W1332

Know Before You Plant: How to Check Soil, Manure or Compost for Possible Chemical Contamination from Herbicides

Brooke Keadle Emery, Former Produce Safety Extension Assistant, Department of Plant Sciences
Annette Wszelaki, Professor and Commercial Vegetable Extension Specialist, Department of Plant Sciences
Bruno Pedreira, Associate Professor and Director, Forage Specialist, Department of Plant Sciences
David McIntosh, Coordinator and Researcher, Department of Plant Sciences
Forbes Walker, Professor and Soils Extension Specialist, Department of Biosystems Engineering and Soil Science

Are There Chemical Residues in Your Field?

Did you recently purchase new farmland? Was your farm impacted by a flood? Did you buy compost or manure from a new source? Each of these scenarios raises additional questions that you should ask to help prevent potential chemical contamination in your field that could impact crop growth (Table 1). Conducting a bioassay is an economical and easy way to determine if your soil or compost might have been contaminated with herbicides or other chemicals that will limit your crop emergence or growth.

Table 1. Potential causes of chemical contamination in field soil, compost, and manure. This is not an exhaustive list.

Reasons chemical residues could be in your soil or compost	
Herbicide drift	Unknown previous land usage
Previous herbicide sprays/accidental overapplication	Herbicides from forage survived in animal gut and through composting process
Large flooding events	Composting inappropriate materials
Area previously used to dump spray tanks	Compost contamination during transport/delivery

A note on herbicide residues in compost: The pyridine carboxylic acid class of herbicides, including aminopyralid, clopyralid and picloram are chemicals often used on pastures, grain crops and lawns. This class of chemicals is extremely persistent and remains active even after being consumed by animals in their feed, being excreted and being composted. In some cases, the herbicides may persist for one or more years after application. These herbicides also can remain active in hay or grass clippings used as mulch or used to create your own compost. These chemicals cause growth and development irregularities in broadleaf plants, particularly those in the tomato and bean families.

When buying compost, or getting materials from others to make your own, always ask if the component materials were sprayed with these herbicides, and if so, which ones? Table 2 lists common trade names of pyridine carboxylic acid herbicides likely to be sprayed in Tennessee. This list of common names can change frequently, so always check the label for the active ingredients.

Conduct a bioassay every time you plan to use new compost or manure to limit the risk of applying unintended herbicides on your field. Moreover, if you are a certified organic grower and unknowingly apply contaminated straw or compost to your field, you could lose your certification due to applying a prohibited substance.

Table 2. Common trade names for the pyridine carboxylic acid class of herbicides that are likely to be utilized in Tennessee. Trade names are current as of April 2025 and are subject to change.

Aminopyralid	Clopyralid	Picloram
Chaparral™	Hornet™	Grazon P+D™
DuraCor™	Redeem R&P™	Grazon PD3™
ForeFront™	Stinger EC™	Surmount™
GrazonNext HL™	SureStart II™	
Milestone™		

What Is a Bioassay?

A bioassay is a quick way to determine if there may be residual herbicides in your soil, manure or compost. Results of the bioassay will help you determine if it is safe to plant certain crops in your field this year or if your compost is suitable for field application.

Testing the soil, manure or compost for residual herbicides in a commercial laboratory can be expensive, as a separate test is required for each active ingredient or pesticide for which you are testing. In many cases, laboratory testing can produce false negative results due to the very low levels of herbicide (parts per billion or pbb) that might not be detected in the laboratory but may still result in injury to sensitive plants.

How to Conduct a Green Bean Bioassay

1. Collect a representative sample of the soil or compost that you would like to test:
    - If you have multiple fields, test each one separately. If you receive multiple compost deliveries, keep the piles separate and test each delivery separately.
    - Collect samples the same way you would for a soil nutrient analysis—from several different locations within the field (sample randomly across the field) to create one mixed sample. For compost, collect samples from several locations within the pile.
    - For field soil specifically, collect soil from the top 4-6 inches with a soil probe and mix your cores together, removing any plant biomass from the top.
2. Put soil or compost into small cups or pots labeled with the sampling location:
    - Create three to four pots (4-inch) from each sampling location for the best results.
3. Create three to four pots (4-inch) from each filled with clean potting soil or field soil you know is not contaminated. These will be used to compare to the other pots.
4. Plant two green bean seeds about 1-inch deep in each pot, water and place in a sunny window or greenhouse. Tend to your beans as you would any other crop with regular watering.
5. After 1-2 weeks, or when you have two to three true leaves on the plant, compare the growth of the beans grown in the known soil to the soil or compost samples that you are testing. Do they look the same? Are the green bean plants in the sampled soil, manure or compost contorted or oddly shaped? Did they germinate? See Figure 1 for examples.
6. Decide if the green bean plants in the sample soil or compost grew to your satisfaction. If yes, go ahead and plant in your field or spread your compost. If not, you may need to grow a different crop than planned this year or give the field ample time to allow chemicals to leach out of the soil. The time to leach the chemicals out of the soil will depend on the amount of herbicide present, rainfall, sunlight and other environmental factors. There is evidence that activated charcoal can inactivate herbicide residues in the field, but this may not be cost effective, depending on the size of the field. Always do another assay before planting back into the field with a sensitive crop.

Figure 1. *Examples of green beans showing chemical damage in a bioassay. Notice the puckered and twisted leaves. Photos by Annette Wszelaki.*

Do I Have to Use Beans?

No! Green beans are great to use because they are extremely sensitive to chemical damage, however, you can use any crop you plan to grow. Simply follow the same directions listed above, but plant the crop you wish to grow in the same way you would plant it in the field. For example, if you plant tomato transplants in the field, grow transplants in clean soil then move those transplants into your pots of collected soil to look for changes in appearance and health of the plants once roots have been allowed to grow into the soil (1-2 weeks).

Here is a list of crops that are sensitive to aminopyralid herbicides:
Amaranthaceae- spinach
Asteraceae- lettuce
Apiaceae- carrots
Cucurbitaceae- squash, melons, cucumbers, pumpkins
Fabaceae (legumes)- beans, peas
Rosaceae- strawberries
Solanaceae- tomatoes, peppers, eggplants, potatoes
Vitaceae- grapes
Several types of ornamental flowers

Conducting a bioassay is a simple and economical way to ensure you are planting crops in non-contaminated soil, compost or manure. It is a good idea to conduct a bioassay before planting on new land, when receiving a new load of compost or manure or after a flooding event. Never spread soil, compost or manure that you believe contains any type of chemical residue before doing a bioassay. If you encounter symptoms of chemical damage to your crops during a bioassay, plant a non-sensitive crop or do not plant a crop in the field for the year.

Online Resources

Herbicide Residues and Expected Damage for Several Different Crops: **content.ces.ncsu.edu/conducting-a-bioassay-for-herbicide-residues**

UT Herbicide Stewardship Website: **herbicidestewardship.tennessee.edu/herbicides/**

Herbicide Carryover in Hay, Manure, Compost, and Grass Clippings: **content.ces.ncsu.edu/herbicide-carryover**

2025 Weed Control Manual for Tennessee: **tiny.utk.edu/weed2025**

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