cm)	29	461	591	6608	0.26
Pct. Gain Compared to Check	**29**	**24**	**12**	**16**	**16**

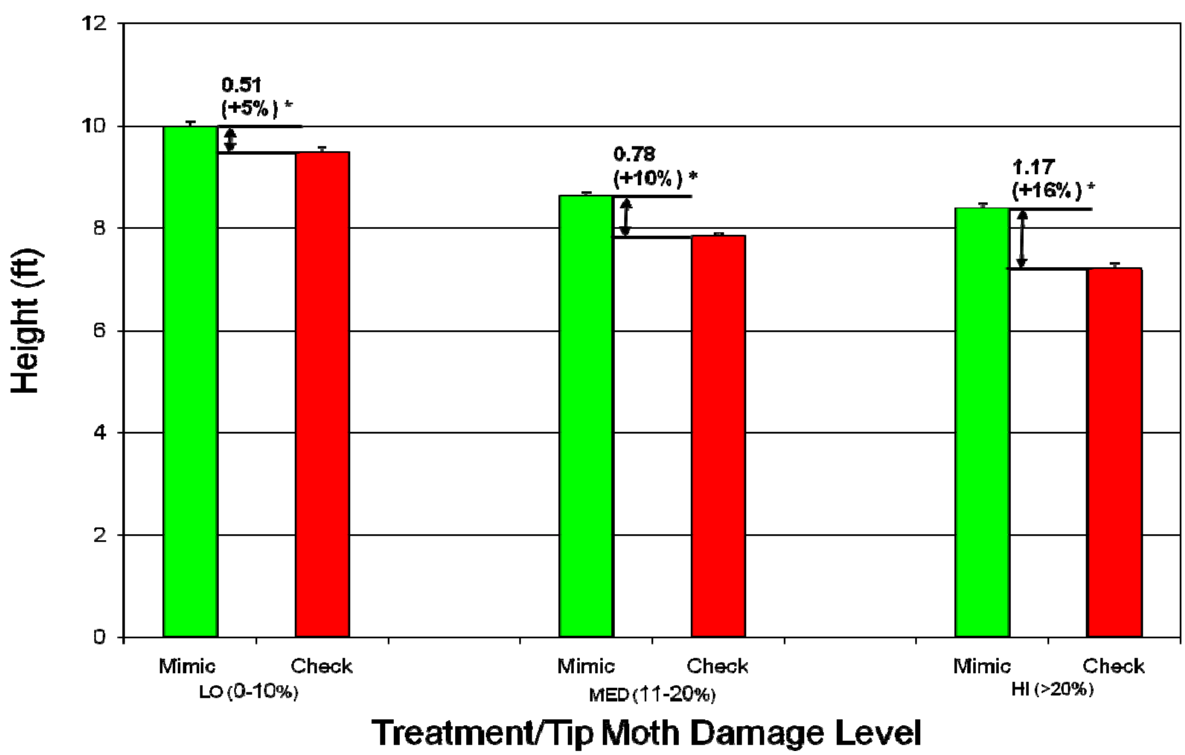

Figure 1. Differences in 3rd-year height. (ft) of protected and unprotected loblolly pine exposed to different tip moth pressures.

Continued on Page 4

Pine Tip Moth (continued from Page 3)

Tree - Age (1-2), percent tip moth infestation of terminal and top whorl shoots after of 4 - 5 generations, and height and diameter at 6 inches at end of 2nd year.

Site - Previous stand history, site index (at 25 yrs), silvicultural prescription (for 2-year monitoring period), topography (slope, aspect, and position), competing vegetation: (proportion of bare ground, grasses, forbes, and woody stems after 2nd and last generation each year), rainfall (on site or from nearest weather station), and acreage of susceptible loblolly stands (< 20 ft tall) within 1/2 mile of study stand boundary.

Soil - Texture and drainage, percent organic matter, soil description/profile (depth of 'A' and to 'B' horizons; color and texture of 'B' horizon), depth to hard-pan or plow-pan, depth to gleying, and soil sample (standard analysis plus minor elements and pH).

