# Principles of Weed Management

Teryl R. Roper
Dept. of Horticulture
University of Wisconsin-Madison

When the concepts of Integrated Pest Management (IPM) are discussed the discussion usually relates to insect and disease management. However, of the pests that infest cranberry beds, weeds have the potential to be the most yield limiting. When new herbicides were registered yield per acre increased, in some cases dramatically. Recent estimates suggest yield reductions of up to 60% if current weed management materials were lost. Left uncontrolled, weeds will compete for light, water and nutrients.

Weed management approaches have changed dramatically over time. A generation or two ago growers could only hand weed, clip the weeds to reduce shading or spot treat with salts or petroleum distillates to control weed competition. Today growers still use hand weeding and clipping, but the use of chemical herbicides and biological agents to control weeds offer exciting possibilities. This article will discuss cultural, mechanical chemical and biological aspects of weed management.

## Cultural management techniques

Managing weeds really begins before beds are planted. Using excavated sand rather than surface sand for the bed surface will minimize the amount of weed seed present. Make sure that the planting stock came from a bed that had minimal weed populations. It is always prudent to visit the source of the vines before they are mowed.

Having good drainage throughout a bed will reduce some weed pressure. Some weeds prefer wet areas and won't be a problem if drainage is adequate. Good drainage also promotes good vine growth and a healthy canopy will compete well with weeds.

Along with good drainage, maintaining a proper soil pH will discourage the growth of some weeds. The weed profiles of older beds in traditional settings have a different weed spectrum than newer beds with sandy soils in upland settings.

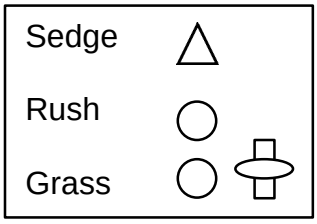
Being clean and tidy can also minimize weed encroachment. When beds are established if the dikes are seeded to a grass and then mowed as needed will reduce the weed pressure onto the beds. Grasses will keep broadleaf weeds from becoming established and broadleaf weeds are the most likely to have seeds that will blow onto a bed. A post-harvest trash flood can serve to float off trash including weed seeds. This is particularly important for dodder. This will also remove diseased leaves and may reduce disease pressure. Place tarps under harvest equipment on dikes and then collect and remove the debris.

For some weeds there is no substitute for handweeding. New beds will require one or two hand weedings until the vines cover the soil and can compete with the weeds. In some cases clipping or mowing the weeds above the canopy will reduce the competition and allow cranberries to flourish.

## Weed Identification

Optimal weed management required that growers know what weeds are in their beds and where they are. Management of perennial woody weeds is different than perennial herbaceous weeds. Managing grass weeds is different than broadleaves, sedges or rushes. Weed

identification guides have been produced with color photographs of the weeds as well as a description of their botanical characteristics. These are also available on the Internet at the WSCGA web site. Other good sources of weed identification materials are wildflower books for the Midwest.

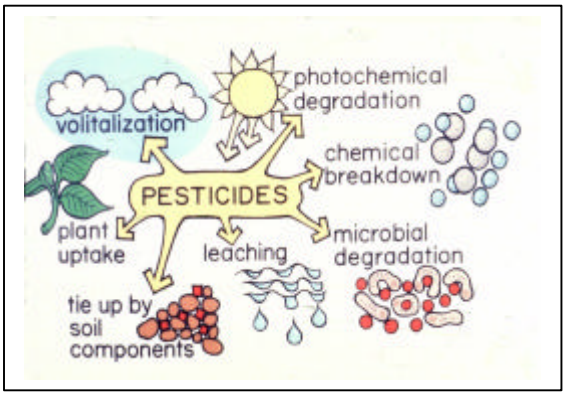



Differentiating between grass and broadleaf weeds should be simple. Telling grasses from sedges from rushes is more difficult. Fortunately these weeds do have distinguishing characteristics. If you pick the stem of these types of weeds and rub the stem between your fingers you'll be able to tell that the stem is round or triangular. Rushes and grasses are round while sedges have a triangular stem. If the stem is round you can look at the stem to see if nodes are present, i.e. that leaves arise at various heights along the stem and that there are slightly raised rings where the grass leaves attach. Rush leaves all arise from the plant base.

## Chemical weed management

Since the late 1950's a number of herbicides have been evaluated and several have been registered for use on cranberries. Successful use of herbicides requires information about how particular herbicides work, how they are absorbed and where they are active and for how long. In order to be effective, herbicides must be present at the site of action in sufficient quantity to be active and when the target plant is most susceptible.

