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A Quick Test for Atrazine Carryover
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A Quick Test for Atrazine Carryover

Residues of atrazine may remain in the soil and affect some susceptible crops the next year. Crops most often affected included soybeans, field beans, sugarbeets, alfalfa, oats, wheat and many broadleaf horticultural crops. Attempts to predict the extent of carryover and damage to sensitive crops the year following atrazine use have been only partially successful. The rate of atrazine disappearance and, therefore, the amount remaining the next year is affected by soil texture, pH and organic matter content as well as atrazine application rate, rainfall, and plant growth the previous year.

Chemical analyses for atrazine are slow, complicated, expensive and can be made only in specialized laboratories. In addition, results obtained from chemical analyses do not necessarily reveal whether your crop will be injured.

Plants Can Tell

Biological assays, using test crops similar to the field crop to be grown, are more practical and can be done with simple equipment found in most homes or offices. The biological assay outlined as follows does not provide an exact measure of the amount of atrazine present in the soil, but it can show you whether sufficient atrazine remains to harm sensitive crops.

The Soil Sample

Get a representative sample of soil from the field suspected of having atrazine residue. Take samples from the top 2 to 3 inches (5 to 7½ cm) from several locations. Atrazine residue often occurs in patches in a field. Sample enough places to avoid missing areas of high residue, such as

turn-around areas, eroded knolls and terrace channels. Plants growing in such areas frequently show the most injury. You may wish to take and analyze separately samples from areas where excessive residue is anticipated.

Collect your soil sample from at least six places in each area sampled. Remember that the assay is only as reliable or representative as the sample you begin with. A total of 10 pounds (4.5 kg) of soil are required for each sample assayed.

Assays should be run on the moist samples within two days after they are obtained from the field. Samples that cannot be assayed immediately should be stored in a freezer, if possible. Atrazine residue may decrease due to chemical and biological breakdown if samples are stored indoors under warm conditions.

Wet soil should be spread out and allowed to partially dry to a workable condition. If the soil is cloddy, crush so the clods are no larger than wheat seed, but do not pulverize.

A "No Atrazine" Sample Needed

Divide the 10 pounds (4.5 kg) of soil into two equal portions. Beans or oats will be planted directly into one portion; the other portion will be treated with activated charcoal prior to planting oats or beans.

Add one level teaspoon of activated charcoal to half (5 lbs—2 1/2 kg) of the soil. Mix the charcoal with the soil thoroughly. Any atrazine in this soil will be bound to the carbon in the charcoal and will be inactivated. Soil treated in this way provides the equivalent of a soil not treated with atrazine for comparison purposes.

Activated carbon or charcoal can be obtained as a non-prescription item at most drug stores for

NOTE: Authors are J. D. Furrer, Extension Agronomist, and Terry Lavy, Professor of Agronomy, University of Nebraska. This Bulletin is reprinted through the courtesy of the Agricultural Extension Service of the University of Nebraska — Gary Schultz, MSU Extension Specialist in Crop and Soil Sciences.



Atrazine injury on beans. Yellowing around the leaf edge is the first sign. Leaves next turn brown at the outer edges; browning later extends toward the center of the leaf. New leaves appear normal at first but eventually brown with continued atrazine uptake and exposure to sunlight.

a small charge. Many garden and hobby shops now stock activated charcoal for use in terrariums. For best results use powdered charcoal. Granular charcoal could be manually powdered prior to use, but it would be best to purchase powdered charcoal.

Potting soil or soil from a garden or fence row may be substituted for the charcoal treated soil sample. Be certain that the garden or fence row was not treated with a residual herbicide.

Planting and Growing

Flower pots or half-gallon (2 liter) or larger milk cartons are satisfactory for planting and growing. If cartons are used, cut and lay them down for planting purposes. Use the same kind of container for both treatments. Punch holes in the bottoms for drainage. Fill one container using charcoal treated or uncontaminated soil and another with soil as it came from the field. Properly identify each container.

