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Northeast Missouri
Ag Connection

Your local link to MU for ag extension and research information
http://agebb.missouri.edu/agconnection

Preventing Yield Loss: Soil Testing for Soluble Salts in High Tunnels

Soil testing provides valuable insights into pH and the levels of nutrients, guiding fertilizer application as well as recommendations of materials to adjust soil pH, such as lime or sulfur. Soil testing in a high value production space, such as a high tunnel, is even more critical to ensure revenues cover construction and maintenance costs.

Most growers are familiar with testing soil for macronutrients (nitrogen, phosphorous, potassium, calcium and magnesium) and pH, but might be less familiar with testing for soluble salts. Soluble salts are measured by electrical conductivity testing and reported in units of mmhos/cm. High levels of soluble salts in soil can reduce yields and damage crops. Sodium is not the only soluble salt that can cause yield loss, excess fertilizer salts such as magnesium, calcium, and potassium can also contribute to this problem. Plant nutrients should always be applied based on soil test recommendations. Excess nutrients (organic or synthetic) applied in dry forms or through fertigation, shallow irrigation, and high levels of salts in irrigation water, can all over time raise soluble salt levels in the soil to damaging levels.

Soils with high levels of soluble salts are categorized in a range from very slightly saline, to very strongly saline, depending on the concentration of soluble salts in a tested volume of soil. As soluble salts accumulate to high levels in the rootzone, plants have a much harder time withdrawing water from the surrounding soil. Certain crops are more sensitive to high salt levels than others. For example, beets can thrive in moderately saline soils, while other crops such as tomatoes and peppers might suffer yield losses of 25% or greater in similar soils. In field production systems in Missouri, salt accumulation in soils is generally not a concern, due to high levels of precipitation from rainfall and snow that leach soluble salts downward out of the rootzone.

However, in high tunnel production systems rainfall is completely excluded, and accumulation of high levels of soluble salts in the rootzone is much more common. Higher rates of fertilizer are often applied to high tunnel soils to maximize crop yields, additionally, drip irrigation does not supply enough water to leach salts downward into the soil profile. In a high tunnel, as water evaporates and moves upward in the soil profile, salts can accumulate to damaging levels in shallow layers of the soil. In a survey of high tunnel growers in Pennsylvania (Penn State), soils in conventional high tunnels on average had strongly saline soils, while soils in organic high tunnels on average had moderately saline soils. Whether organic or conventional, salt levels in high tunnel soils were shown to be capable of reducing yields of non-salt tolerant crops.

There are multiple options high tunnel growers can use to manage this problem. One option would be to move the high tunnel to a new location with fresh soil, the added

benefit of this practice is to reduce soil-borne disease issues that tend to accumulate in high tunnels. This practice however might not be feasible, as most growers treat high tunnels as fixed stationary structures. The second option is to remove the plastic from a high tunnel after crop harvest in the fall and leave the high tunnel open until the following spring. Annual or semi-annual removal of plastic has proven successful for some growers, who are able to maintain soluble salts below damaging levels in their high tunnels. This process involves a high amount of labor and might not be possible for growers who use their high tunnels for winter production of crops such as spinach and greens. Using high amounts of irrigation in high tunnels can also leach soluble salts out of the rootzone. General guidance for this practice is to apply six inches of water to leach 50% of salts from the rootzone, 12 inches to leach 80%, and 24 inches to leach 90%. Leaching can be accomplished with drip irrigation or sprinklers.

The only way to know whether soil has high levels of soluble salts is to test. It is recommended to collect a dozen subsamples taken throughout the tunnel, to a depth of 6 inches. If growing on fixed beds, it is recommended to sample only from the beds and not from the alleys or walk-ways. Thoroughly mix the subsamples together and drop off two cups at the local MU Extension office or send samples directly to the MU Extension Soil Testing Laboratory. University of Missouri Extension Soil Testing Lab offers soluble salt testing (as measured by electrical conductivity) for $6. Make sure to request an electrical conductivity test, or E.C. test, when submitting the sample. Salinity tolerances and potential yield losses of common vegetables are listed in the table below. Tomato yield losses of 10% can occur at electrical conductivity values as low as 3.5 mmhos/com, and 50% at values of 7.6 mmhos/cm. See the table below for soluble salts levels capable of reducing yield in other commonly grown high tunnel crops. If the soil test indicates high levels of soluble salts and a grower chooses to take action to address this problem, it is important to retest the soil to ensure the practice was successful in lowering soluble salts to desired levels.

