An Update on Cedar Losses

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This past late autumn through this spring I have received calls from Districts and producers about dead seedling junipers. The seedlings were all planted last spring, but that is the only common theme in these failures. The losses, often 100% in some belts, cannot be attributed to a single nursery as they came from several sources. They also are not isolated to a specific county or even a region of the state. One county might see significant losses in their cedar plantings and the adjacent county relatively few. Even within a county there can be significant differences. There are counties with two different buyers using the same nursery stock, but their customers experienced different survivals.

I visited many of the sites this winter and spring and collected samples of plant material and soils. I also had samples sent to me. Herbicide drift or soil residual is always a possibility agent for failure, particularly when an entire planting dies, but none were detected in any sample. This does not mean that herbicide was not a factor in some of the losses, just that the concentration may have dropped below detectable levels. However there are a number of triazine herbicides, such as Atrazine which can cause significant carryover injury if tree seedlings are planted on these sites. Some plant growth regulators such as Tordon have also been linked to tree injury a year after use. Others, such as Authority, are cell membrane disrupters which have long residual action but with the exception of Authority XL (which cannot be used in SD) or MAX should not have carryover concerns for tree seedlings.

There were some pathogens identified on some of the junipers, mostly molds which can cover plants with a white to gray webbing. Most mold fungi are saprophytes or weak pathogens so in themselves not a threat to the plant but are indicators of poor storage conditions.

Another possibility is issues with the stock between shipping from the nursery to planting. The following is a short review of best management practices for transporting, storing and planting seedling stock.

<u>Picking up the plant material from the nursery</u>

There is no better way to transport the stock than in a heavy-duty cardboard box with a polyethylene film. This protects the bare-root seedlings from physical damage and desiccation during shipping from the nursery to the county cooler. Do not remove the plant material from boxes.

<u>Storage at the county cooler</u>

The seedlings should be held at temperatures between 34 and 38^{o}F with the temperature never exceeding 40^{o}F. Warm temperatures will increase respiration resulting in the loss of carbohydrate reserves that are essential for root initiation and growth. The warmer temperatures will also lead to desiccation injury to the roots and foliage.

High storage temperatures will also favor mold development. *Rhizoctonia* and *Phoma* are two pathogens that proliferate in warm storage and these fungi were isolated from some juniper samples. This does not mean the infection came from storage, but instead may have flourished in the warmer and wet environment. Mold has been linked to root rot in some studies. Mold also means the storage conditions were too warm and wet. While a high humidity (90-95%) is essential, that does not translate to keeping water on the plant tissue. Mold fungi need free water for spore germination and colonizing needles.

A good check for survival potential for moldy plants is the "fingernail test" – scrap the bark from the stem and if the tissue is soft, watery and brown, rather than hard and white, it's probably dead. The same test can be used on the roots.

Transportation to the field

Ideally the seedlings are held for only a short time period – a few days – in the county cooler before planting. This is generally not possible and plants often remain longer but the longer the plants are held and the warmer the cooler, the poorer the survival. Storage for more than a month and at temperature above 40^{o}F can lead to poor survival.

Planting

Seedlings should be kept moist and covered as they are transported to the field. Once on site, if possible soak the roots of the junipers for about 20 to 30 minutes before planting. The seedlings should receive 16 to 30 oz. of water within an hour of planting. The water should be applied slowly so it seeps into the soil. I have seen a few watering systems when the watering coming from the nozzle is under so much pressure it scoured the soil around the seedlings!

The seedlings should be receiving approximately 1-inch of water a week through precipitation or watering at least three times a week with about 16 to 30 oz of water.

I know it will not be possible to follow all these instructions but the closer these are adhered to the better the chances of survival.

Any District that is receiving calls this summer on cedar failures please contact me as soon as possible (605-695-2503, email john.ball@sdstate.edu). Since the mountain pine beetle epidemic is winding down I have more time this summer to travel the state and would prefer to investigate failures in the summer while I have live tissue than try to figure out the problems in November after the trees are completely dead.