

Pesticide Residues¹

Frederick M. Fishel²

This fact sheet discusses factors that affect residues of pesticides, including the reasons for their persistence and means to avoid their hazards.

Introduction

Whenever pesticides are applied, their residues will remain on treated surfaces for a time. The chemical properties, frequency of application, rate applied, and environmental factors determine how much residue will be present. Residues are important in certain circumstances and necessary for some types of pest control where their presence provides continuous control. Herbicides applied where crop rotation is not a factor or in areas where total long-term weed control is desired, such as fence-rows and adjacent to buildings, are examples of this phenomenon. Protecting structural foundations from termites is another desirable feature of pesticide residues. However, residues are undesirable when they expose people, domestic animals, or wildlife to unsafe levels of pesticides. Pesticides that move off-site or miss the intended application site can remain as residues in soil, water, or on surfaces. Also, pesticide containers can hold small amounts of residues that require proper cleaning and disposal to

prevent environmental contamination (refer to EDIS Fact Sheets PI-3 *Pesticide Container Rinsing* and PI-18 *Proper Disposal of Pesticide Waste*). Acceptable levels of residues for any pesticide are known as its tolerance and set by government agencies. The tolerance is the maximum amount of a pesticide that may remain on or in raw agricultural commodities. Research is conducted using laboratory and animal tests to establish tolerances. From this research, amounts of pesticides which remain are determined to be harmless to consumers. A conservative margin of safety is included in tolerance levels when established by the Environmental Protection Agency (EPA). Each pesticide that is registered for a food use must have an established tolerance, and their levels will vary depending upon the pesticide's mode of action, toxicity and all uses of the pesticide. In establishing the tolerance of a pesticide, researchers consider the total diet of the consumer and their nonfood exposure over a lifetime of 70 years. State and federal agencies monitor produce to ensure that growers do not exceed pesticide residue tolerances. Any produce that is found to exceed a tolerance is seized. Occasionally, pesticides can be erroneously present due to:

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2. Frederick M. Fishel, Associate Professor, Agronomy Department, and Director, Pesticide Information Office; Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

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- The crop absorbing pesticides that were applied to the site previously;
- A grower applying pesticides to an unregistered crop;
- A grower applying a rate of pesticide that exceeds the label recommendations;
- The pesticide is applied too close to the crop's harvest; or
- Drift of a pesticide from another site.

Postharvest use of pesticides can also leave residues on produce. Improper use of pesticides in warehouses, markets, or restaurants may also leave illegal residues on food products. According to a 2000 survey by the Food Marketing Institute, food safety was identified as the number one issue that can affect a retail operation. Although very rare, excessive pesticide residues on food products are a concern. The persistence of a pesticide is the amount of time from its application until its breakdown. Certain pesticides do not degrade rapidly in the environment, thus would be referred to as persistent. Some of these pesticides, such as many of the chlorinated hydrocarbon insecticides, were banned for use once these characteristics were determined. Undesirable features of persistence include:

- The potential for pesticide exposure;
- Some pesticide labels will require longer restricted-entry intervals, and
- The increased chance of the pesticide leaving the treated site through water movement, leaching, and wind.

Persistence may restrict growers from planting certain crops on a previously treated site. Regulations establish plantback restrictions to prevent injury from residues to subsequent crops. When these restrictions apply, the pesticide label will specify which may be grown or those which should not be planted. The label will also state how long after application a grower must wait before planting other crops. Plantback restrictions are a good reason for keeping accurate pesticide application records.

Pesticide Accumulation

Accumulation refers to the buildup of pesticides resulting from repeated use. It may occur in the soil, groundwater, plants, lakes, ponds, and animal tissues. A concern in Florida is that copper compounds used as fungicides in citrus groves accumulate after many years of use.

Pesticide Breakdown (Degradation)

Special hazards may exist when pesticides degrade in the environment. Some degrade into toxic compounds before breaking down further. Others may fail to break down because of unusual environmental conditions. Each location has unique environmental conditions that will influence the way chemicals degrade. Some of these environmental factors include:

- Soil texture;
- Soil moisture;
- Soil organic matter;
- Air flow, temperature, and rainfall; and,
- The presence of plants and animals.

For example, some herbicide rates must be adjusted according to the type of soil that they are applied to in order to be effective, or in some cases, to prevent crop injury.

Avoiding Hazardous Residues

The following measures can reduce the hazard of harmful pesticide residues:

- Comply with label directions for application rate, timing, and placement;
- Avoid incompatible mixtures that create pesticide wastes;
- Avoid pesticide spills;
- Prevent back siphoning into sources of water during the mixing process;

- Calibrate application equipment accurately;
- Avoid mixing more material than is necessary for the job;
- Select pesticides that break down rapidly; and,
- Use formulations that reduce the chances of drift.

Damage to Treated Surfaces

Pesticides may sometimes stain or damage treated surfaces where they are exposed. The pesticide's active ingredient or its inert ingredients may be responsible for the damage (refer to EDIS Fact Sheet PI-44 *What Are Inert Ingredients?*). Application rates and the concentration of the spray mixture may be responsible for this type of damage. To determine if damage to the treated site will occur, apply a small amount to a test area first.

Additional Information

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