Tip moth infestation levels were determined in each plot by surveying the internal 50 trees during the pupal stage of each tip moth generation in the same manner as in the impact study. Data on tree height and diameter at 6 inches were collected in November or December on 2nd-year sites.

Most data have been collected from each of the 138 plots established from 2001 through 2009. Mr. Trevor Walker, graduate student at Stephen F. Austin State University, is using the data set in a thesis project to develop a hazard-rating model to predict the extent to which plantations are at risk to tip moth damage. Preliminary regression analysis indicates the following to be important predictors of proportion of infested tips (many of which are confirmed by prior studies):

1) Age – second-year sites have higher tip moth populations than first-year sites.
2) Generation - there are higher levels seen in later generations.
3) Treatment - spraying reduces tip moth populations.
4) Site Preparation Release and Additional Herbaceous Control - sites with lower levels of competing vegetation tend to show higher tip moth levels.
5) Fertilized sites have significantly lower tip moth top whorl proportion infested (about 8% on average in ages 1 and 2). Fertilization appears to increase the average number of total shoots while decreasing the average number of infested shoots.

Other variables (depth to gleying, boron, sulfur, pH, percent base saturation of magnesium, calcium, and hydrogen) are regarded as important in the regression model, but have no clear direct effect on proportion of tips infested individually. This suggests that there is an interaction effect between two or more variables in their contribution to the relationship with proportion infested.

Mr. Walker hopes to complete model development by January 2011. The model then needs to be validated within the Western Gulf Region and perhaps across the South. Additional plots have/will be established in 2010 and 2011.

Pine Tip Moth Control

SilvaShield™ Forestry Tablets (imidacloprid plus fertilizer, Bayer) and PTM™ (fipronil, BASF) were registered with EPA in 2006 and 2007, respectively, based largely on efficacy trials conducted by FPMC. Both products have been shown to provide extended (18 – 36 months) protection of pine seedlings against pine tip moth. Several trials have been established since 2006 to determine optimal application techniques, rates and timing.

Trials were established in 2007 and 2008 to assess operational applications of PTM™ by hand or machine planter, respectively. Hand application after planting is marginally effective, whereas applications of fipronil while machine planting continue to significantly reduce tip moth damage and improve tree growth during the second growing season in both 2008 and 2009. An additional trial was established in 2008 to assess the efficacy of fipronil applied at different depths to one-year old pine. Shallow (4") fipronil applications provided slightly better protection compared to deeper (8") applications. In addition, treatments applied in plant holes consistently provide better protection against tip moth than treatments applied post-plant. A trial was also established in 2007 on two sites to test the efficacy of fipronil applied to containerized seedlings prior to planting. The effects were excellent the first year, very good through 2008 and moderate (but still significant) the third year (2009) (Figure 2). Volume growth improvements due to fipronil treatments ranged from 21 – 63% (Figure 3). Due to concerns related to chemical leaching and worker exposure, BASF has postponed a request to modify the PTM™ label to include use on containerized seedlings. FPMC is currently working to address these concerns.

For SilvaShield™, trials were established on five sites in 2007 to further evaluate application techniques. Tablets applied in plant holes continued to work well through 2009 to reduce tip moth damage (Figure 4).

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Pine Tip Moth (continued from Page 4)