Soil samples may be sent directly to the laboratory at the address below, be sure to include a check made payable to "MU Soil Testing" as well as a soil sample form. Sample forms can be obtained at your local MU Extension office or online at: https://extension.missouri.edu/mp727

MU Soil and Plant Testing Laboratory
1100 University Avenue
Mumford Hall Room 23
Columbia, MO 65211

Source: *Justin Keay, horticulture specialist*

Salinity Tolerance of Common Vegetables

Crop	Threshold Value	Yield Loss 10%	25%	50%
	ECe (mmhos/cm)			
Beets	5.3	8.0	10.0	12.0
Broccoli	2.7	3.5	5.5	8.2
Cabbage	1.8	2.8	4.4	7.0
Carrot	1.0	1.7	2.8	4.6
Cauliflower	2.7	3.5	4.7	5.9
Cucumber	2.5	3.3	4.4	6.3
Lettuce	1.3	2.1	3.2	5.2
Pepper, Bell	1.3	2.2	3.3	5.1
Spinach	3.7	5.5	7.0	8.0
Squash/Pumpkins	3.9	4.9	5.9	7.9
Tomato	2.5	3.5	5.0	7.6

Adapted from *Salinity and Plant Tolerance*, Utah State University Extension

2022 Farm Income Tax Resources

Farmers begin to think about income taxes this time of year. This year was unique with the drought, high fertilizer and chemical prices and variation in soybean yields. Corn yields and prices have been positive.

1) **Farmer's Tax Guides** (IRS Publication 225) should be available at all extension offices now. They are a no cost reference guide that helps with tax questions.

2) **1099 forms** are available at some offices for a small charge. They must be sent to non-employee, independent contractors paid over $600. Remember, 1099 NEC forms are utilized for most farm custom or contractor work (combining, haying, dozing, etc.), while the 1099 MISC form is for cash rent, attorney, or veterinary labor, etc. These forms must be sent to the recipient and to the IRS by January 31, 2023.

3) **Farm Income Tax Workshops** will be held to update producers and others on changes or clarifications. There is no cost to attend, but pre-registration is required. Persons can attend either in-person or online. The content is the same both times.

Thursday, December 1 12:30 to 2:45 pm
Boone County Extension Center (Columbia)
Putnam County Library (Unionville)
Schuyler County Assembly Room (Lancaster)

Tuesday, December 6 6:15 to 8:30 pm
Audrain County Courthouse Basement (Mexico)
Mercer County Extension Center (Princeton)

Pre-registration is required. To register call your local ag business specialist or online at muext.us/abpevents Contact an MU Extension Ag Business specialist or a tax professional for specific tax questions.

Source: *Joe Koenen, ag business specialist*

December Gardening Tips

Houseplants

- On cold nights, move houseplants back from icy windows to prevent chilling injury.
- Over-wintering geraniums like bright light and cool temperatures. Keep soils on the dry side.
- Be sure newly purchased indoor plants are well protected for the trip home. Exposure to icy temperatures for even a few moments may cause injury.
- Water houseplants with tepid water. Cold tap water may shock plants.
- Holiday Poinsettia basics: provide bright light for at least half the day; keep plant away from drafts, registers and radiators; the soil should dry slightly between waterings; punch holes in decorative foil wraps to prevent soggy soil conditions.

Ornamentals

- Be sure the root zones of azaleas and rhododendrons are thoroughly mulched. Any organic material will do, but mulches made from oak leaves, shredded oak bark, or pine needles are preferred.
- Living Christmas tree basics: store the tree outdoors in a cool, shady, windless area until ready to plant; dig the planting hole before the ground freezes; after planting, place mulch around the tree, but do not pile it against the trunk; water the tree if snow and rain are not adequate; spray with an anti-transpirant to reduce needle moisture loss;
- Hairspray works well to keep seed heads and dried flowers intact on wreaths and arrangements.
- Hollies may be trimmed now and the prunings used in holiday decorations.
- Only female holly trees bear the colorful berries. There must be a male tree growing nearby for pollination, if fruits are desired.
- Christmas trees hold needles longer if you make a clean, fresh cut at the base and always keep the trunk standing in water.

Miscellaneous

- Rabbits fed corn or alfalfa, may leave fruit tree bark unharmed.
- Clean and oil all garden hand tools before storing for winter.
- All power equipment should be winterized before storage. Change the oil and lubricate moving parts. Either drain fuel systems or mix a gas stabilizing additive into the tank.
- Apply mulches to bulbs, perennials and other small plants once the ground freezes.

-Missouri Botanical Garden-

Parting Thoughts

Some of you may not know but after a 43-year career, I am retiring. I want to thank all of you that read this newsletter, my weekly column (which I will continue), as well as publications and articles I have written over the years. I appreciate all the people whose lives I have touched in that time, my co-workers especially. Some final thoughts for this newsletter:

a) Missouri fence law – do not assume lawyers know the law or interpret it right.

b) Farm leases – written leases are always better than oral ones. Get specifics in writing.

c) Estate/succession planning – in my career many more farmers/producers have seen this as a critical part of their business which is good. Remember to review it regularly as values change.

d) Ag related laws – the world has changed and thus landowners and farmers must follow the rules and laws much closer than years before.

e) Cash flows and finances – remember that cash flows and other financial information is for you the producer and not just your lender.

f) Get everything in writing and keep a copy – that includes important papers like loans, leases, loan payoffs, land purchases, improvements not depreciated and anything else you may want later.

It has been a pleasure serving Missouri citizens for all these years and look forward to seeing or hearing from you in the future.

Source: *Joe Koenen, ag business & community specialist*

Wishing you a Merry Christmas and Happy New Year!

from the Northeast Missouri Ag Staff