FACT SHEET

Testing for Herbicides In Plants

The need for testing for herbicide residues in plant tissue can be varied. The most common situation is related to suspected crop damage. Another possibility is to verify that a feed does not contain levels of residue that could be detrimental to livestock. Either case can represent a substantial investment on the part of a grower. An understanding of the mode of action of herbicides is needed to properly evaluate a situation and collect plant tissue samples for analysis. This fact sheet contains general information regarding how various herbicides interact with a plant's metabolism and tips on collecting plant tissue samples for analysis.

Herbicides In The Plant

When herbicides come into contact with plant tissue either by translocation through the plant's roots or foliar contact, they begin interacting with the plant's metabolic processes. Some herbicides will be altered or metabolized through this process, depleting the concentration of the original or parent compound. Other herbicides and those present at high enough concentrations will reside in the plant tissue as the parent compound. Some may be transported to newer growth in the plant, while others remain at the point of contact. These complex possibilities have to be considered when diagnosing crop damage and deciding whether or not to collect plant tissue samples and which portion of the plant to sample.

The following table lists three categories of movement of several classes of herbicides along with a few examples of each.

HERBICIDE MODE OF ACTION CATEGORIES

Injures New Growth / Moves from Leaves to Roots	Injures Old Growth / Moves Only Upward	Localized Injury / Little to No Movement
Auxin growth regulators (2,4-D, dicamba, triclopyr) **Imidazolinones** (imazethapyr, imazaquin) **Sulfonylureas** (chlorimuron, nicosulfuron) **Sulfonanilides** (flumetsulam) **Aromatic amino acid inhibitors** (glyphosate) **Pigment inhibitors** (clomazone) **Lipid synthesis inhibitors** (fluazifop, sethoxydim)	**Triazines** (atrazine, simazine, metribuzin) **Substituted ureas** (linuron, tebuthiruon) **Uracils** (bromacil, terbacil)	**Bipyridiliums** (paraquat, diquat) **Diphenylethers** (aciflurofen, fomesafen)

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Sampling Plant Tissue

Timing is critical when collecting plant samples for herbicide analysis. Herbicides can be metabolized by the plant system very rapidly, drastically reducing the possibility of detecting even trace levels of the parent compound. Spray drift incidents of growth regulators are a good example of this problem since they are active at such low levels and by the time leaf symptoms have developed most of the parent compound has metabolized.

Another variable factor governing herbicide levels in the plant tissue is the rate of transpiration for the crop. If the plant is not moving the herbicide from the soil into the plant, such as in it's seedling stage, symptoms will not be evident. Once the roots start to extract nutrients from the soil solution, the herbicide levels can reach critical levels very quickly.

If herbicide damage is suspected, collect a tissue sample immediately and freeze it. This will essentially shut down the metabolic process of the plant tissue. Crop symptoms in the field can then be observed and the samples analyzed if crop growth is impaired or yield losses occur.

When collecting plant tissue samples, collect the portion of the plant most dramatically displaying symptoms. Since trace levels of the herbicide are being sought, it is very important to supply the lab with an adequate amount of plant tissue. Collect enough plant material to fill a quart size plastic bag, seal the bag and freeze it.

Just as with soil samples, it is suggested to also obtain a sample from the crop area which is not displaying damage symptoms to aid in interpretation of the test results.

Once samples are collected, plant tissue must be frozen and remain frozen until it arrives at the lab. Pack the samples in an insulated cooler and cover the samples with dry ice. In order to assure the samples arrive in good condition, they should be shipped to the lab using a 24 hour courier. In order to validate proper sample handling, we suggest accompanying the samples with a chain of custody document. These are available from the laboratory.

Interpreting Results

Lab results are reported in units of concentration of the herbicide found related to the fresh weight of the plant tissue. The terms normally used are mg/kg or ug/kg. "BDL" is a term used to report that the level of herbicide that may be in the sample falls below what the lab can detect. That level is referred to as the Detection Limit.

Just as with soil samples tested for herbicides, interpreting lab results of plant tissue can be a challenge. A multitude of other environmental factors will influence not only the concentration of herbicide found in a plant but also how well the plant can handle that level of herbicide. A report of analysis showing "BDL" for the result doesn't necessarily mean that the damage observed was not caused by the herbicide that was tested for. As stated before, timing is critical when testing plants for herbicide damage. We suggest having a field evaluated for herbicide crop damage by a trained specialist as soon as suspicions arise. In some cases, a visual inspection can provide more valuable information than a chemical analysis. The laboratory can then be used to conduct an analysis to confirm the diagnosis.