Weed Management and Identification

Hilary A. Sandler
UMass Cranberry Experiment Station
P.O. Box 569
East Wareham, MA 02538
(508) 295-2212, ext. 21
hsandler@umext.umass.edu

Understanding the ecological relationships that underlie the interactions between weeds and cranberries is critical for successful weed management. In addition, versatility in correctly identifying the predominant weeds on a commercial bog is also essential. This paper discusses the place of weeds as part of an ecological framework that enables us to think about the present state and the future development of weed IPM and action thresholds in cranberries. Weed mapping, as well as the distinguishing features among grasses, sedges, and rushes, will also be discussed.

Weeds can be described in a variety of ways. Often, we assign anthropomorphic terms to weeds. They are “aggressive”, “competitive”, “undesirable”, or “unsightly”. Often they are defined as “plants out of place” (Radosevich et al., 1997; Zimdahl, 1999). Most certainly, weeds are plants of minor economic value that compete directly with desired agricultural activities. Weeds can also be described from a biological perspective. They are successful colonizers of disturbed habitats (e.g., new plantings). They are noteworthy for their high germination rates (annuals), vigorous vegetation reproduction (perennials), and rapid growth. Often, they have unspecialized needs for pollination, which promotes genetic variability and reproduction. From a biological point of view, weeds are very successful organisms.

How are weeds different from insect pests and how does this affect IPM? Weeds function in the agroecosystem in different ways from their insect counterparts. Weeds are closely related to cranberry vines biologically in that they are both stationary organisms that compete for water, space, nutrients, and light. The distribution of weeds on a farm can be influenced by pH, the presence of (the) water (table), and location (edge or middle). Organisms occur in particular places in time because they are successful at capturing resources from the environment. In other words, they established or occupy a certain niche in the agroecosystem. Our challenge as scientists and growers is to better understand the dynamics that enable a weed to be more successful at capturing resources than the cranberry plant. The next steps would be to manipulate the farm environment to make it less susceptible to invasion by weeds and to reduce the farm’s vulnerability to weeds. Ultimately, we would find ways to reduce the ability of the weeds to affect the yield and quality of the cranberry. Table 1 lists several points of distinction between weeds and insects and how these affect the implementation of IPM activities.

Table 1. List of distinguishing points between insects and weeds and the impact on IPM activities.

Weeds	**Insects**
• Weeds are perennials.	• Insect populations may or may not be present in numbers that exceed the action threshold (AT).
IMPACT: "Scouting", in the traditional sense (numbers exceed the AT) is less useful for weed pests.	
• Weeds are typically easier to. control prior to emergence.	• Insecticides usually work best as a contact or systemic after the pest is present.
IMPACT: Use of weed mapping allows you to make management decision ahead of time.	
• Weed damage depends largely on weather, which affect weed-vine interactions.	• Insect damage is usually less dependent on weather.
IMPACT: Precise ATs are more difficult to establish for many weed pests.	
• Many weed species are present at any one time.	• Few key insect pest are present simultaneously.
IMPACT: Strategies must be broad-based in many cases.	
• Weeds and cranberries are both plants. They are more similar to each other than insects.	• Insects are biologically dissimilar to vines.
IMPACT: It is challenging to develop controls that will harm weeds and not harm the vines.	

Correct identification of weeds is key. Flowering plants are divided into two major groups: monocotyledons and dicotyledons. This dichotomy is based upon the number of leaves that emerge from the seed. Monocots have one true seed leaf. Examples of monocots include the grasses, sedges, and rushes. Dicots have two true leaves upon emergence and examples include broadleaf plants. Monocot leaves are characterized by parallel veins. The flower parts (petals, sepals) of monocots are typically in 3's and 6's. Dicot leaves have netted venation and their flower parts occur in 4's and 5's.

It is important to have good identification manuals. If a weed is abundant on your farm and you need to be certain of its identity, be sure to contact your extension personnel for verification. Be especially vigilant about getting misled by common names of plants because they can be confusing. For example, broom sedge is actually a grass; woolgrass is really a sedge; and an entire group of sedges are called bulrushes. For additional information and excellent illustrations on the differences between these monocots, see the University of Massachusetts-Dartmouth publication by J. Sears (Sears et al., 1996).

Table 2. Summary of distinguishing characteristics of grasses, sedges, and rushes.

