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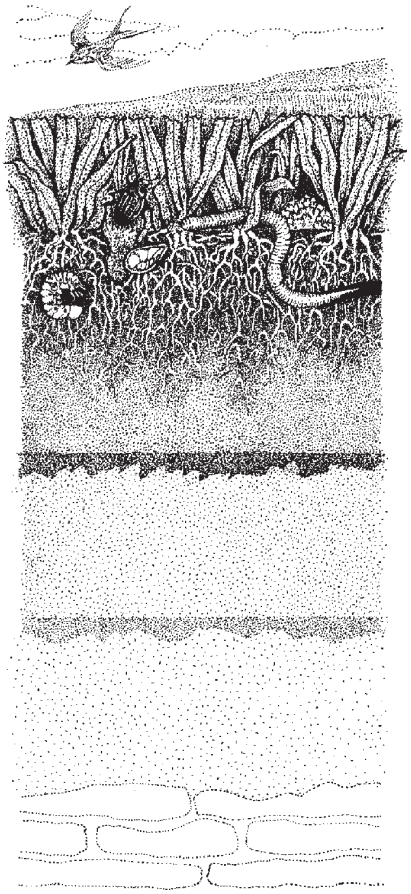

Conducting A Bioassay For Herbicide Residues

What is a Bioassay? A bioassay is a technique for determining 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 and direct method to determine if it is safe to plant turf or other landscape plants into areas previously treated with herbicides or into soil with an unknown history of herbicide use. ■

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

When is a Bioassay Warranted?

When turf is damaged by wear or other pests, residual herbicides, such as those applied for crabgrass control, can prevent turf emergence and establishment. Top soil brought onto the site often comes from abandoned farm land. These soils often contain herbicide residues, particularly atrazine, which can injure turf seedlings. Additionally, if you suspect that a herbicide contaminated product is responsible for some unusual turf injury, both the affected turf and the product can be tested.

How to Conduct a Bioassay

1. *Collect representative soil samples.*
   a. Sample 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.
   b. Take separate samples from high spots, low spots, and different soils. Also sample areas where sprayer overlap could have over-dosed the turf.
   c. Take soil cores. Remove the thatch and keep only the upper two inches of soil. Most residual herbicides will be bound in the upper two inches of soil. On sandy soils sample to four inches.
   d. Take several samples from an area and combine them. You need enough soil to fill a pot in which you will grow the bioassay plants (I suggest a 3 to 4 inch pot).
2. *Select the bioassay species.*

In general, the best bioassay species is the one you intend to grow. However, turfgrasses sometimes do not grow well indoors in pots, nor do they respond rapidly or decisively enough to be reliable bioassay species. Therefore, it is often advisable to select other species. For general bioassays, oats, cucumber, and tomato are

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This Times

Bioassay

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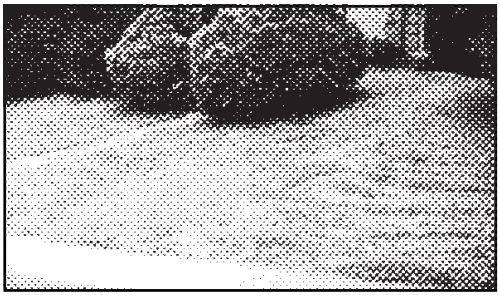
A bioassay determines if it is safe to plant turf or other landscape plants into areas previously treated with herbicides or into soil with an unknown history of herbicide use.

A bioassay is a simple, inexpensive, and accurate way to determine if herbicide residues are present at high enough concentrations to affect turfgrass seedling emergence and growth.

good species and are readily available. Table 1 provides a list of recommended bioassay species for detecting different herbicide residues.



Vandalized turf may require bioassay before reseeding.

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 windowsill and keep them watered (do not waterlog). Watch the plants for about three weeks.

4. Evaluate plant growth.

a. Oats in "clean" soil should be about four inches tall when you evaluate the plants. Cucumbers and other broadleaf indicator plants should have three true leaves (not counting the seed leaves).

b. Examine the overall growth, leaves, and roots. Look for stunting, yellowing (or other discoloration), abnormal leaf or stem growth, and root swelling or stunting.