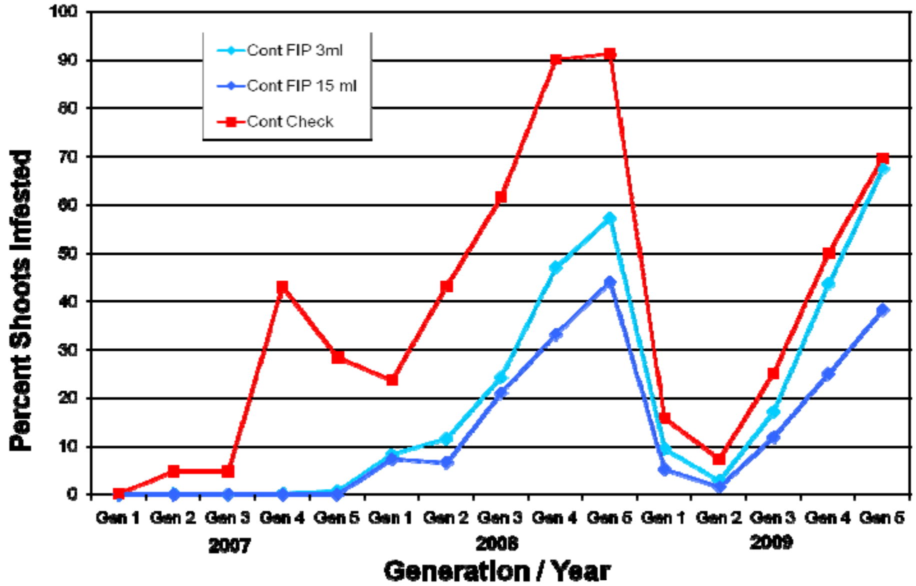

Figure 2. Tip Moth Damage by generation in 2007, 2008 and 2009 (Angelina and Polk Co. sites combined)

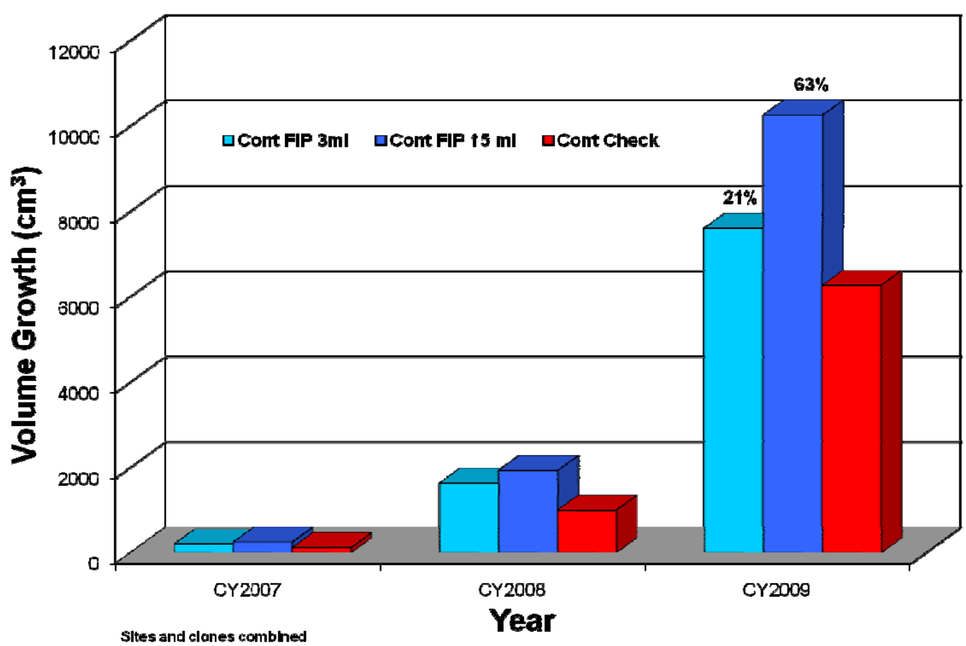

Figure 3. Mean volume index (cm^3) by treatment and year for loblolly pine.

Volume growth improvements due to SilvaShield™ "adjacent" and "planthole" treatments averaged 52% and 78%, respectively (Figure 5). Tablets applied next to seedlings after planting were less effective. New trials were established in 2008 to refine application techniques, evaluate different rates, and develop operational procedures. One, two and three tablets were equally effective when applied shallow (4") or deep (8") at planting. Post-plant treatments were more effective against tip moth at higher rates, but inconsistent in their effect on pine growth. Operational treatments were more effective against tip moth when applied just after planting compared to application at the beginning of the second growing season. However, both applications significantly improved growth parameters.

