Why ID Weeds First?

• One size does not fit all.
  • Ex: Mowing mature pigweed in the summer vs repetitive mowing of Johnsongrass.

• For assistance with weed identification, visit the local Extension office or search on [http://oak.ppws.vt.edu/weedindex.htm](http://oak.ppws.vt.edu/weedindex.htm)

• This site has detailed ID info (leaf, stem, flower features)

• Plant ID lab at VT-talk to your agent to submit a sample
Know the Enemy - Classifications

- **Annuals**: These weeds complete their life cycles within one year.

- **Biennials**: These weeds complete their life cycles over the course of two years. Most are 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.
Examples - Annuals

Crabgrass
Examples - Biennial

Bull Thistle
Examples - Perennials

Bermudagrass/Wiregrass
Know the Enemy - Classifications

- **Seasonal Growth Habits:**
  - Summer annuals dominate between the spring and fall frost. Summer annuals will be killed by fall frosts, while perennials such as Bermuda grass may go dormant until spring returns.
  - Winter annuals prefer cooler temperatures when moisture is abundant. They grow rapidly in the fall and die off in the late spring when temps get hot and weather is dry.
Examples-Summer Annual

Lambsquarter
Examples-Winter Annual

Henbit and Deadnettle
Know the Enemy-Classifications

- **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.
Know the Enemy:

Classifications

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.
Examples-Broadleaf

Horsenettle
Examples-Grasses

Nimblewill
Examples - Sedges

- Yellow and purple
- “Sedges have edges”
Other Common Weeds
Bluegrass (Annual, Kentucky)

- Boat-shaped tip
Johnsongrass

- Summer perennial
Bindweed (looks like Morning Glory)

- Perennial
Brambles
Broomsedge

- Perennial grass
Carpetweed

- Summer annual
Cocklebur

- Summer annual
Chickweed

- Common: winter annual
- Mousear (fuzzy!): perennial
Dandelion

- Perennial
Deadnettle

- Winter annual
Dodder

- Parasitic vine
Dog Fennel

- Perennial
Garlic

- Perennial
Kudzu

- Let’s hope this isn’t what your hop yard looks like!
Milkweed

- Perennial
Palmer Amaranth

Summer annual
Pigweed (Redroot, Spiny, Smooth, Prostrate)

Summer annual
Plantain

- Perennial
Poison Hemlock

- Biennial
Poison Ivy
Purselane

- Succulent summer annual
Ragweed

- Summer annual
Tree-of-Heaven
Virginia Knotweed and Smartweed

- Smartweed - Summer annual
Which weed control options are in our toolbox?
Which weed control options are in our toolbox?

- Hand-pulling
- Cultivation
- Mowing/Clipping
- Organic and Conventional Spray Treatments
- Mulching/Covering
Tillage + Cultivation

• Cons:
  • Soil health, erosion
  • Labor/fuel
  • Damage if done close to crowns
  • Brings new weeds to surface, annuals take advantage
  • Some plants may survive and be spread by it

• Pros:
  • Smooth, weed-free surface
  • Can be highly effective at killing many weed seedlings such as crabgrass
  • Can be used to incorporate cover crops, green manures, fertilizers

• If you till, get competitive edge before weeds do
• Try spot-cultivation-chopping, etc
Cover Crops behind Tillage

Legumes to build N:
• Alfalfa-spring, late summer
• Hairy Vetch-early fall
• Crimson Clover-spring, fall
• Fava Beans-early spring, late summer

• Barley, Wheat, Oats, Rye-fall
• Buckwheat-spring, summer
Hand-Pulling

• Cons:
  • Tedious and labor-intensive
  • Not the ideal option for weeds with tough taproots or those which reproduce asexually and leave pieces behind

• Pros:
  • Can be used to manage herbicide-resistant weeds
  • Can be ideal for managing highly prolific summer annuals (pigweed, lambsquarter—always pull these if they get large)
  • No need to bring out herbicide, fuel, equipment

• Burn or bag plants like pigweed and lambsquarter to ensure that seeds do not shatter off the plant.
Mowing/Clipping

• Cons:
  • Requires fuel, equipment
  • Not always feasible in a garden setting
  • Not a good idea for weeds which have nearly gone to seed—seeds will just be spread by mowing

• Pros:
  • Close, frequent mowing requires the plant to expend root reserves
  • Timely mowing can keep weeds from producing seeds. Most weeds which produce seeds are good candidates because clipping will delay seed production and will stress the plant
  • Repeated mowings preceding a spray application are helpful for stressing weeds and preparing them to succumb to the product. **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 properly contact them.**
Mulching/Covering

• Cons:
  • Breakdown of mulch will consume some available N
  • May not suppress all weed seeds and many perennials, and weeds will emerge from any slits or openings
  • Can sometimes attract rodents around bases of plants
  • *Some materials carry in weed seeds unless properly composted*

• Pros:
  • Can be an excellent weed prevention strategy for many annuals.
  • Helps retain soil moisture
  • Creates a layer of composted as it decomposes.
Spraying

Cons:
- Requires $, application equipment, and/or mixing
- Few organic pesticides available for those sticking to organic program
- Using near hops in growing season could be calculated risk; hops are a broadleaf plant, so watch broadleaf and nonselective herbicides

Pros:
- Highly effective at controlling weeds when used properly
- Products available to prevent germination OR kill existing vegetation

As a general rule, herbicides are more effective at warmer outdoor temperatures and some may need to be mixed with an adjuvant to help them adhere properly to weeds with waxy leaves.
How do herbicides work?