If Herbicide Residues Are Present

There are basically three options.

1. Leave the soil fallow (or stockpile top soil) for one growing season before planting (in turfgrass areas this is generally not feasible);
2. Plant another species which is tolerant of the herbicide, such as a different turfgrass species, or install a woody ground cover bed; or,
3. Incorporate (rototill) activated carbon into the soil to a depth of six inches. The recommended amount to detoxify herbicide residues is 100 lb activated carbon per acre for

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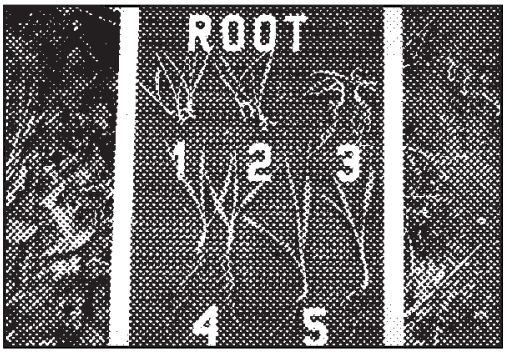

Oats as affected by preemergence herbicides.

Recommended Bioassay Species for Herbicides and Expected Injury Symptoms

Herbicides	Recommended Test Species	Expected Symptoms
Acetanalides (Dual, Lasso, Pennant)	Oat	Stunting, malformed leaves.
Amitrol	Oat, cucumber, tomato	White (not yellow) leaves.
Dinitroanilines (Balan, Treflan, pendimethalin, others)	Oat, cucumber	Stunting, swollen and shortened roots.
Isoxaben (Gallery)	Cucumber Mustard, chinese cabbage	Swollen roots, stunted plants. Reduced emergence; if plants emerge, roots are swollen/stunted.
Oxadiazon (Ronstar)	Oat, tomato	Stunted shoot growth, roots less affected; foliage necrotic where contacted by herbicide treated soil.
Sulfonylureas and imidazolinones (Glean, Oust, Lesco TFC, Pursuit, Arsenal, others)	Tomato, cucumber, spinach	Stunting and general yellowing of new growth.
Triazines (Atrazine, simazine, others)	Oats Cucumber, tomato	Stunting, yellow leaves. Stunting, interveinal yellowing of new leaves starting with about the 3rd true leaf.
Synthetic auxins (Banvel, MCPP, 2,4-D, Turflon, Picloram, others)	Cucumber, tomato	Malformed, twisted shoot growth.

Bioassay

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every pound of herbicide active ingredient (AI) per acre suspected to be present. After incorporating activated carbon, run the bioassay again to confirm detoxification.

If option three is chosen, 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 fluid ounce of this to each 4 inch pot of soil. [This will approximate an application of 600 lb 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.

A bioassay is a simple, inexpensive, and accurate way to determine if herbicide residues are present at high enough concentrations to affect turfgrass seedling emergence and growth. By conducting a bioassay on new top soil or in new seedings previously treated with a herbicide, you may avoid wasted time and turf seed, thus saving you time and money in the long run.

JOSEPH C. NEAL
DEPT. OF FLORICULTURE AND ORNAMENTAL HORTICULTURE

When turf is damaged by wear or other pests, residual herbicides, such as those applied for crabgrass control, can prevent turf emergence and establishment.

Summer Insects

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spring. Cutworm adults are often seen around lights in June in New York State. Caterpillars are called cutworms because they often clip grass blades at the crown and drag them into their burrows to feed. Cutworms may severely damage bentgrass greens if heavy populations are not controlled.

Cutworm damage.

Summer Management: Best method for determining heavy infestation of cutworms is to drench soil with disclosing solution. Adult moths in light traps and bird feeding in turf may suggest possible problems with cutworms. Insecticides must be watered in to reach cutworms in their burrows.

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CUTT is a quarterly newsletter from the Cornell University Turfgrass Faculty. The purpose of *CUTT* is to bring to you the latest research results from Cornell, as well as other universities, in a timely manner. Each issue, published to coincide with the change in seasons, will help you understand turfgrass better, enable you to manage your turf better, and maintain healthier turf with greater environmental protection ■

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