Continued on Page 6

Pine Tip Moth (continued from Page 5)

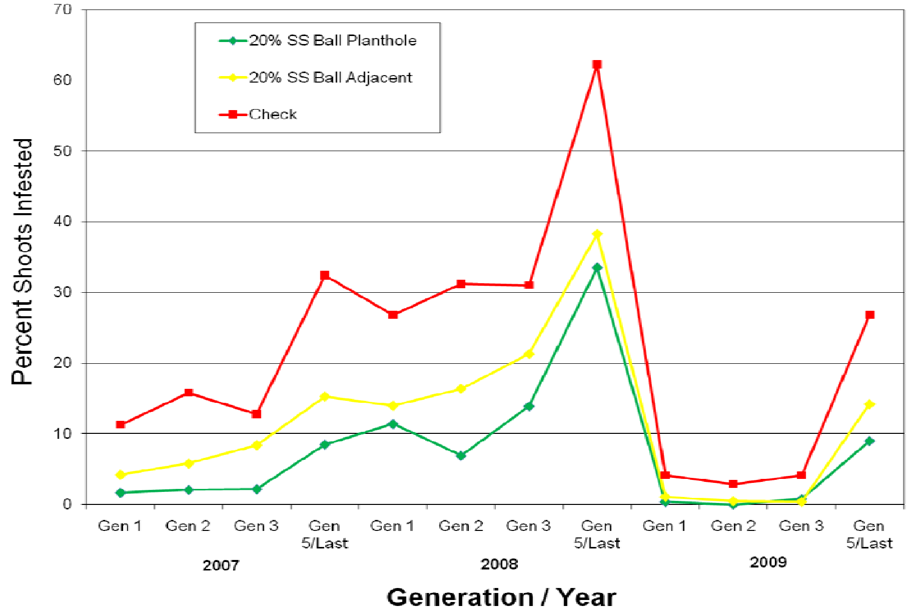

Figure 4. Tip moth damage by generation averaged over five sites in Texas and Arkansas, 2007 – 2009.

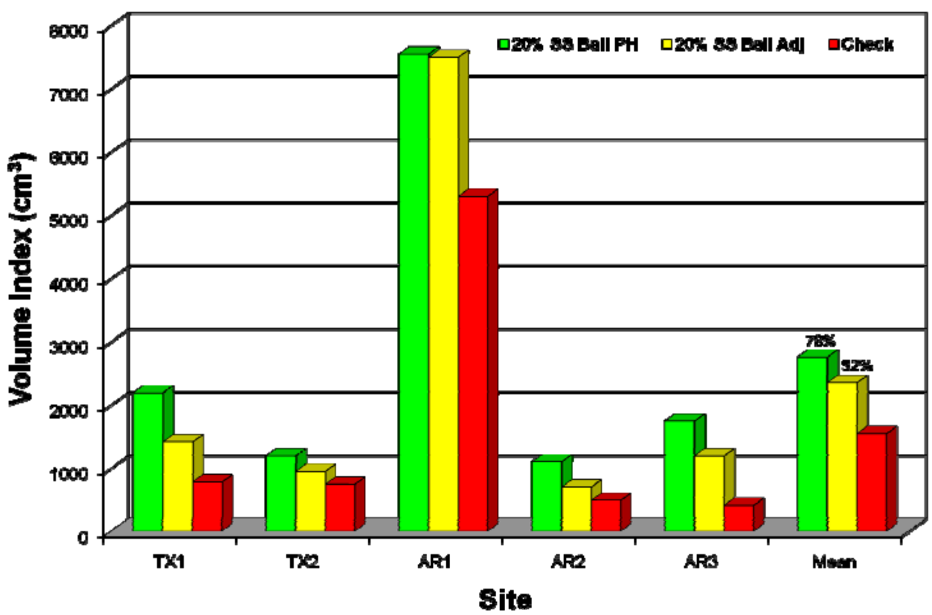

Figure 5. Mean volume index (cm^3) of three year old loblolly pine by treatment and site, 2009.