	Grass	**Sedge**	**Rush**
Stem	hollow, round	triangular	solid, round
Leaves	usually flattened	usually V-shaped	usually reduced
Leaves	in two's	in three's	much reduced
Fruit	single seed	single seed	multi-seeded fruit
Nodes	present	not present	not present
Ligule	may be present	not present	not present

Weed Mapping. Weed mapping is currently the best tool we have to monitor and track weed populations on the cranberry farm. It is recommended to weed map every year, but since many cranberry weeds are perennials, an every other year cycle may also be appropriate. Priority groups have been established based on three criteria (Else et al., 1995): the potential of the weed to cause yield loss, the rate of spread, and the difficulty of control. ***Priority One*** weeds (zero threshold) cause severe losses, spread rapidly, and are difficult to control. Examples would include dodder (*Cuscuta gronovii*), dewberry (*Rubus hispidus*) and silverleaf (*Smilax glauca*). Weeds in ***Priority Two*** are of serious concern. They are less damaging to yields than those in Priority One, but they are still aggressive and difficult to control. Examples would include narrow-leaved goldenrod (*Euthamia tenuifolia*), greenleaf (*Smilax rotundifolia*), and asters (*Aster* spp.).

Weeds of less importance are grouped in ***Priority Three***. Weeds in this group may reduce yields, but yield impact is low. Spread or growth of these plants is relatively slow. Control is not as difficult as with Priority One and Two weeds. Priority Three weeds might include perennial sedges and grasses, rushes, and red maple (*Acer rubrum*). The lowest concern weeds are placed in ***Priority Four***. These species are primarily found in bare spots, weak areas, or along bog edges. Most are relatively easy to control. Weeds in this group include clover (*Trifolium repens*), white violet (*Viola lanceolata*), and annual grasses.

Growers should prioritize their own weed populations into a system that works best in their particular situation. Expenditures to gather this type of information must be balanced by the benefits of the information gained. In general, weed mapping according to the above scheme can be done fairly rapidly and economically. It is helpful to use a pre-drawn map that includes landmarks such as sprinkler heads. More labor-intensive activities (utilizing current technologies) would include GPS and GIS systems. These systems permit very accurate plotting and assessment of weed populations, but they require a great deal of time to input and gather the information.

When mapping, consider how the weed populations may be distributed on the farm. This should aid in the precision application of preemergence herbicides. Populations can be distributed in *regularly* (finding one individual predicts very well where you will find another individual), *randomly* (finding an individual has no correlation with where you might find another individual), or *patchy*. Most populations occur in patches. Thus, if you find one individual, chances are very high that you will find another close by. Bear in mind that finding patches of weeds may cause you to overestimate how many weeds you actually have on your farm. You may be just as likely to monitor in a place that has no weeds; here, you will underestimate your weed population. Try to keep this in context when you are assessing weed populations based on a few monitoring locations.

Why haven't ATs been established for cranberry weeds? In fact, action thresholds for weed species in most agricultural commodities have not been established. First, very low densities of weeds can cause significant loss and thus, growers have an "intuitive" feel for excessive levels. In addition, herbicides have been available at very low cost (for most commodities). In cranberries, many of the preeemergence herbicides are quite expensive, so it would be beneficial to try to pursue the establishment of ATs. However, several other obstacles remain in place that hinder the development of weed action thresholds. First, counting individual weeds is very difficult. We need to develop better ways to quantify weed populations. Secondly, plants can change size and impact over the course of their life cycle. This complicates the modeling aspect of precisely defining a threshold. Thirdly, weed communities on the farm are a mixture of species. Complex interactions over nutrients, water, light, and space have yet to be delineated. Lastly, an action threshold model should consider the incorporation of non-economic criteria such as crop quality and ease of harvesting. These are aspects that are important to the grower, but are not typically factored into the development of traditional ATs.

Literature Cited.

Else, M.J., H.A. Sandler, and S. Schluter. 1995. Weed mapping as a component of integrated pest management in cranberry production. HortTechnology 5:302-305.

Radosevich, S., J. Holt, and C. Ghersa. 1997. Weed ecology-implications for management, Second edition. J. Wiley and Sons, New York, NY.

Sears, J.R., J. Dunn, and B. Harrrison. 1996. An illustrated guide to the weeds of cranberry bogs in Southeastern New England. University of Massachusetts-Dartmouth, Dartmouth, MA.

Zimdahl, R.L. 1999. Fundamentals of weed science, Second edition. Academic Press, San Diego, CA.