

A TRIED-AND-TRUE TEST FOR RESIDUES

Keep tender seeds and plants out of harm's way by using a bioassay to test for herbicides in soil.

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If there's one injury to crops that's preventable, its herbicide residue damage.

A simple bioassay uses susceptible plants to identify if the chemical is present in concentrations high enough to inhibit germination and/or growth. However, scientists sometimes use more sensitive bioassays to estimate herbicide concentrations in soil and water, and to identify unknown herbicide residues from the symptoms of injury.

A bioassay is a technique to determine if herbicide (or other chemical) residues are present in soil or water at high enough concentrations to adversely affect plant growth. This is a simple, direct way to decide if it's safe to seed or plant into areas previously treated with herbicides or into soil with an unknown herbicide use history.

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Some Recommended Bioassay Species And Expected Injury Symptoms

Herbicides	Test Species	Expected Symptoms
Acetanalides (Dual, Lasso)	Oat, ryegrass	Stunting, malformed leaves
Amitrol	Oat, cucumber, tomato	White (not yellow) leaves
Dinitroanilines (Treflan)	Oat, ryegrass, cucumber	Stunting, swollen and shortened roots
Isoxaben (Gallery)	Cucumber Mustard, chinese cabbage	Swollen roots, stunted plants Reduced emergence
Oxadiazon (Ronstar)	Oat, ryegrass, tomato	Stunted shoot growth, roots less affected. Some foliar necrosis.
Sulfonylureas and imidazolinones (Pursuit)	Tomato, cucumber, spinach	Stunting and general yellowing of new growth.
Triazines (Atrazine)	Oats Cucumber, tomato	Stunting, yellow leaves Stunting, interveinal yellowing of new leaves
Synthetic auxins (MCP, 2,4-D)	Cucumber, tomato	Malformed, twisted shoot growth

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Time to Test

Three situations are ideal for a bioassay:

- * When newly seeded or established plants show seemingly unexplained symptoms of injury, stress or decline.
- * When you seed or plant into areas previously treated with residual herbicides. Topsoil from abandoned farmland often contains herbicide residues, particularly atrazine, which can injure many plants.
- * When you suspect another product may have been contaminated with a herbicide. (Both the product and treated soil can be tested.)

How to Conduct a Bioassay

1. **Collect representative soil samples.** Sample from areas suspected of having herbicide residues as well as areas which are known to be free of herbicides. You will use the herbicide-free soil for comparison.

Take separate samples from high spots, low spots and different soils. Also sample areas where sprayer overlap could have resulted in an overdose.

Take soil cores. Remove the thatch and keep only the upper two inches of soil, where most residual herbicides will be bound. On sandy soils sample four inches.

Take several samples from an area and combine them. You need enough soil to fill several pots in which you will grow the bioassay plants. (I suggest 3- to 4-inch pots).

2. **Select the bioassay species.** The best bioassay species is usually the one you intend to grow. However, some crops do not grow well indoors in pots, nor do they respond rapidly or decisively enough to be reliable bioassay species. therefore, it's often better to select particular species known to perform well in bioassays, such as cucumbers and tomatoes (see Table 1).

3. **Seed and grow for about three weeks.** Seed the bioassay species in "clean" and "contaminated" soil. Place the pots in a greenhouse or on a sunny window sill and keep them

watered (do not waterlog). Watch for about three weeks.

4. **Evaluate plant growth.** Cucumbers and other broadleaf indicator plants should have three true leaves (not counting the seed leaves). Examine the overall growth, leaves and roots. Look for stunting, yellowing (or other discoloration), abnormal leaf or stem growth and swelling or stunting.

What if the Test is Positive?

If residues are present, you have three options:

Leave the soil fallow (or stockpile topsoil) for one growing season before planting.

Plant a species which is tolerant of the herbicide, such as a woody groundcover bed.

Incorporate (roto-till) activated carbon into the soil to a depth of six inches. The recommended amount to detoxify herbicide residues is 100 pounds activated carbon per acre for every pound of herbicide active ingredients (AI) per acre suspected to be present. After incorporating activated carbon, run the bioassay again to confirm detoxification.

Be aware that activated carbon does not detoxify all herbicide residues. Therefore, you may wish to run a small test in pots to determine whether the activated carbon will effectively detoxify the herbicide residues.

Mix 1/2 ounce (dry measure) of activated carbon in 1 quart of water. Add 1 quart of water. Add 1 fluid ounce of this to each 4-inch pot of soil. (This will approximate an application of 600 pounds activated carbon per acre.) Dump the soil in a bag and mix well, then return the soil to the pot and run the bioassay.

If the plants grow well, proceed with the application of activated carbon to the field. If the plants are still stunted, contact your local Cooperative Extension office for assistance.



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