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Black Turpentine Beetles Can Kill Young Pine Trees.

Recently a forester in East Texas noticed several scattered dead and dying loblolly pine trees dying along the edge of a 6-year old plantation. A closer look revealed numerous black turpentine beetle (BTB) attacks on 30+ dead, fading and green trees in the area. Presumably, the severe drought in the area stressed the trees to the extent that BTB could successfully attack and kill them.

Thought You Might Be Interested to Know . . .

Emerald Ash Borer Reported in East Tennessee

North Carolina Pest News, July 30, 2010

In late July, the Tennessee Department of Agriculture announced that emerald ash borer had been found in Knox and Loudon counties. These counties are very close to Swain and Graham counties in North Carolina. The Tennessee Department of Agriculture and the USDA's Animal Plant Health Inspection Service are expected to issue quarantine measures on the movement of firewood, ash nursery stock and ash timber.

Emerald ash borers can kill an ash tree within three years of the initial infestation. Adults are dark green, one-half inch in length and one-eighth inch wide (left, image by D. Cappaert), and fly from April until September, depending on the climate of the area (probably more like May to August in North Carolina). Larvae spend the rest of the year beneath the bark of ash trees. When the beetles emerge as adults, they leave D-shaped holes in the bark about one-eighth inch wide.

Additional information can be found at: http://www.na.fs.fed.us/spfo/pubs/pest_al/eab/eab.pdf. http://www.anr.msu.edu/robertsd/ash/ashtree_id.html.

Walnut Twig Beetle and Thousand Cankers Disease Now in Tennessee

North Carolina Pest News, August 6, 2010

The Tennessee Division of Forestry recently announced that thousand cankers disease has also been found around Knoxville, Tennessee. The extent of the infestation suggests that this disease (*i.e.*, the walnut twig beetle and its associated fungus, *Geosmithia morbida*) has been there for at least ten years and is relatively slow to develop which makes detection harder. Symptoms may not develop for years after infection. First signs are yellowing and flagging in upper parts of tree followed by a progressive dieback of larger limbs (left, image by Whitney Cranshaw). This usually starts to show up during the summer. This disease can be a problem wherever black walnut (*Juglans nigra*) is found. The disease, spread by the walnut twig beetle *Pityophthorus juglandis (above left , image by Jim LaBonte)*, can be fatal. Cankers form in cambium at beetle sites and then coalesce (above, Image by Ned Tisserat).

Additional information can be found at: http://www.ext.colostate.edu/pubs/insect/0812_alert.pdf. http://www.colostate.edu/Depts/bspm/extension%20and%20outreach/thousand%20cankers.html

More Plant Health Care Concerns & Curiosities

By Steven K. Rettke, Ornamental IPM Program Associate, in Rutgers Cooperative Extension, Plant and Pest Advisory, Landscape, Nursery & Turf Edition, June 3, 2010

This article is a continuation of "Plant Health Care Concerns & Curiosities" included in the previous *PEST* newsletter.

✔ **GRINDING STUMPS:** Typically when a tree is removed from a property, the owner requests for tree replacement recommendations. However, it is important to remember to grind-up the old tree stump before any new trees are placed in close proximity to it. There are several root rotting fungi that are capable of becoming pathogens to living trees that are nearby. Some of these potential pathogens include *Xylaria* root rot (Dead Mans Fingers), *Ganoderma lucidum* (Ganoderma root & butt rot) and *Armillaria mellea* (Armillaria root rot). With a sizable food source such as a dead stump, these dead wood decay fungi can eventually become primary pathogens and infect live plants. By grinding the stumps the food source is removed and these fungi become less of a threat.

✔ **ALL MULCHES ARE NOT CREATED EQUAL:** Although the mulching of trees and shrubs is an important plant health care practice, their effects can sometimes produce unexpected consequences. Different mulching materials should influence supplemental fertilizer practices. Nitrogen fertilizers can be applied to help reduce nitrogen immobilization where wood pallet or hardwood bark is found. Alternatively, where plants are growing in composted mulches, nitrogen application rates need to be adjusted to avoid over-stimulation. Over fertilization, especially with high nitrogen, may decrease mycorrhizae.

