PI 164

UF UNIVERSITY of FLORIDA
IFAS Extension

Activated Charcoal for Pesticide Inactivation[1]

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Activated charcoal in general

Activated charcoal is a very porous, soft, black substance made by heating materials containing carbon within a restricted amount of air. These are most often derived from hardwood trees and coconut shells. Charcoal adsorbs 100 to 200 times its own weight. The adsorption capacity is developed by activating the charcoal through heating. Powdered activated charcoal is made up of very small carbon particles that have a high affinity for organic chemicals, such as pesticides. It has a very large surface area to which organic molecules can bind. When activated charcoal is applied to pesticide-contaminated sites, the pesticide molecules are attracted to the charcoal particles and bind upon contact. Activated charcoal is not effective for inorganic pesticides such as arsenates, lead compounds, sodium chlorate, sulfur, borax, and water soluble organic pesticides, such as but not limited to MSMA and DSMA. Besides pesticide inactivation, other uses of charcoal include:

- As a medicinal antidote for poisonings
- For deodorizing air within the home
- As an ingredient in some soaps used for bathing
- For drinking water filtration

Spill remediation

Activated charcoal can be used for reducing the effects from spills of organic pesticides, some petroleum products, and hydraulic fluids. Some of these sites may be in close proximity to a water source, such as a well. On some sites, pesticide levels in soils may be quite high where pesticides have been mixed and loaded for many years. The absence of vegetation on these sites indicates pesticide residues. Unfortunately, there is no sure way to determine how much pesticide residue remains in the soil of such a site. If the site will be treated with activated charcoal, planting some type of seed several weeks following the treatment will indicate whether residues are still present. If the seeds germinate and seedlings appear healthy, it can be assumed that the effects of the pesticides have been inactivated. If the seedlings

1. This document is PI 164, one of a series of the Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Originally published January 1996 as ENH-88, a fact sheet in the Environmental Horticulture Department. Revised June 2008. Visit the EDIS Web Site at http://edis.ifas.ufl.edu.

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All chemicals should be used in accordance with directions on the manufacturer's label.

appear unhealthy, do not grow, or die, the area may need to be retreated.

Inactivation of pesticides

If a pesticide, such as an herbicide, has been applied to a site where susceptible plants will be seeded or transplanted, activated charcoal can be used to adsorb or inactivate the pesticide. Activated charcoal can also be used to clean out spray systems in order to negate phytotoxic effects to susceptible plants from herbicide residues.

How to apply

For small areas, a sprinkling can or garden sprayer may be used. Because of the limited agitation available on a garden sprayer, the slurry should be premixed and poured through a screen to assure complete mixing. Stir or agitate frequently during application.

For large areas,

- Use spray equipment designed for concentrated wettable powders. This includes centrifugal pumps, piston pumps with ceramic cylinders, and hardened stainless steel nozzles capable of handling abrasive powders.
- Consult standard commercial literature, or the distributor of the specific activated charcoal product for the choice of nozzles, pressures, and other conditions to achieve the desired dosage. All spray equipment should be calibrated.
- Make sure spray equipment, tubing, screen and nozzles are completely clean. Physical examination of screens and nozzles is recommended. Remove the screens if practical.
- The final spray mixture should contain 1 pound of activated charcoal in each gallon of water.
- Add sufficient water to begin moderate agitation. Simultaneously add the balance of required water and activated charcoal. Continue agitation until a uniform mixture is obtained.
- Maintain moderate agitation while spraying.

Amount to apply for specific uses

- *Spills.* Activated charcoal can be used on organic pesticides, some petroleum products and hydraulic fluids. Use 100 pounds of activated charcoal to every pound of active material spilled, but no less than 2 pounds of activated charcoal per 150 ft^2 (600 pounds per acre) of contaminated area. The activated charcoal should be worked into the contaminated soil, preferably to a depth of 6 inches. With severe spills, it may be necessary to remove some of the contaminated soil prior to the application of activated charcoal.
- *Sprayer cleaning.* Activated charcoal can be used to clean spray equipment after pesticide application. For large sprayers, first wash with water containing 1 cup of detergent for each 50 gallons of wash water, circulate through the entire system, and then drain. Next, fill the tank half full of fresh water. Add 1 pound of activated charcoal for each 50 gallons of wash water. Then, add the balance of water to completely fill the tank. Recirculate the wash water for 15 minutes, then flush it through the sprayer's nozzles for another 10 minutes. Drain the system and flush with fresh water until all evidence of the activated charcoal has disappeared from the rinse water.
- *Turf herbicides.* Turf areas that have been treated with preemergence herbicides can be reseeded earlier than normal by treating them with activated charcoal. Whenever it is desirable to terminate the effect of a preemergence herbicide, apply an activated charcoal slurry at a rate of 1 pound in 1 gallon of water for each 150 ft^2. The slurry should be watered into the soil and the grass washed free of heavy deposits. Where possible, it is desirable to rake the charcoal into the soil thoroughly. The area can be seeded 24 hours after the treatment.

- *Crop rotation.* It is often desirable to plant an herbicide-sensitive crop in soil previously treated with herbicide, or in soil where harmful residue remains. Activated charcoal can be used to reduce the effects of such undesirable residues. Before using however, consider that the herbicide product's label directions for rotational restrictions must take precedence. The application varies with the type of crop and the amount of residue. In general, 100 pounds of activated charcoal per acre is used for each pound of active ingredient applied to the soil with a minimum rate of 300 pounds per acre. The charcoal should be worked into the top 6 inches of soil for effectiveness.

Examples

Example 1 (Desirable, but susceptible planting). Golf course superintendents plan to overseed dormant Bermudagrass fairways with ryegrass for a green-up during the cooler months. The label of the herbicide that was applied for summer annual weed control states to wait at least 3 months following the last application to overseed. Superintendents want to be sure that the effects from any residual herbicide are negated. How much activated charcoal should be applied to inactivate the herbicide? They should use 1 pound in 1 gallon of water for every 150 ft^2 of turf. They would need to calculate the square footage area of the fairways that will be treated for the total amount of activated charcoal needed.

Example 2 (Spill remediation). A site that has been used for mixing and loading pesticides for many years will be inactivated. If the site is 20 feet by 20 feet (400 ft^2) and you assume the level of pesticide is 50 pounds per acre, this would be equivalent to 0.46 pounds of pesticide active ingredient within this site. Applying too much activated charcoal should not cause a problem, therefore it is always best to estimate the amount of pesticide residue within the soil on the high side. Based on applying 100 pounds of activated charcoal for each pound of pesticide active ingredient, 5,000 pounds per acre of activated charcoal would be needed on a per acre basis. Because this site is 400 ft^2, the amount of activated charcoal needed would be 46 pounds.

Additional information

MeadWestvaco. http://us.meadwestvaco.com/index.htm (accessed April, 2008).

Norit Americas Inc. www.norit-americas.com (accessed April, 2008).

Table 1. Conversion from pounds of activated charcoal per acre to pounds per 1,000 ft^2.

Pounds per acre	Pounds per 1,000 ft^2
100	2.3
200	4.6
300	6.9
400	9.2
500	11.5
600	13.8