College of Agriculture,
Food and Environment
Cooperative Extension Service

Kentucky Nursery LISTSERV Bulletin

University of Kentucky Nursery Crops Team | **End of November 2018**

Wetter than Average Start to December

The National Oceanic and Atmospheric Administration (NOAA) currently predicts the first week of December to be cooler than average with a higher than average amount of precipitation. This trend is expected to drop off with less precipitation in the second half of December

Based on sea temperatures in the Pacific Ocean forecasters estimating an 80% chance for El Niño this winter, with a 55-60% certainty of this lasting until spring. Wintertime El Niño is associated with warmer, drier weather to the northwest of Kentucky with wetter weather to our southeast. As we exist in the transitional zone between these two weather patterns, making general statements about precipitation trends we will experience is difficult, but we may be in for a mild winter.

Please see the **UKAg Weather Center's Long Range Outlooks** for more information.

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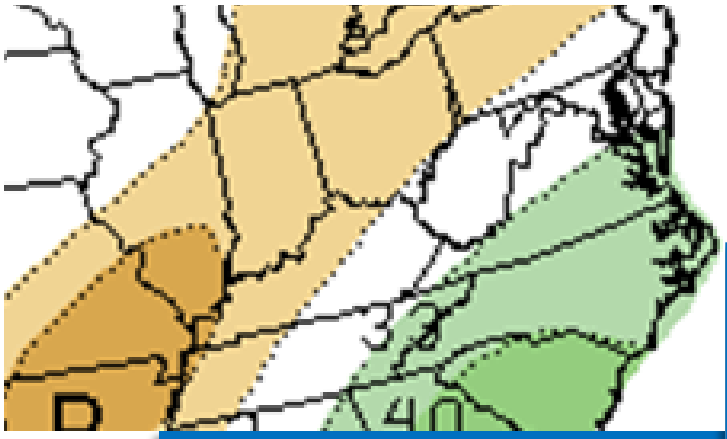

One-Month Outlook, Precipitation Probability
Nov 15th, 2018. Valid December 2018
Source: NOAA Climate Prediction Center

- **Preparing Nursery Plants for Winter**
- **End-Of-Season Irrigation System Checklist**
- **Frost and Freezing: A Producer's Guide**

Preparing Nursery Plants for Winter

Savannah McGuire, Research and Extension Support Staff, Horticulture

As temperatures continue to drop across Kentucky, it's time for nursery producers to start thinking about ways to preserve and protect plants during the upcoming winter months. Different production systems will require different maintenance, and finding the system that works the best for your operation will save money and time in the long run. Vigilance and preparation will ensure that your plants remain healthy and viable until the springtime.

Figure 1. Liner nursery

Image: University of Massachusettes

Protection Techniques

Field nurseries

- Use barriers, windbreaks, and covers to prevent windburn.
- Placing plants in the shade can ensure that rootballs do not freeze.

Seedbeds and liner nurseries

Figure 2. Container nursery stock, tightly clustered

Image: University of Massachusettes

- Frost heave can occur when temperature fluctuations in the soil cause the plant to become expelled from the growing media.
- Plants that have weaker roots, like small plants, are susceptible to being heaved from the ground and dying.
- Clay soils are more prone to frost heave occurrences, but this can be remedied with heavy mulching. 6-8" of mulching should be applied after plants go dormant
- Polyester and fabric covers can help to protect plants from the cold, but be aware that heat buildup under the cover may cause the plants to break dormancy early.

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Container nurseries

- Common problems in container nurseries are plant dessication and lack of root hardiness. If the rootball freezes, water will be prevented from reaching the top of the plant.
- It is important to water plants with the right amount and frequency in order to prevent desiccation and give the plant the thermal capacity to resist freezing.
- Keep plants upright during the winter to prevent asymmetrical growth and sun scalding on bark.
- Keep containers tightly next to one another in clusters and wrap clusters with paper or plastic to prevent air movement.
- Mulch the top of containers and surround them with hay bales to retain heat.
- Keeping Plants in the shade can prevent water loss and frost burn.
- Thermal blankets and fabric over the tops and sides of clusters of containers can help to minimize air flow.
- If using a hoop house to overwinter plants, wait until plants are hardened before covering. Houses positioned from north to south will have a lower temperature than east-west houses. For extra protection, ventilate, heat the houses, or insulate them with double paned walls
- Check to see if plants would benefit from herbicide treatment before being put away. This will ensure that greenhouse weeds will not kill nursery crops.

