



## Weed Control in Hops

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### Introduction

Because hops are long-lived perennials, controlling weeds near plants without causing injury can be challenging. Furthermore, empty spaces between rows can quickly become filled with weeds if left unmanaged. Growers therefore need a year-round weed management plan. An important part of that plan is identifying the common weeds at the site and understanding their life cycles. Once weeds have been identified, a management plan can be developed using cultural, chemical, or integrated approaches.

### Weed Life Cycle

**Annuals:** These weeds complete their life cycles within one year. This group can be subdivided into summer annuals, which germinate in spring and summer and generally are killed by frost, and winter annuals that germinate primarily in fall and die off with the onset of hot, dry weather in late spring.

**Biennials:** These weeds complete their life cycles over the course of two years. The common biennial weeds are all broadleaves.

**Perennials:** These weeds can live for many years. Furthermore, some perennials are “creeping,” meaning that they can spread asexually through structures like rhizomes or stolons. Perennial grasses can be divided into warm-season ones, such as bermudagrass, which go dormant in fall and resume growth in spring, and cool-season ones, like quackgrass, which stay green throughout the year.

### Weed taxonomy

Weeds can also be classified into plant families based on their morphology, including the number of cotyledons at germination.

**Broadleaf plants (Dicots):** This term applies to plants that have two seed leaves (cotyledons) when they germinate from seed. Certain selective herbicides exist which can be used to control broadleaf weeds without killing grasses or sedges.

It should be noted that broadleaf herbicides could kill or injure not only weeds but also desirable broadleaf plants such as clover, alfalfa, soybeans, ornamental plants, and common vegetables if these plants come into direct contact with the product. Most notably, hops are broadleaf plants and should therefore be shielded from contact with herbicides which target broadleaf weeds.

### Monocots

These plants have one seed leaf (cotyledon) when they germinate from seed. Two major subgroups within the monocot group are the grasses and the sedges. It is important to tell these two groups apart as most grass herbicides do not affect sedges and most sedge herbicides do not control grasses.

**Grasses:** This term applies to plants that have round or flattened stems, and long, narrow leaves with parallel veins. Leaves are two ranked. Certain selective herbicides exist which can be used to control grasses without killing desirable broadleaf plants.

**Sedges:** These plants have a grass-like appearance but are not grasses. Sedges have triangular stems and the leaves are three ranked. To differentiate between sedges and grasses, use the reminder that “sedges have edges.” The products needed for

chemical control of sedges can also differ from products appropriate for grass control.

It cannot be stressed enough that weeds should be properly identified before a grower chooses a control program. Many common weeds can vary in growth habit according to their annual or perennial nature and therefore may vary in response to each control method. Furthermore, they may spread through seeds, vegetative reproduction, or a combination of both. As a result, not every weed control method is appropriate for each nuisance plant and choosing the wrong method could possibly even worsen the problem. For example, mowing mature pigweed in the summer can help the plant disperse hundreds of thousands of its seeds; in the same vein, repetitive mowing can be used over time to weaken a stand of Johnsongrass. For assistance with weed identification, visit the local Extension office or use the identification tool located at <http://oak.ppws.vt.edu/weedindex.htm>.

### Weed Control Tactics

In any weed control program, growers may choose one method or may utilize a combination of weed control tactics. These options are outlined below.

**Cultivation:** Tilling and other forms of cultivation are common for weed control in many crop production systems. The drawbacks of cultivation include increased soil erosion, some damage to soil health and structure, and the possibility of damage to hop plants if cultivation takes place too close to crowns. Cultivation can also bring underground weed seeds near the surface for germination, and certain weeds such as crabgrass and pigweed have a propensity to emerge and thrive in disturbed soils. Finally, weeds such as bermudagrass which spread via stolons or rhizomes may survive cultivation and continue to grow from intact pieces of plant tissue. Cultivation can spread plant parts of creeping perennials such as yellow nutsedge tubers and bermudagrass stolons, resulting in greater weed density. On the other hand, cultivation temporarily results in a smooth, weed-free surface for site establishment or planting a cover crop between rows. Cultivation can also be highly effective at

killing weed seedlings such as crabgrass, an annual. If cultivation is used, the ground ideally needs to be covered with a mulch or a desirable crop must be planted quickly so as to outcompete weeds that emerge after cultivation.

**Hand-pulling:** Although tedious and labor-intensive in a large hop yard, hand-pulling certain weeds is a worthwhile practice. In fact, some row crop farmers employ the practice to resolve certain problems even in large fields. Situations that warrant hand-pulling in the crop world include finding weeds that “escaped” an herbicide application. Weed control will never be 100% effective following an herbicide application. One special reason for hand-pulling weeds is to restrict the spread of herbicide-resistant weeds. Certain weed species in Virginia, including populations of redroot pigweed, smooth pigweed, Palmer amaranth, and common lambsquarters have developed resistance to certain herbicides. Although herbicide-resistant populations may not be prevalent in hop yards, it is prudent to hand-pull troublesome weeds that survive an application of an appropriate product. Preventing seed production will reduce the weed seed density in the soil, reducing the weed population in future growing seasons. Escaped plants of annual weeds such as Palmer amaranth can produce thousands of seeds. If mowing, spraying, cultivation, or other methods do not control these plants while they are still small, hand-removal and burning or bagging of the larger, seed-producing plants is the best way to ensure that seeds do not shatter off the plant and back into the hop yard. Some weeds are difficult to remove by hand-pulling, such as common pokeweed, which has a large tap root, or yellow nutsedge, as hand-pulling generally leaves the rhizomes and tubers underground. Weeds which reproduce asexually, those which have a large taproot, or those with deep root systems may be good candidates for a weed control program which includes spot-treatments with an herbicide.