It is most important to use these products when trees are first planted. If raw or fresh mulches are used, they are best applied in the late fall or winter in order to reduce their initial negative effects on plant growth and health. As soon as the organic matter is partially decomposed and the competition for nutrients begins among soil microorganisms, then the beneficial effects can begin.

Compostted leaf and twig litter are best because they will support the growth of mycorrhizae. In natural forests where there is decaying leaf litter, the non-woody roots, and especially mycorrhizae, will be abundant in the highly organic top layer of soil. In cities, more composted wood and leaves should be added in *correct quantities* to soil about the base of trees.

✔ **BEST MULCH TO CONTROL WEEDS?:** Several years ago, researchers at NC State tested 5 organic mulches (pine bark, hardwood bark, cedar chips, longleaf pine needles, and shortleaf pine needles) over a two-year period to determine their durability, attractiveness, and weed control. Mulches were applied and maintained at a 3.5 inch depth, with or without either black plastic or a polypropylene weed barrier blanket. All organic mulches applied alone reduced total weed counts by only 50%.
Applying black plastic under any organic mulch resulted in 100% weed control. The polypropylene blanket under the organic mulches gave excellent control of tall fescue, vetch, wild violet, and wild garlic.

However, polypropylene was ineffective in controlling yellow nutsedge and bermudagrass. Pine bark was the next most durable mulch, requiring the least replenishment (retaining 70% initial volume) after 630 days. The greatest loss was observed with shortleaf pine needles. Longleaf pine needles were considered the most attractive mulch. (Ref.: Skroch et al, J. Envir. Hort. 10(1):43- 45, Mar'92)

✔ **CARPENTER ANTS:** Carpenter ants can infest live trees, but their presence indicates that there is dead wood in that plant, and the tree is potentially a hazard. Carpenter ants nest in moist, rotted wood and excavate cavities, often leaving a hollow shell of live wood that may easily snap off during a windstorm or snow/ice load.

✔ **SQUIRREL DAMAGE:** Grey squirrels are notorious in the fall season for "attacking" red oaks and other shade trees during the weeks prior to leaf drop. They chew off twigs less than ¼ inch diameter

Continued on Page 9

Concerns & Curiosities (continued from Page 8)

and the fallen twigs litter the ground. Explanations regarding this annoying squirrel behavior have been postulated.

One possibility is that the squirrels are cutting branches to get acorns to the ground. Another reasonable likelihood is the squirrels will use twigs and leaves for nesting materials. Chewing the twigs off the oak trees before the leaves drop will provide for better nesting fodder since the leaves will continue to stay attached. These are a couple of educated guesses that some of your curious homeowner clients may find interesting.

✔ **MID-SEASON LEAF DROP:** Homeowners/ clients may become concerned when large shade trees drop their leaves during mid-season, With the ground littered with spent foliage, the conclusion often is that “their favorite shade tree is dying!” Linden, birch, and sycamore trees are often most susceptible to mid-season leaf drop. In a majority of cases, this is a normal physiological growth habit for these species. The trees commonly drop foliage in mid-season in order to reduce leaf surface area and subsequent water loss. This leaf shedding ability is especially important during typical summer droughts or other periods when water availability in soils is limited. Neither tree health nor tree growth is usually affected.

✔ **INTERPRETING SOIL COLOR:** Soil color can often indicate the presence of important plant growth properties. Observe the soil to determine these properties:
Black/dark soils = Soils high in organic matter content. They absorb more heat and tend to warm up more quickly in the spring.
Red or yellow soils = Well drained soils. They contain soil iron in the oxidized (rusted) state.
Gray or blue soils = Poorly drained soils. These contain soil iron in the reduced state.
Gray mottles in the subsoil = Soils that are also somewhat poorly drained. These tend to be saturated with water at some period of the year. (*Ref. Heckman, J. Plant Pest Advisory 2(6); 1996*).

