Kentucky Nursery LISTSERV Bulletin

University of Kentucky Nursery Crops Team

End of August 2016

Long Range Outlook Information

Don't let the cool front moving across the region over the next few days fool you: the forecast from NOAA over the next three months is for higher than average temperatures across the entire state and lower than average precipitation for most of the state. Northern KY is predicted to have a average probability of rain during that same time.

See **UKAg Weather's Long Range Outlooks** for a variety of forecasts of temperature and precipitation probabilities.

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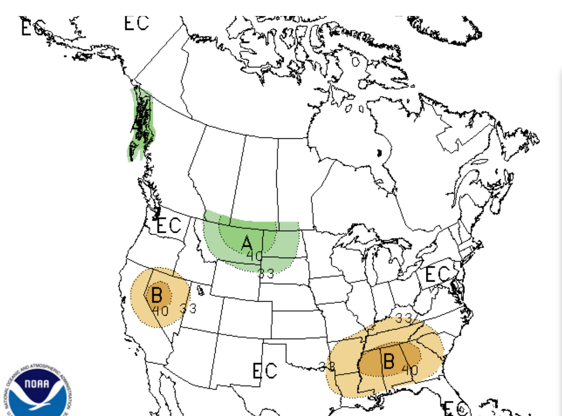

Three-Month Outlook (SEP, OCT, NOV), Precipitation probability, Image: NOAA

- **Cedar-hawthorn Rust**
- **Interpreting Your Water Test Results**
- **Leaching Fraction Test to Reduce Irrigation Water Waste in Container Nursery**

Cedar-Hawthorn Rust

Kim Leonberger, Extension Associate, Plant Pathology
Nicole Ward-Gauthier, Extension Specialist, Plant Pathology

Cedar-hawthorn rust is a common disease of apple, crabapple, hawthorn, and ornamental pear in Kentucky; it also affects quince and serviceberry. Symptoms are beginning to appear across the state. The pathogen overwinters as galls on its alternate hosts, cedar and juniper. Removal of these galls on cedar can later reduce disease incidence on the deciduous hosts. Once trees become infected limited management options are available.

Cedar-Hawthorn Rust Facts

- Leaf symptoms begin as small, pale yellow spots on upper leaf surfaces (Figure 1). Spots enlarge to become orange with black dots in the center. Infected fruit, petioles, and twigs exhibit similar symptoms.
- In mid-summer, small orange-yellow tubular fruiting bodies project from lower sides of leaf spots or from fruit (Figure 2). Severely infected leaves and fruit may drop prematurely.
- Cedar-hawthorn rust in known to infect apple, crabapple, hawthorn, mountain ash, pear, and serviceberry.
- The pathogen requires more than one host to complete its life cycle. Cedar and juniper serve as alternate hosts. In mid-late summer, spores from deciduous hosts are blown to evergreen alternate hosts. Infection results in the formation of galls (swellings), which expand over a period of 2 years before producing spores that infect deciduous hosts.
- Primary infection begins in early spring during leaf expansion.
- Damp conditions with temperatures between 50 -60°F favor disease development.
- Caused by the fungus *Gymnosporangium globosum.*

Figure 1. Leaf symptoms begin as small yellow spots on upper leaf surfaces.

Photo: John Hartman, University of Kentucky, bugwood.org

Figure 2. On undersides of leaf spots or on fruit, small orange-yellow tubular fruiting bodies develop

Photo: Kim Leonberger, University of Kentucky

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Management Options

- Select cultivars that are resistant or immune to cedar-hawthorn rust.
- Maintain plant health with proper nutrition and irrigation practices.
- Destroy nearby unmanaged, abandoned, or wild hosts.
- Prune and destroy galls found on juniper and cedar.
- Fungicides may be used preventatively during leaf expansion and flowering. Homeowners may use fungicides that contain myclobutanil or mancozeb. Always follow label directions when utilizing fungicides.

Additional Information

- Cedar-Hawthorn Rust, University of Illinois Extension – Focus on Plant Problems
- http://extension.illinois.edu/focus/index.cfm?problem=cedar-hawthorn-rust
- Apple Rust Diseases (PPFS-FR-T-05)
- Backyard Apple Disease & Pest Management Using Cultural Practices (with Low Spray, No Spray & Organic Options) (PPFS-FR-T-21)
- Fruit, Orchard, and Vineyard Sanitation (PPFS-GEN-05)
- Simplified Backyard Apple Spray Guides (PPFS-FR-T-18)
- Disease and Insect Control Programs for Homegrown Fruit in Kentucky including Organic Alternatives (ID-21)
- Commercial Midwest Fruit Pest Management Guide (ID-232)

Interpreting Your Water Test Results

Carey Grable, Extension Associate, Nursery Crops

As we discussed in last month's newsletter, water quality is very important when it comes to producing a healthy crop. When it comes to a water source, growers must be conscious of factors such as **pH**, **Electrical Conductivity**, **Alkalinity**, and levels of various macronutrients and micronutrients present. Growers should consider conducting regular water tests as all of these factors can change over time. Water tests can be run by the University of Kentucky and sample bottles and forms can be obtained through your local county Extension Office.

