

Mode of Action of Herbicides and How to Prevent Failures

Herbicide registrations vary by fruit crop and tree age. Always read the label carefully, and pay close attention to restrictions and application times and rates.

Herbicide mode of action

Herbicides must (1) adequately contact the target weeds, (2) be absorbed by the weed, (3) move within the weed to the site of action without being neutralized, and (4) be in high enough concentration to be toxic at the site of action. The mode of action refers to the chain of events from absorption to the weed's death. The specific site the herbicide affects is referred to as the site of action. Understanding herbicide mode of action is helpful in knowing what groups of weeds are killed. It can specify the application technique that will be most effective. It can help in diagnosing herbicide injury problems and preventing the development of herbicide-resistant weeds.

A common method of grouping herbicides is by the mode of action. Many herbicides have similar chemical properties and are grouped into chemical families. In some instances there may be two or more chemical families that may have the same mode of action and can, therefore, be grouped into herbicide classes. Rotating to a herbicide that has a different mode of action on an annual basis can prevent the buildup of resistant types of weeds and will help maintain a diverse weed population without the increase of any dominant species. For a complete listing of herbicides by their class, go to the [HRAC website](#).

Herbicide failure

Many growers who apply herbicides but do not obtain the desired results blame the material. However, in many cases it is not the fault of the herbicide but rather that of the applicator. Unlike insecticides and fungicides, many soil-applied herbicides need rain to work well. They need about ½ inch of rain shortly after application to activate them. Some herbicides, like Casoron, need rainfall to move them into the soil away from sunlight to prevent photodegradation. Also, if rainfall comes some time later, it will stimulate germination of weed seedlings just at the time that the concentration of the herbicide falls below its effective level due to natural breakdown in the soil. With our erratic weather patterns in the last few years, herbicides in orchards have not performed as well as we would like. Most herbicides generally do not give complete season-long control of all weeds, especially in young plantings where the canopies have not filled out completely. In older, more mature plantings, denser and fuller canopies often provide some shade that helps inhibit weed seedling growth under them.

The second most common reason for herbicide failure is applying materials that do not control the weed species present in your orchard. Read the label carefully and be sure the material you are using is labeled to control your problem weed. This means you must also be able to correctly identify the weed. There are many pictorial sites for weed identification on the web.

The third most common reason for poor weed control is applying the material at the wrong time. Poor timing is more of a problem with materials such as glyphosate, Fusilade, Poast, and 2,4-D. Read the label carefully to determine the appropriate time for the best control of the weed species present. Environmental conditions can also affect timing. Most postemergent herbicides should be applied when the weeds are not under stress and instead are actively growing.

The last possibility for failure is the development of herbicide-resistant weed species. Similar to the way apple scab can develop resistance, the overuse of a single mode of action herbicide can speed the development of resistance. Rotate the herbicides you use to incorporate different modes of action. To learn more about herbicide mode of action, visit the [Herbicide Resistance Action Committee website](#).



Please refer to the [Penn State Extension Tree Fruit Production Guide](#) for chemical recommendations.

Contact Information

Robert Crassweller

Professor of Tree Fruit

rnc7@psu.edu

814-863-6163

extension.psu.edu

Penn State College of Agricultural Sciences research and extension programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

Where trade names appear, no discrimination is intended, and no endorsement by Penn State Extension is implied.

This publication is available in alternative media on request.

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to all qualified applicants without regard to race, color, religion, age, sex, sexual orientation, gender identity, national origin, disability or protected veteran status.

© The Pennsylvania State University 2017