Temperature and Drought in the Landscape

By Ann B. Gould, Specialist in Plant Pathology, in Rutgers Cooperative Extension, Plant and Pest Advisory, Landscape, Nursery & Turf Edition, July 29, 2010

Environmental conditions, such as temperature, moisture, aspect, and planting site characteristics, play a large role in plant health and the development of disease and insect problems. Recent heat and dry conditions have had adverse impact on many plantings as well, especially in newly-installed or shallow-rooted trees and shrubs.

Drought stress

Recent conditions for much of East Texas and other areas of the South have been abnormally dry (refer to the US Drought Monitor website for current conditions at http://drought.unl.edu/dm/monitor.html). Water is important to plants; living organisms consist chiefly of water, so the uptake of water is critical if plants are to grow. Water also facilitates the movement of nutrients from the roots to aerial plant parts, as well as sugars, made in the leaves during photosynthesis, to the roots. Thus, conditions that impede the flow of water in the vascular system will add to plant stress.

In the daily life of a plant, water deficit is a normal phenomenon that occurs during the daytime when loss of water from the leaves exceeds water uptake in the roots. This deficit is made up at night and during periods of rain or dew formation. Under dry soil conditions, however, roots fail to replenish the lost moisture and physiological stress develops. Native plants in a given area are adapted to variations in water supply and show symptoms of drought stress only under unusually dry conditions. Planted trees and shrubs, however, can be more susceptible to drought conditions.

Symptoms of drought stress are readily seen on the leaves, which may droop, wilt, curl, turn yellow, defoliate, or develop a burn at the tip or margin. Older leaves usually succumb first. Elsewhere on the plant, green tissues shrink, the sapwood may crack, and roots in drying soil are damaged as they become less permeable to water. Dead tree tops, shortened needles, and sparse foliage indicate a general decline in vigor that becomes evident in the years following severe drought stress.

Plants vary in ability to tolerate moisture stress. Seedlings are very susceptible to drought stress because their root systems are shallow and undeveloped. Newly- transplanted trees are similarly

Continued on Page 10

Temperature & Drought (continued from Page 9)

affected because they have lost many absorbing roots during the transplant process. In some situations, highly-porous rooting media present within the root ball dries rapidly, so that water shortage occurs even though surrounding soil may contain sufficient water. Drought can be particularly damaging to plants because it may take them years to recover from the stress. In addition, drought predisposes plants to problems with insects and diseases.

Heat stress

Recent conditions in East Texas have included sustained temperatures in the high 90s with minimal rain. Temperature optima vary with plant species; most plants do best within the 60 and 85°F range. The minimum and maximum temperatures a plant tolerates will depend on plant species and growth stage. As we know, some species tolerate colder temperatures; others prefer warmer growing conditions. Damage due to excessive ambient or soil temperatures, however, is different. High temperatures interfere with proteins in cells, disrupting cell membranes and affecting photosynthesis and the activity of enzymes. Sunscald, a type of heat stress, occurs on the sun-exposed surfaces of fleshy plant organs (fruit, vegetables, and succulent leaves). Energy from absorbed light raises the temperature of exposed plant cells; on hot, sunny days when the temperature of these tissues exceeds that of the surrounding air, affected tissues turn off-color and become water soaked, blistered, and sunken. Sunscald may also occur indoors; fleshy leaves of house plants placed near windows with a southern exposure may collapse and turn brown as the sun's rays raise the temperature in these leaves to excessive levels. High soil temperatures can kill young seedlings at the soil line and cankers may form on the crown of older plants.

Heat and drought stress combined

In nature, however, plants are most often injured when heat stress is combined with other environmental factors, including moisture stress (drought), light, and wind. Fast-moving air rapidly dehydrates plant tissues, and the moisture lost may not be replenished under drought conditions. Above-ground symptoms of combined heat and environmental stress in landscape plants include wilt (including flower buds), defoliation, marginal leaf scorch, leaf yellowing and cupping, and in extreme cases, plant death. Newly-installed plant materials and those suffering from poor placement, construction injury, and other environmental concerns are most seriously affected. Plants easily affected by heat and drought include azalea, dogwood, and Japanese maple.