When you get the results of your water test, you will be presented with several pieces of important information. The first result you will see is the **pH**. Your irrigation water pH should ideally be between 5.5 and 6.5 for most nursery crops (acid loving plants like hollies and azaleas prefer a pH between 4.5 and 5.5). As we mentioned in previous newsletters, pH can affect a plant's ability to uptake vital nutrients. However, water sources in Kentucky with a pH above 7.0 are far more common, requiring managers take steps to bring down the pH. If your pH is high, take note of your **alkalinity**. The management of pH based on alkalinity is discussed below.

The next result you will see in your report is Conductivity. The **Electrical Conductivity** (or **EC**) is a measure of the total dissolved salts present in the water. A higher EC reflects a greater concentration of dissolved salts in the water. The standard unit for EC is mmho/cm. When irrigation water comes from an on farm pond which collects runoff (a form of water recycling), EC can reflect how much fertility is being added to the plants by the irrigation water alone. It's also important to remember that higher levels of salt can lead to root injury.

Alkalinity is reported next on the water test. This is, as we discussed last month, the measure of the water's ability to neutralize acids. Higher alkalinity levels can lead to increasing pH over time. Most labs report this number in either ppm (parts per million) or meq/l (milliequivalents of calcium carbonate per liter of water). For nursery production, alkalinity of 150ppm or less is generally acceptable. When alkalinity starts to approach 300ppm, growers should consider acid injection or an acidifying fertilizer to help control substrate pH. A very useful tool is available online to help growers with acid injection. AlkCalc (Figure 1), developed by the University of New Hampshire Extension program, is a web-based tool that lets you input your pH, alkalinity of your water sample, and desired pH. It will then tell you the rates at which you should inject several different concentrations of acids to achieve your desired pH.

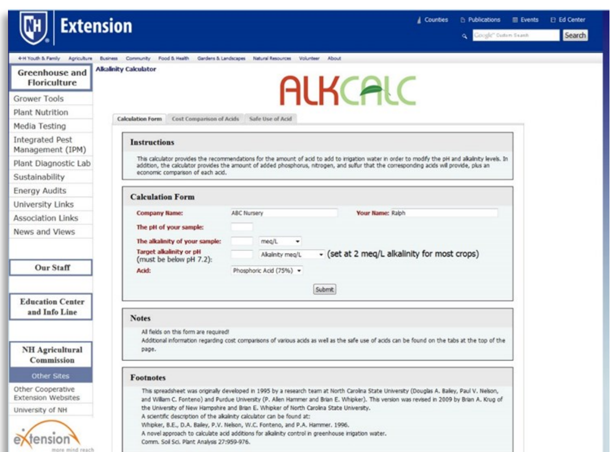

Figure 1. AlkCalc website, a free Alkalinity Calculator

Image: University of New Hampshire

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The last things reported on your water test are the levels present for several different nutrients. The nutrients included on this test are Nitrates, Phosphorus, Potassium, Calcium, Magnesium, Zinc, Copper, Iron, Manganese, Boron, and Sodium.

For a full listing of how each of these nutrients can affect your plants, as well as the optimal ranges these should be, read **Understanding Irrigation Water Test Results and Their Implications on Nursery and Greenhouse Crop Management** - *Dewayne L. Ingram, Horticulture. This publication can be found online on our* Media and Water Testing page*.* If you have any questions or concerns about water testing, or interoperating your water test results, contact your local county Extension Agent or feel free to email me at cagrab2@uky.edu.

University of Kentucky
College of Agriculture, Food and Environment

Water Test
Water Source and Nutrient Solution

SECTION I.
Date received by county ____________________

County ____________________

Name ____________________

Address ____________________

City ____________ State ____ Zip ________

Telephone Number ________________

Owner's Sample Identification Number ________________

Lab Use Only:

For County Use Only:

County Code

County Sample #

Billing Code:

SECTION II. TYPE OF SAMPLE
Mark (x) One

Irrigation Water

☐ Well

☐ Pond

☐ Municipal system

☐ Other ________________

Nutrient Solution

☐ Fertilizer
Type ________________
Rate ________________

☐ Epson Salts

☐ Gypsum

☐ Acid
Type ________________
Rate ________________

SECTION III. IRRIGATION METHOD
Mark (x) One

☐ Overhead ☐ Trickle or low-pressure emitters ☐ Sub (Float, Flood)