Systems for covering plants

Unheated Hoophouses can be covered with a variety of materials. 4-6mm white polyethylene will reflect solar radiation and will not get as warm as clear polyethylene. The lack of light when white plastic is used may cause plants to stretch. To prevent this, orient hoophouses north-south to keep temperatures cooler and prevent transpiration

It is best for cold sensitive plants to be in the center of the house and for more tolerant varieties to remain on the edges. If temperatures remain around 25-30 °F a lightweight, foam blanket can help to keep plants warmer.

Plastic stretched tightly across a hoop house can help prevent wind damage.

Image: Carey Grable, University of Kentucky

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"A **Heated Greenhouse or Polyhouse** with Roll-up sides covered with two layers of clear poly are often used by perennial growers" (UMass Extension 2011). A heat source can help to maintain temperatures at 25°F for nursery plants and around 32°F for perennials (this can be monitored with a soil thermometer). If air temperature is consistently about 40°F, increase ventilation.

Greenhouses should remain at 50°F during fall months to make sure that plants are well rooted. Temperature should be maintained at 35°F during the winter. Clear poly will allow for maximum sunlight exposure for plants,. Additionally, clear poly will keep foliage dry and allow plants to break dormancy earlier (for earlier shipping). Rolling up the sides can ensure that the temperature inside of the greenhouse is the same as the outside air temperature, if desired. Lowering the sides will allow for protection against unexpected freezing temperatures during the springtime.

Spun-bond polyester or polypropylene fabric low tunnels

Image: NC-State University Extension

Structureless systems is work by laying protective covers directly above plants and keeping the edges flush with the ground. It difficult to check the plants once they are sealed, and the cover should not be removed. Ventilation can become an issue on warmer days with this system.

Plants should be placed upright with their pots touching one another. Make sure that tall and woody plants are leaned over like shingles before covering. Plants can be covered with a microfoam-poly cover, but ensure that the cover is tightly over the plant according to the manufacturers instructions.

Double layers or protection are suggested for areas with high winds or where temperatures may fall near -10°F. Blankets can pose problems if they retain too much moisture and are not properly vented.

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Other methods

"A variety of other techniques have been utilized to protect container grown plants during winter, including retractable-roof greenhouses, covered cold frames, earthen pits, sunken frames, root cellars, barns and sheds, covering with evergreen boughs and deep snow" (UMass Amherst Extension).

Caring for overwintering plants

As long as plants are not actively growing, they can remain cold and alive over the winter. Preventing active growth will ensure that plants can remain growing when temperatures are warm again.

When to cover and uncover

As winter approaches, wait as long as possible before covering plants in order to allow plants to harden off and minimize the risk of cold damage. As a general rule, cover from 30-45 days after the first frost.

Wait until the risk of below-freezing temperatures is gone before removing covers from plants. When uncovering, aim to prevent early shoot growth as well as to protect plants from unusually cold temperatures. Check covered plants regularly and ventilate if needed. It may be beneficial to cut holes in poly coverings at the beginning of the spring to balance ventilation and frost protection.

Overwintering container grown plants is the most important thing that you can do to protect the value of your plants during cold months. Choose the protection system that best meets your inventory and needs.

Source / Additional Reading

Overwintering Container-Grown Ornamentals
https://ag.umass.edu/landscape/fact-sheets/overwintering-container-grown-ornamentals

End-of-Season Irrigation System Checklist

Excerpted from University of Washington, College of Forest Resources

1. **Chlorinate to clean out systems**
   - □ Backflush sand filters
   - □ Inject liquid bleach (5.25% chlorine) at concentration of 500 ppm.
   - □ Allow for minimum of 30 minute contact time for farthest emitter.
   - □ Shut system down for 24 hours, then flush in following order:
     - -filters
     - -mainline and submain
     - -lateral lines

2. **Filtration equipment**
   - □ Flush and drain filters
   - □ Inspect filters for wear, corrosion, damage
   - □ Check condition of seals, gaskets, and valve seats.