Management of heat and drought

When faced with a drought situation, keep the following points in mind:

● Irrigate as needed during dry periods to replace soil moisture in the root zone. This is especially important for young, shallow-rooted, and newly transplanted trees.

● Apply mulch (no more than 3 inches) to reduce soil moisture loss and soil temperature.

● Avoid using fertilizers during drought conditions; fertilizer salts pull moisture from plant roots, causing them to further dehydrate.

● Control weeds and grasses in and around stock to reduce competition for water during dry periods.

● Consider planting native and drought-tolerant species in areas of low rainfall or on drought-prone sites.

● To increase moisture retention at planting time, add organic matter to dry, sandy, or gravelly soils.

● Certain diseases and insects commonly occur on plants stressed by drought. During the next few years, expect to see problems such as canker, *Armillaria* root rot, dogwood anthracnose, *Verticillium* wilt, pine wilt nematode, and borer develop in the landscape.

Points to keep in mind regarding temperature and landscape plantings include:

● Compared to rural areas, urban environments have greater temperature fluctuations due to shelter from winds and re-radiated heat.

● Plants in containers are not as insulated as those in the ground and may be exposed to extremes in temperature.

● Mulch trees with a fine-textured, organic mulch (no more than 3 inches) to reduce soil temperature and decrease moisture lost from evaporation.

● Consider adding partial shading (arbors and trellises) to help sensitive plants cope with heat stress.

● When sufficient water is available, many of the effects of heat are minimized. Ensure that plant roots are well-hydrated during periods of intense summer weather.

● Choose plants that are appropriate for the hardiness zone in your area.

Schmidt Sting Pain Index

North Carolina Pest News, August 13, 2010

In 1990, Justin O. Schmidt published a four-point pain scale for bee, ant and wasp stings. This wasn't the first pain scale and he seems to have borrowed a bit from Starr's 1985 pain scale (to which he contributed), but it has earned him a place in entomology culture. Perhaps it is his added helpful descriptions. It might be interesting to refresh our memories as summer winds down and populations of certain stinging insects begin to peak.

1.0 **Sweat bee:** Light, ephemeral, almost fruity. A tiny spark has singed a single hair on your arm.

1.2 **Fire ant:** Sharp, sudden, mildly alarming. Like walking across a shag carpet and reaching for the light switch.

1.8 **Bullhorn acacia ant**: A rare, piercing, elevated sort of pain. Someone has fired a staple into your cheek.

2.0 **Bald-faced hornet**: Rich, hearty, slightly crunchy. Similar to getting your hand mashed in a revolving door.

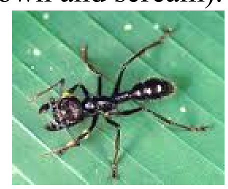
2.0 **Yellowjacket**: Hot and smoky, almost irreverent. Imagine WC Fields extinguishing a cigar on your tongue.

2.x **Honey bee and European hornet.** Like a matchhead that flips off and burns on your skin.

3.0 **Red harvester ant:** Bold and unrelenting. Somebody is using a drill to excavate your ingrown toenail.

3.0 **Paper wasp:** Caustic and burning. A distinctly bitter aftertaste. Like spilling a beaker of hydrochloric acid on a paper cut.

4.0 **Pepsis wasp (aka tarantula hawk):** Blinding, fierce, shockingly electric. A running hair drier has been dropped into your bubble bath (if you get stung by one you might as well lie down and scream).



4.0+ **Bullet ant:** Pure, intense, brilliant pain. Like walking over flaming charcoal with a 3-inch nail in your heel.

It should be noted that your scores may vary from Schmidt's. Also, just because an insect can sting, doesn't mean that it is likely to sting. Who know why anyone except an entomologist would be handling a "tarantula hawk" pepsis wasp or be stung by one. Fortunately, the bullet ant does not occur in the U.S. (except in the Cincinnati Zoo).

References:

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