Plant 6 beans (soybeans, field beans or garden beans) or 10 oat seeds in each container. Press or punch the seeds no deeper than 1/4 inch (6 mm) into the soil. Thoroughly wet the soil. Germinate beans at 72°F (20°C). Lower temperatures are satisfactory for oats. Cover the containers with plastic food wrap until plants begin to emerge to help insure favorable moisture conditions during germination. At emergence remove the plastic. Water as needed. Do not let the soil dry out.

Soon after emergence, thin the beans to 3 plants per container by clipping. Thinning should be done as soon as possible after emergence to reduce the amount of herbicide removed by



Atrazine injury on oats. Browning starts at the leaf tip and progresses towards the stem.

discarded plants. It's not necessary to thin the oats. Plant and thin so there is uniform distance between the seed and plants.

Keep the containers in a warm place (70 to 75°F—20 to 22°C) where they will get as much sunlight as possible. *Sunlight is essential for the development of atrazine injury symptoms.* Artificial light has much less intensity than sunlight and, therefore, is not entirely satisfactory.

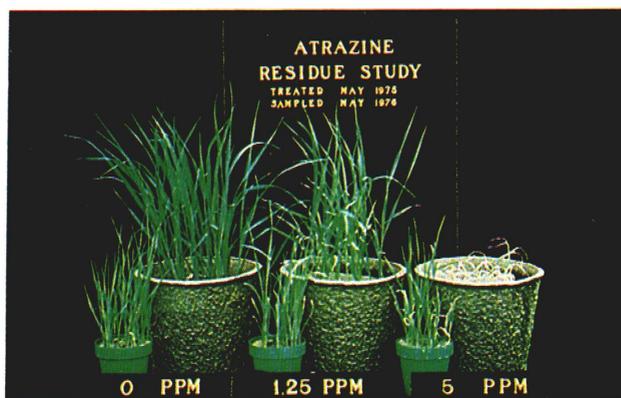
The Symptoms and Crop Choices

Atrazine injury symptoms on seedlings should become apparent between 8 and 20 days after the plants emerge. Less time is required if high levels of atrazine are present. With temperatures lower than 70°F (20°C), it will take longer. When low atrazine levels are present, atrazine symptoms normally appear in 2 weeks, providing moisture, temperature and light have been favorable. Leaf tips or edges of the older, more mature leaves become chlorotic (yellow-brown). At about the same time a brown speckling may appear near the soybean leaf edges. Eventually chlorosis may spread over the whole leaf. Plants growing in charcoal treated or uncontaminated soil should be normal. NOTE: If test plants die in both containers, disease could be the cause.

If atrazine symptoms occur, plant the field from which the samples were obtained to an atrazine tolerant crop such as corn or sorghum.

Why Limit Plant Population When Testing?

Recent research shows that too many plants per container do not detect low atrazine residues. *It is most important that plant numbers be kept low.* Three bean plants or ten or less oat plants



The small pot and large pot behind the signs marked 0 ppm, 1.25 ppm and 5 ppm contained the same concentration of atrazine and the same number of oat plants. The oat plants completely died in the large pot containing 5 ppm atrazine while in the small pot there were injury symptoms but not death. Plant to soil ratios are important for accurate atrazine bioassays.

are all that should be used in 5 to 10 pounds (2 1/2 to 4 1/2 kg) of soil. These numbers more nearly approach field conditions and will provide a more accurate indication of low atrazine levels.

Simply put, when large numbers of plants are present, each plant extracts a very small amount of atrazine from the soil—an amount so small that it may not be toxic to the bean or oat plants. When fewer plants are grown in the same amount of soil, the roots have more room to spread out. With more root room per plant, each plant is able to extract more atrazine from the soil and will show greater injury symptoms, or even death, if the atrazine is present in harmful amounts.

Bioassay Not Limited to Atrazine

The bioassay outlined has been directed to atrazine (AAtrex). Since atrazine is used so extensively and is relatively long lasting, more problems have occurred with it than with other materials.

The same bioassay procedure could be used to determine soil residues of metribuzin (Sencor/Lexone), simazine (Princep), linuron (Lorox), cyanazine (Bladex) and other triazine or substituted urea herbicides.

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