**Mowing:** In general, mowing is an effective way to control weeds that grow upright because recovery from close, frequent mowing requires the plant to expend root reserves and also because timely mowing can keep weeds from producing seeds.

Mowing can be used to stimulate young, tender growth, which is better at absorbing herbicides. The repeated mowings preceding the spray application are helpful for stressing weeds, making them more susceptible to herbicides. However, mowing should be halted a few weeks prior to herbicide application so that the weeds can re-grow enough leaf area for the product to be properly absorbed. Exceptions to this rule of thumb include wild onion and wild garlic, which can be mowed close to the herbicide application to enhance uptake of the product.

Ideally, large weeds that have mature seed should not be mowed but rather hand-pulled and removed from the production area. If these weeds can feasibly be hand-pulled, it is worthwhile to remove them before mowing so that the seeds are not dispersed and added to the seed bank in the soil for future years. Clippings containing weed seed can be bagged, but this may not be feasible in a large hop yard.

**Mulching and Covering:** Mulching can be an excellent weed prevention strategy. Mulch made of straw, wood chips, and other natural materials also helps retain soil moisture and can create a layer of compost as it decomposes. However, the breakdown of non-composted mulch will also consume some of the available nitrogen in the yard. Furthermore, mulch is more effective for controlling annual weeds than perennial weeds. Organic mulches as well as black plastic and landscape fabrics can also provide cover for rodents that may consume crop plants. Deep layers of mulch piled up against crop shoots may cause damage to the crop. Black plastic provides greater weed control than organic mulches but does not allow for rain to pass down to the roots and restricts gas exchange. Landscape fabrics provide lower weed control than solid black plastic but do allow for water and gas exchange. Weeds can emerge from any cracks or tears in the plastic cover.

**Herbicides:** Chemical products controls can be highly effective for controlling weeds. Weeds can be spot-sprayed, or an entire area can be treated with a product that kills existing weeds or one that prevents their germination. In general,

preemergence herbicides are used for control of annual weeds, while postemergence herbicides are generally needed for control of perennial weeds. As a general rule, postemergence herbicides are more effective at warmer outdoor temperatures and some may need to be mixed with an adjuvant to achieve thorough leaf coverage or to improve absorption into leaves. Spraying near actively-growing hops could be risky if the product in question is capable of killing broadleaf plants. To reduce the risk of drift which can cause injury, avoid spraying on windy days and use a sprayer nozzle that creates a large droplet size. Always follow label directions for spray timing and hop plant protection measures.

### Herbicides in the Hop Yard

There are several ways to classify herbicides. These classifications are important to understand when reading product labels and choosing a control program.

**Preemergence herbicides** are used to control weeds as they emerge, preventing them from establishing. In general, preemergence herbicides do not control emerged weeds. If weeds are present when a preemergence herbicide is to be applied, they can be controlled by using a postemergence herbicide or through cultivation.

**Postemergence herbicides** act on visible, established weeds. Certain postemergence herbicides have no soil residual activity, so they will not control any weeds that germinate after application.

Postemergence herbicides can be divided into selective and nonselective types.

**Selective herbicides:** Selective products kill a specific type of weed. In many cases, they target either broadleaf or grassy weeds. A product for killing broadleaf weeds and woody plants could also harm hops if it improperly contacts them. There are also certain **non-selective** products that can kill both broadleaf and grass plants.

**Postemergence herbicides can also be categorized as “contact” or “systemic.”** Contact herbicides kill plant tissue where the product touches the plant, whereas **systemic herbicides** are transported throughout the plant and can be used to kill not only sprayed foliage but also underground plant parts. Contact herbicides quickly burn leaf tissue but do not affect underground portions of perennial weeds. Systemic herbicides are slower-acting but are the preferred type for perennial weed control.

**Legal Considerations:** All pest control products are classified as General Use products or Restricted Use products by the Virginia Department of Agriculture and Consumer Services. GU products do not require the user to have a pesticide applicator certification, while RU products do. However, there are other factors aside from product classification which may require an applicator to be certified in order to use pesticides lawfully. Please see the VDACS pesticide page at <http://www.vdacs.virginia.gov/pesticides/> or speak with the local Extension office for assistance with questions about pesticide applicator laws and to determine if you will be required to become a certified applicator.

A product must be registered for use in Virginia and registered for use on hops in order to be used

lawfully for weed control in hops. Furthermore, “the label is the law,” so the product should only be used on sites specified on the label to target weeds specified on the label, and all other label directions must be followed. Although product labels can be lengthy, they contain critical information for users including measures to mitigate the risk of injury to hops plants, required personal protective equipment and handler safety procedures, directions for use, approved rates for various targeted weeds, and stipulations for days required between application and planting of a new crop, known as the “plantback interval.” The label also indicates the required number of days between the last application and harvest of the crop on the site. This is known as the “pre-harvest interval,” or PHI.

**Choosing a Chemical Control Option for Hops:** Extension recommendations are updated annually according to product registration changes, label changes, and other factors. As a result, specific recommendations and product rates for use on hop yards are listed in the Virginia Cooperative Extension Pest Management Guide which can be accessed through your agent or by visiting [www.ext.vt.edu](http://www.ext.vt.edu).