3. **Valves**
   - □ Completely drain all valves.
   - □ Clean corrosion, dirt, etc. from valves.
   - □ Lubricate valves
   - □ Make sure all valves are open.

4. **Controllers and sensors**
   - □ Clean controllers and sensors.
   - □ Check condition of controller panel seals.
   - □ Remove and store batteries.
   - □ Flush and drain hydraulic control conduits.
   - □ Disconnect field wires.
   - □ Check for frayed, worn or broken electrical wires.

5. **Chemical injection equipment**
   - □ Thoroughly flush and drain.
   - □ Clean interior and exterior equipment surfaces.
   - □ Lubricate pumps, motors and gear reducers
   - □ Examine condition of check-valves and backflow preventers.
   - □ Cover shaft and other exposed metal with protective lubricant.
   - □ Check gaskets and seals.

6. **Electric motors**
   - □ Clean, lubricate, cover

7. **Centrifugal pumps**
   - □ Drain, clean, lubricate, cover

Source: "Preparing Nursery Plants for Winter"
http://depts.washington.edu/propplnt/Overwintering.htm

Frost and Freezing: A Producer's Guide

Savannah McGuire, Research and Extension Support Staff, Horticulture

Understanding some principles of how plants react to frost and freezing can help you to create an action plan to keep them safe and healthy over the winter. Ice crystals forming within a plant cell can be detrimental to plant vitality, so it is also important to have a basic understanding of plant cellular biology to preserve your investment.

Figure 1. Frost on Swiss Chard

Source:
Michigan State University

Frost and Freeze Injury

A frost is when we get a visible amount of frozen water on the plant surface. A freeze is when the air temperature drops below freezing. Sometimes we get frost when the temperatures are above freezing and we often can have a freeze without frost. It is dependent on the amount of water in the air.
The frost damages plants by disrupting the cells of tender growth or dehydrating the tissue by extracting water from the tissue to form ice.

Figure 2. Apple flowers killed by a freeze

Source:
Mark Longstroth, MSU Extension

When ice crystals form in water-filled plant tissues they dehydrate cells and disrupt membranes. The result is collapsed and/or darkened plant parts.

Freeze damage occurs when temperatures sustain at 32 degrees or below and is progressive within plants. The softest tissues like leaves and tender new shoots are hurt first. Tougher stem tissue and buds down from the tips endure less damage, but are not immune if the temperatures are lower and the duration is longer. Limp, dry and brownish leaves damaged by frost easily stand out, however damage to stems and buds may remain hidden. Freeze damage to plants might not become evident for several months or even years.

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Freezing on a Cellular Level

To respond to freezing temperatures, there are two basic biological strategies that plants use to stay healthy. Plants may go dormant to avoid injury or they may remain active and make other physiological changes. A plant's ability to transport water and nutrients can be impacted in two ways: phloem in the plant may become damaged by sap becoming more viscous as temperatures fall and xylem function may be interrupted by the formation of air pockets.

Freezing of intercellular water can cause mechanical damage (via ice crystals) to plant cells which most plants cannot survive. Some plants can develop resistance to this by altering the content of the water held in plant cells. Increased electrolytes, proteins, and salt levels can lower the temperature at which the water inside plant cells will freeze. Resistance to freezing in plants is based either on tolerance or resistance to extracellular ice formation or the avoidance of intracellular freezing.