Herbicides act by disrupting some critical plant function. Some herbicides interfere with photosynthesis energy transport so plants can't transform light energy to chemical energy. Others disrupt photosynthetic pigments. Others prevent the formation of critical amino acids, proteins, or nucleic acids. Some interfere with root growth while others disrupt the plant cuticle causing plants to dry and wither. Some act only where applied and others are translocated within the plant.




Since herbicides are placed into the environment they are also subject to degradation. Degradation is necessary so herbicide active ingredients don't persist in the environment indefinitely, but they must be present long enough to be effective. Many herbicides break down when exposed to light, particularly UV light. These herbicides (Devrinol) must be covered or washed into the soil shortly after application. Soil microbes can break down some herbicides and either uses them as an energy source or at least cleave the active ingredients into innocuous compounds (Devrinol). Chemical reactions in the soil such as reacting with water or soil ions can deactivate some herbicides (Roundup). Some herbicides will leach through the upper soil layers so that they are below the effective rooting zone (Stinger). When herbicides are absorbed into non-susceptible plants they can be metabolized and deactivated inside those plants. Some herbicides have a high vapor pressure and will volatilize into the atmosphere (Casoron). The various herbicides must be managed differently to obtain the desired results.

Because different herbicides have different modes of action (disrupt different aspects of plant metabolism) they also control different groups of weeds. The weeds that will be controlled

by a product are listed on the package label. While these lists are not exhaustive, they usually represent the range of weeds that are prominent for the crops on which it is labeled. Some products are better on grass or broadleaf weeds. Others work only on grasses. Because of these differences in effectiveness it is critical to know what weeds are present before choosing a product to use.

Chemical herbicides can further be classified as pre-emergent or post-emergent. Pre-emergent herbicides either prevent germination or, more typically, interfere with rooting or growth of the seedling. Post-emergent herbicides will kill grasses that are actively growing. Most post-emergent herbicides are selective only through selective application.

Table 1. Characteristics of herbicides registered for cranberry as of 1999.

| Herbicide | Weed spectrum | Fate | Half life | Mode of action | Transport |
|---|---|---|---|---|---|
| **Casoron** | Broadleaf, grass, sedge | Microbial degradation, volatilization | 2-12 months | Rooting and germination inhibitor | Xylem |
| **Evital** | Grass, sedge, rush | Microbial degradation, light, volatile | 45-180 days | Inhibits pigment synthesis | |
| **Devrinol** | Annual grass, some broadleaf | Microbial degradation | 8-12 weeks | Inhibits root growth | |
| **Princep** | Annual grass, broadleaf | | > 1 year | Inhibits photosynthesis | Xylem |
| **2,4-D** | Broadleaf | Microbial degradation | 1-2 weeks | Unknown, multiple sites | |
| **Roundup** | Emerged weeds | Degrades quickly | 0 days | Inhibits amino acid synthesis | Phloem |
| **Poast**<br>**Select**<br>**Fusilade** | Emerged grass | | 2-5 days<br>2-5 days<br>< 20 days | Inhibits lipid synthesis | |
| **Scythe** | Green tissue | | No residual activity | Disrupts membranes | |
| | | | | | |

In addition to traditional chemical herbicides there are also possibilities for "bio-herbicides". These would be disease or perhaps viruses that would attack the weeds but not cranberries. With today's technology the fungal spores or virus particles do not persist well in the environment. With more careful application and proper formulation perhaps their longevity and activity can be improved.

Weed mapping allows optimal application of herbicides. Using a map of your beds indicate on the maps where particular weeds or groups of weeds are a particular problem. Rank the weeds as very invasive (high priority), moderately invasive and moderately competitive (medium priority), or not competitive or invasive (low priority). As you plan your herbicide applications you can pay particular attention to areas that are a high priority.

**Conclusion**

What does the future hold for weed management? There are lots of possibilities, but also lots of uncertainty. Molecular biology/genetic engineering holds some opportunities. A resistance gene could be inserted into cranberry allowing broadcast application of an herbicide over the cranberries to control weeds. This would be very beneficial during the early establishment years when competition is critical and the canopy is incomplete. There are opportunities to use existing chemistry for cranberry once efficacy, crop safety and residue analysis are completed. Funding from the industry to continue this research will be critical.

No single method of weed management is sufficient in today's environment. Good cultural practices like managing pH and selecting appropriate sites are equally important to using the correct herbicide. Timing herbicide application for the target weed species can be improved. Maintaining the current arsenal of products and practices is important while we seek new products and practices to manage weed pests.