SECTION IV. TYPE OF CROP
Mark (x) where appropriate

☐ Vegetable	☐ Ornamental	☐ Tobacco
☐ Greenhouse	☐ Container	☐ Direct seed
☐ Field	☐ Field	☐ Plug and transfer

SECTION V. OTHER INFORMATION

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Leaching fraction test to reduce irrigation water waste in container nursery

Zenaida Viloria, Extension Associate, Nursery Crops
Win Dunwell, Extension Professor, Horticulture

Irrigation is a daily practice in container nursery that determines in large extend the efficiency of the production system. Water is not only a vital input that keeps nursery crops alive and growing but also the vehicle to supply them the nutrients and pesticides. Water is frequently supplied by overhead irrigation. Generally, an irrigation cycle is run until the water drains excessively. Drip irrigation is a more efficient system; however, water can still be wasted. According to USDA, agriculture uses the largest amount of ground and surface water in the USA, representing 80% of the total water consumption. Agricultural water must be managed efficiently to give proper use to a scarce resource and develop a production system more ecofriendly.

There are some easy and reliable procedures to determine the efficiency of an irrigation system based on the amount of water drained. For instance, leaching fraction (LF). Leaching fraction test is the amount of water excess in proportion to the amount of water applied to a container after an irrigation period. It is determined through the formula:

$$\%LF = \frac{\textbf{volume of water leached from a container}}{\textbf{volume of water applied to a container}} \times 100$$

Overall, it is recommended to keep the LF within 10-20% range. However, considering the beneficial outcome of extra watering to remove any salt buildups in the substrate, 40% or higher LF is recommended when the water EC is ≥ 2000 micromho/cm. In cases where the EC is ≤ 1000 micromho/cm the LF should be around 15%. The higher LF, the greater water and fertilizer runoff, plant disease spread and incidence, and the subsequent increase of production cost. Near zero LF is applied under scheduled irrigation to provide plants the amount of water they need when they need it. Such scheduled irrigation increases water and fertilizer use efficiency. Low LF, this is lower than 5 %, might be a concern because it could cause salt accumulation, particular in cases where the irrigation water contains high salt levels.

LF measurement in overhead irrigation system

1. Five potted plants per irrigation block are randomly chosen and fitted into a larger container with no gaps or holes to collect the drained water. Potted plants must be located in different locations in the block.
2. Next to each potted plant-bucket, set an equal size pot and collecting bucket described previously. (See Figure 1).

Figure 1. AlkCalc website, a free Alkalinity Calculator

Photo Credit: Jim Owen

3. Run the irrigation keeping the irrigation settings.

4. Once the irrigation time is up, wait for full drainage and measure the volume of drained water from empty pot and potted plant.

5. Apply the formula $$\textbf{LF} = \frac{\textbf{Water leached (volume)}}{\textbf{Water applied (volume)}} \times \textbf{100}$$

Consider individually each set of potted plant and collecting bucket for calculation.

6. Average the five LFs.

LF measure in drip irrigation system

1. Five plants along with its corresponding emitter are placed in the collecting buckets. Select plants from different points
2. Next to each potted plant-bucket, place an emitter in a collecting jug or bucket
3. Run the irrigation keeping the irrigation settings.
4. Once the irrigation time is up, wait for the water to finish draining and measure the volume of water per emitter and potted plant-bucket.
5. Apply the formula $$\textbf{LF} = \frac{\textbf{Water leached (volume)}}{\textbf{Water collected in the jug (volume)}} \times \textbf{100}$$
6. Average the five LFs

Irrigation settings need to be adjusted if the LF is too high. Other irrigation parameters must be checked such as interception efficiency, distribution uniformity, and irrigation scheduling, keeping in mind that water need varies among taxa, growth stage and seasons.

Additional information

Mathers, H.M., Yeager, T.H. and Case, L.T. 2005. Improving irrigation water use in container nursery. Horttechnology. http://horttech.ashspublications.org/content/15/1/8.full.pdf

Zinati, G. Irrigations management options for container-grown nursery crops. http://irrigationtoolbox.com/ReferenceDocuments/Extension/Eastern%20States/Irrigation%20Management%20Options%20for%20Containerized-Grown%20Nursery%20Crops.pdf

Million, J. and Yeager T. 2015. Monitoring leaching fraction for irrigation scheduling in container nurseries. http://edis.ifas.ufl.edu/pdffiles/EP/EP52900.pdf

Owen, J. What's Your Leaching Fraction? Digger Magazine. October 2007. http://oregonstate.edu/dept/NWREC/sites/default/files/pg_programs/nursery/digger_articles/digger_2007_12_p40-43.pdf

The University of Kentucky's **Nursery Crop Extension Research Team** is based out of two locations across the bluegrass to better serve our producers.

The **University of Kentucky Research and Education Center (UKREC)** in **Princeton** serves western Kentucky producers while our facilities and personnel on main campus in **Lexington** serve central and eastern Kentucky producers.

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