• To be effective must reach....
  • Target plants
  • Target sites on plant
  • Both above
    • ...in sufficient concentration
    • ...before degradation, volatilization, leeching, etc.
Herbicide Fate In Soils

VOLATILITY
PHOTODECOMPOSITION
EROSION
CHEMICAL DEGRADATION
PLANT UPTAKE
ADSORPTION
MICROBIAL DEGRADATION
LEACHING
What Herbicides Do To Plants

- Disrupt cell membranes
- Inhibit lipid production
- Inhibit amino acid production
- Inhibit growth
- Inhibit photosynthesis
Herbicide Classifications

• **Selective herbicides**: Kill a specific type of plant (Ex: most target EITHER broadleaf OR grass-type weeds)
• **Non-selective herbicides**: Kills both broadleaf and grass plants

• Hops are broadleaf plants. Weeds that can kill broadleaf plants could also hurt hops.
• Shield plants from spray drift
• Use large droplet size and avoid windy days
• Follow label directions-some MUST be applied only in dormant season or other specific times to avoid injury
Herbicide Classifications

- **Contact herbicides** kill plant tissue where the product touches the plant, don’t kill underground plant parts
- **Systemic herbicides** are transported throughout the plant and can be used to kill entire plant

- **Preplant/Burndown** kills weeds during site establishment
- **Pre-emergence herbicides** control weeds right as they emerge
- **Post-emergence herbicides** act on established weeds
Herbicide Recommendations for Hops

- Use recommendations from our “PMG”-the Pest Management Guide. Located on our the VCE website—search “hops”
- These are the products which are recommended by our specialists-research-based recommendations
- Follow label instructions!
NO MATTER WHICH OPTION YOU CHOOSE...

• Product MUST be labeled for use on the site you choose.
  • Ex: using product labeled for lawns-only is not permitted for use in hop yard.
  • Always check! Labels can change.

• Product must be registered for use on your site/for your purpose AND approved for use in Virginia
  • Be aware when referring to out-of-state pubs, online sales
NO MATTER WHICH OPTION YOU CHOOSE...

• Some products are “Restricted Use” and require a certification to buy and apply. Homeowner products tend to be “General Use.” Visit http://www.vdacs.virginia.gov/pesticides/certification.shtml to find out when certification is required.

• Visit http://www.kellysolutions.com/va/pesticideindex.htm to check which products are registered, check which sites are approved for a product, view and compare labels for products, etc.
• Active ingredient
• PPE and requirements for when/how/where/how much to apply
• Preharvest interval and plantback interval
Rules of Thumb for Herbicide Treatment

• Adjuvant: Check label. May be needed to “stick” to leaves. Label provides guidance.

• Clean out sprayer properly (especially after 2,4-D!). Label provides guidance.

• Work better when temps are warm and leaves are dry-check label for application guidelines.

• If recently mowed, give time for regrowth (exception: garlic)
Two periods are ideal for spraying perennials: the early-bud stage (the 2 weeks before flowering), and fall. Why?

1. Sugar direction is moving toward underground perennial structures
2. Plenty of leaf area to take in herbicide
3. Perennial structures at lowest energy level
Herbicide Timing for Summer Annual Weeds

**SPRAY**

- **Seedling**
  - Spring & summer

- **Vegetative**
  - Less than 10” tall

**SPRAY**

- **Flowering & seeding**
  - Summer

Annuals are relatively simple to kill during the seedling and early vegetative stages. Increased size and age result in significantly reduced control.
Herbicide Timing for Biennial Weeds

**SPRAY**

- **Seedling**
  - Typically late summer or fall

- **Rosette**
  - Fall - early spring

- **Bolting**
  - Late spring

**SPRAY**

- **Flowering**
  - Summer

*Biennials are relatively simple to kill during the seedling and rosette stage with most broadleaf herbicides. Once biennials begin to bolt in spring, control is significantly reduced.*
Preventing Herbicide Resistance

• We all have the opportunity to understand and prevent it

Definition of herbicide resistance:
Individual plants within a species that have developed the ability to withstand a herbicide treatment that would previously have been lethal to that species.
Resistance: What is It

Garden: Pre-treatment
Resistance: What is Is
Garden: Post-Treatment
Resistance: What is Is Not

Garden: Pre-treatment
Resistance: What is Is Not

Garden: Post-treatment
Q&A

Does an individual plant become resistant over time?

NO.

With repeated selection pressure (ie. pesticide application and exposure), those individuals which are genetically unsusceptible survive and reproduce, therefore, contributing to a more resistant population in the future.
Q&A

Does the herbicide cause resistance?

NO.
Due to naturally occurring mutations, the resistant individuals have been part of the population for years/decades/centuries/ or longer. The imposition of the selection pressure causes these resistant individuals to become an increasingly larger portion of the population.