CCS Pipeline™

PIPELINE

ABIOTIC STRESSED PLANTS!

When plants are under environmental stress (Abiotic stress), especially young plants (transplants), the enzyme Nitrate reductase levels/production can drop because of energy deficit. When this occurs the conversion of nitrate nitrogen to ammonia form for protein synthesis is hindered. An inadequate protein synthesis scenario can lead to all sorts of growth problems and will inhibit recovery. Biotic stress factors: disease, insect pressure, etc. often follow Abiotic problems.

Under prolonged stress conditions (> 3-4 days of water logged, anaerobic or anoxic conditions) application of nitrogen foliarly to plants should be in the Urea, ammonia or other non-nitrate form until the plants resume normal growth. Rates to apply would be from 1 – 4 lb N/ac no more than twice weekly. Younger plants may require less N/application. Calcium and Boron should be included at maintenance levels (0.5 – 1.5 lb Ca/ac/week + B @ a level to supply 2 – 4 oz B/20 acres of crop) with the nitrogen application. If the excess moisture conditions are for less than 2 days, normal foliar materials containing Nitrate Nitrogen and/or Urea forms can be used.

If chlorosis (leaf discoloration) is present indicating a metal, N, K or S problem tissue testing should be initiated to help decide what metals/nutrients to apply. As the plants recover from stress and root systems begin to function normally, transpiration activity resumes and chlorophyll activity (photosynthesis) provides energy resources and then Nitrate reductase issues are usually no longer a problem.

Responding to environmental pressure/stress with corrective action is much easier if an on-going tissue testing program is in place prior to the problem. We often have to foliar feed plants to jump-start their metabolism in water logged soils prior to injection of fertilizer materials. Soil solution Nitrate Nitrogen supplies will become limiting in water logged soils, therefore, injection of materials like Potassium Nitrate and Calcium Nitrate should be considered.

If water logged conditions are for short duration (less than 48 hour periods), foliar nitrate application can stimulate Nitrate reductase production. If the plants are deficient of energy because of: long duration; extreme wind, prolonged water logged conditions (3 – 4 days), reduced energy supplies (overcast reduced sun light), root pruning due to anaerobic conditions in the soil, reduction of nutrient to unavailable form, or loss of nutrients needed for i.e. Nitrate reductase formation (Calcium, Molybdenum, Iron and Boron) or loss of nutrients needed for photosynthesis, then nitrate applications will not help and application of the deficient foliar materials containing urea/ammonia forms of N should be made with the spray. (Short term water logged duration – Use Nitrate or Urea, and for Long term water logged duration – Use Urea or other Ammonia form for foliar feeding.)

Florida growers get a full house of Abiotic stress factors during the hurricane season including excessive wind and rainfall. Planting schedules are also often affected.

Foliar applications of Calcium, Boron and other metals: Fe, Mn, Mg, Cu used in photosynthesis may also be needed. To prevent and/or correct growth issues related to energy deficit, an aggressive tissue testing program needs to be in place prior to environmental issues becoming a problem so you can have a relative scale of change to help interpret what has happened in the soil solution.

Another big problem with prolonged wet conditions is the leaching of nutrients or movement of soluble nutrients in the water column away from the root zone. The extent of leaching will not be known until the soil dries sufficiently for soil testing. In some situations in addition to the basic (A&L Lab S2S3 test) you will need to test for: Urea N, Ammonia N, Organic N and Nitrate N in the soil test (a total N should also be included). As with tissue evaluations a base soil test prior to problems helps with interpretation of test results.

Interpretation of soil nitrogen tests can be tricky; therefore, either call CCS or the Lab Manager for help with the test conclusions. You will also need to know what materials have been applied, when and where for interpretation before you can know the extent of leaching.

Many materials can be used to stimulate plant growth/re-growth after a stress event. Materials like: Nitro-Cal, Potassium Nitrate, Calcium Nitrate, Enviro-Green 20-20-20, Carbo-Cal, MKP, Trisert-K, Urea-Metals mix, various Sun-Glo foliar sprays, etc. can be used in a repair program. We often don't know for several days the extent of root damage, nutrient leaching or energy deficit created by the stress conditions. Extreme above ground environmental changes and extreme soil environment changes can also cause problems and affect transpiration by reducing nutrient movement into the roots. Plastic mulch temperatures can easily reach 140 degrees creating a steam trap at the plastic-transplant hole site and if the duration is long enough the plants will become girdled and die.

Understanding the abiotic stress factors and how to respond to them is very important with any reaction program. Using the wrong; nutrient, nutrient rate or combination, or using the material at the wrong time can result in the problem becoming worse. Don't recommend a solution for fixing stressed plants until you know all the facts and how all the materials will affect the situation. There is no substitution for oxygen in an anaerobic soil. Nutrient form is very important when feeding stressed plants and timing of application with the correct rate can mean the difference between success and failure.

> **[1] Abiotic stress is defined as the negative impact of non-living factors on the living organisms in a specific environment. The non-living variable must influence the environment beyond its normal range of variation to adversely affect the population performance or individual physiology of the organism in a significant way. Whereas a biotic stress would include such living disturbances as fungi or harmful insects, abiotic stress factors, or stressors, are naturally occurring, often intangible, factors such as intense sunlight or wind that may cause harm to the plants and animals in the area affected. Abiotic stress is essentially unavoidable. Abiotic stress affects animals, but plants are especially dependent on environmental factors, so it is particularly constraining. Abiotic stress is the most harmful factor concerning the growth and productivity of crops worldwide. Research has also shown that abiotic stressors are at their most harmful when they occur together, in combinations of abiotic stress factors.**
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> **(From Wikipedia, the free encyclopedia)**