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Dealing with Saltwater Intrusion in Pastures and Hayfields

The capacity of forage plants to grow satisfactorily in salty conditions depends on several interrelated factors, including the plant's physiological condition, growth stage and rooting habits.

All soils contain some water-soluble salts. Plants absorb essential plant nutrients in the form of soluble salts, but excessive accumulation of soluble salts, called soil salinity, suppresses plant growth. When soil salinity exceeds a plant's tolerance, growth declines. As salt concentration rises, water becomes increasingly difficult for the plant to absorb. A plant can actually die from water stress (i.e., lack of available water) in a moist soil if the salt concentration becomes high enough.

Symptoms of salt injury in plants resemble drought. Salt injury and drought are characterized by water stress (wilting) and reduced growth. Severe injury caused by prolonged exposure or high salinity results in stunted plants and tissue death. Reduced growth caused by salinity is a progressive condition that increases as salinity rises above a plant's tolerance threshold.

Plants vary in their response to soil salinity. Salt-tolerant plants (plants less affected by salinity) are better able to adjust internally to the effects of high salt concentrations than salt-sensitive plants. Salt-tolerant plants are more able to absorb water from saline soils. Salt-sensitive plants have a limited ability to adjust and are injured at relatively low salt concentrations.

Forage crops commonly grown in Louisiana vary in their tolerance to salty conditions. Bermudagrass is generally considered to have a high salt tolerance. Some research indicates that bermudagrass can tolerate salt concentrations of up to 5,000 parts per million (ppm) for extended periods. Other perennial forages species such as bahiagrass and carpetgrass aren't as salt-tolerant, but in relative terms, they are still considered to be salt tolerant. Most cool-season forage species such as ryegrass, wheat and barley are considered to be moderately tolerant to salty conditions. Most clover species, including white, red, arrowleaf and crimson, are considered to be salt sensitive.

Most of the resource information on bermudagrass pastures and hayfields indicates these areas should recover well from saltwater intrusion over time. Rainfall is a major player in reducing salinity because it leaches the soil. In fact, 5 inches will remove about 50 percent of the soil salts. Unfortunately, 2006 winter rainfall was well below normal in south Louisiana, thus prolonging the leaching process.

The cause for greatest concern with forage crops is attempting to plant winter annuals such as ryegrass into areas that have received some level of saltwater intrusion. Ryegrass planting normally occurs during September and October. In general, well-established plants will usually be more tolerant of salty conditions than young plants. A literature review makes it is obvious that ryegrass seedlings are much more susceptible to salt injury than are mature plants.

A review committee within the LSU AgCenter in the fall of 2005 established the salinity threshold value for seedling ryegrass as being 1,800 ppm. The probability of problems with ryegrass germination from saltwater intrusion will drop with each successive rain.

Producers can determine the salt content of their soils by taking soil samples and sending them to the LSU AgCenter's Soil Testing Laboratory for analysis. If there is a salt accumulation, it will not be uniform. "Hot" spots will be in the least well-drained areas of the fields. Therefore, for each sample, collect soil from 10 or more places and mix thoroughly in a plastic bucket. Then scoop out a sample to mail to the lab.

Take samples from the top 3 inches of soil. Producers can check with their local extension agent if they have questions about how to perform this procedure or about any associated costs for salt analysis.

Producers also can perform a simple experiment (bioassay) on their own with a small amount of soil from affected areas before planting large acreages of forage crops, especially ryegrass and clovers. The bioassay can help predict potential crop injury. A bioassay does not measure the amount of salt residue present in the soil, but it may indicate whether enough salt residue is present to injure seedlings.

To begin the bioassay procedure, take soil samples in the top 3 inches from several locations in the field suspected of having high salt content. Mix the soil samples together in a clean plastic pail. You will need about a quart of soil for the bioassay. If possible, also take separate samples from fields that did not receive any saltwater intrusion. These samples can be labeled as "check" samples. Plastic bottles and boxes, milk cartons and cottage cheese containers are appropriate containers in which a bioassay can be conducted.

Punch holes in the bottom of the containers to allow water drainage. Sprinkle a small amount of seed (about a teaspoon) in each container of soil and cover the seeds with about ½ inch of soil. Wet the soil with water, but do not saturate it. Place the containers in a warm location (70 to 75 degrees) where they can receive ample sunlight. Keep the containers moist.

Within 7 to 10 days injury symptoms should become apparent. Possible symptoms include no germination, partial germination, slowed emergence or seedlings appearing to be dried out. It is a good idea to compare the germination and growth of the seedlings in the salt-affected containers to those in the "check" containers. Although this is not a precise experiment, it should provide an idea of how various forage species may germinate and grow in areas affected by saltwater intrusion.

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