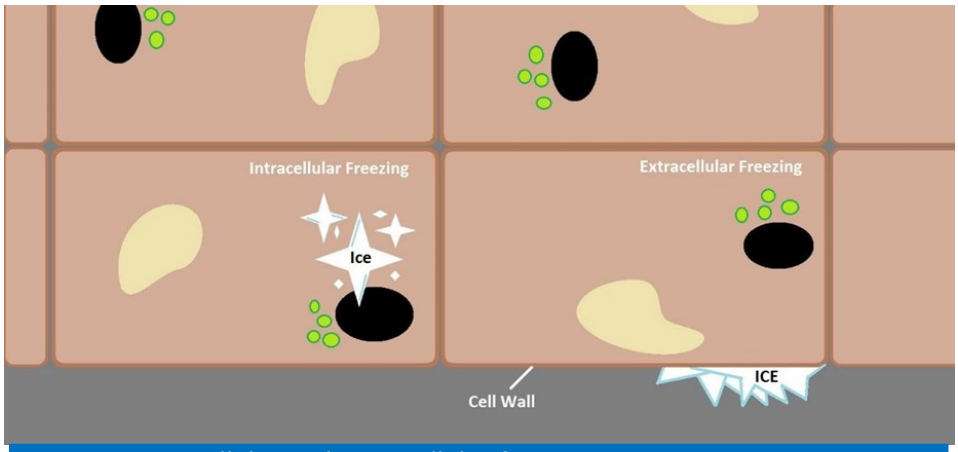

Figure 3. Intracellular and extracellular freezing

Source:
University of Kentucky, Department of Horticulture

Plant hardening (the process of acclimating) can be triggered by a decrease in day length and light intensity, or the gradual reduction of temperature. Plant cells harden via changes to the cell wall structure, changes to the plasma membrane and the storage of sugars and starch in living and nonliving tissues. Growing shoots and recent plant growth are more cold sensitive and are less able to increase their resistance, even after hardening.

The Extent of Damage to Plants Depends on Several Factors

- Types of plant
- Where it was propagated or its origin
- Plant maturity and health
- Fertilizing practices
- Presence of late summer or fall growth
- The lowest air temperature achieved
- Unseasonably early fall freeze or late spring freeze
- Plant parts exposed to freezing temperatures
- Overall duration of the freeze
- Weight of snow and ice load on branches (Figure 4)

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Tree and Shrub Care after Freezing has Passed

Wait until the risk of freezing weather has passed before you prune. Pruned plants are more susceptible to additional damage from the cold. It may be difficult to see where the plant is damaged, especially during the early stages. Sometimes plant damage is very severe, especially if there is excessive snow or ice buildup (Figure 4).

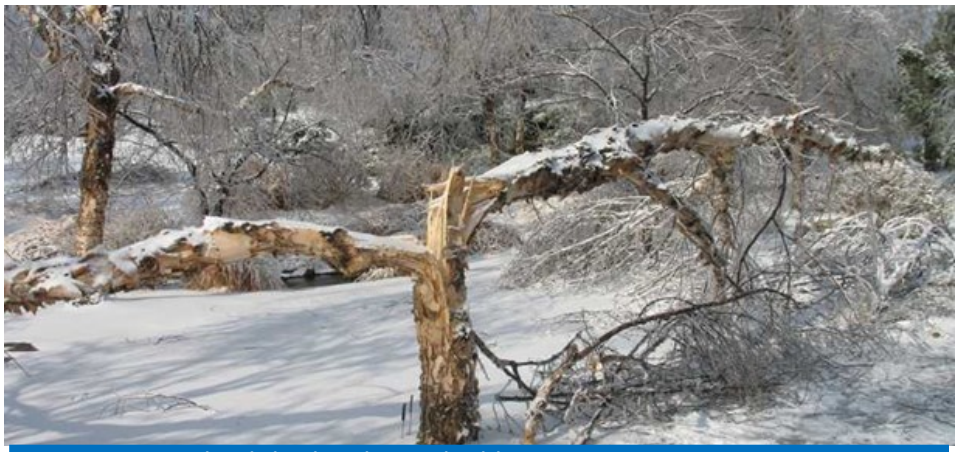

Figure 4. River birch broken by ice buildup

Source:
Missouri Botanical Garden

Plant tissues may not appear to be damaged, but the damage will appear in the springtime. Older buds that are severely damaged will take more time, warmth, and stimuli to emerge than young, undamaged buds.

Once you have identified the damage to the plant, cut 1/2 inch above the bud if it is going in the right direction. You may need to go further down the branch to find a bud that is going in the right direction to keep the preferred plant form.

Additional Resources:

Chilling Injury, Frost and Freeze Injury: What's the Difference?
http://sacmg.ucanr.edu/Chilling_injury/

What is the difference between a frost and a freeze?
https://www.canr.msu.edu/news/what_is_the_difference_between_a_frost_and_a_freeze

Identification and Prevention of Frost or Freeze Damage
https://cals.arizona.edu/mohave/master_gardeners/kingman/articles/frostorfreeze.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.

Check out our YouTube Channel!

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