

Pesticide Applications

Pesticide use is typically recommended as part of an overall management plan for controlling pests that cause crop damage or loss. Pesticide applications in Massachusetts are generally made through chemigation systems, by aerial applications, or by ground rig. Be sure your application system complies with both state and federal laws. ***It is a violation of Federal law to introduce pesticides into an irrigation system through the suction side of the pump.***

Pesticides that may be used during the course of a growing season include herbicides, insecticides, miticides, and fungicides. Pesticides should be used within the context of an integrated pest management (IPM) program (refer to IPM BMP). Application of pesticides should always be conducted in a safe and legal manner.

WORKER PROTECTION STANDARDS (WPS) REGULATIONS REQUIRE:

All workers involved in any aspect of handling, mixing and/or loading pesticides must be trained as a HANDLER or have a pesticide license.

MA LAW REQUIRES THAT ALL PERSONS APPLYING PESTICIDES IN A COMMERCIAL CAPACITY MUST HAVE A VALID PESTICIDE LICENSE.

Several types of licenses are available:

Applicator License. If you intend to do pesticide work using general use (non-restricted) pesticide for hire, you must obtain an applicator license.

Private Certification. If you intend to do pesticide work using restricted use pesticides on property owned or rented by you or your employer for the purpose of raising agricultural commodities, you must obtain a private certification. This is the license usually obtained by individuals working as farmers.

Commercial Certification. If you intend to do pesticide work using restricted use pesticides for hire or not for hire (barter/volunteer) on someone else's property, you must obtain a commercial certification.

Recommended Practices

Worker Safety and Notification

Read and follow all pesticide label instructions.

The pesticide label is based on extensive scientific studies required by the Environmental Protection Agency (EPA) prior to registration in order to protect human health and the environment.

Pesticide labels are continually revised, so thoroughly read and follow all label directions each season. Growers are required to comply with all federal and state laws regulating pesticides.

The label is the law.

Keep current material safety data sheets (MSDS) accessible.

An MSDS, compiled for each pesticide product, contains important health and safety information. Availability of MSDS sheets is required by the Massachusetts Right-To-Know law.

A new MSDS should be obtained each time a pesticide product is purchased. Pesticide applicators, coworkers, and family members should be familiar with all information contained in the MSDS.

Follow all Worker Protection Standards (WPS) requirements.

New WPS require growers to train and notify all employees (family members excluded) about proper pesticide handling and sanitation practices. Carefully read the 'Agricultural Use Requirements' section and comply with all EPA requirements regarding WPS on the pesticide label.

Observe restricted entry intervals (REI) and wear the appropriate personal protection equipment (PPE).

Detailed information is available from the EPA 'How to Comply' manual and video formats. WPS materials and information booklets can be obtained through local suppliers and mail-order businesses.

Keep detailed pesticide application records.

Receiving stations and packing houses may require pesticide application reporting forms prior to delivery of fruit. Check with your handler to determine any specific requirements.

Massachusetts Department of Food and Agriculture (DFA) has specific record keeping requirements. Check with the DFA to insure that you are in compliance with their regulations.

Develop a plan to follow in case of pesticide emergencies.

Pesticide applicators should develop an emergency plan that lists actions to take and persons to contact in case of a pesticide poisoning, spill, fire, or other accident.

Comply with all application notification requirements.

Regardless of application method, most pesticide applications require notification for the public and workers. Notification may need to be oral, written, (or both) as well as the posting of signs. Refer to Cape Cod Cranberry Growers' Association (CCCGA) bulletin for specifics on sign posting and WPS requirements for workers.

Consider neighborhood activities when scheduling pesticide applications.

Be cognizant of foot traffic when making an application. Do a final perimeter check, (inspecting for leaks, people, pets, malfunctioning sprinkler heads, proper sign posting, and planks) immediately prior to the application (refer to Neighbor to Neighbor BMP).

The use of spotters is recommended when the bog is not visible from the injection site or the pumping area. Spotters can help to quickly identify problems in the system (e.g. clogged heads, broken lines) as they occur or alert the applicator should anyone accidentally enter the area.

General Pesticide Application Information

For any application method, always verify chemical compatibility when applying more than one chemical in a single application.

Pesticide mixing and loading should occur in a secure containment area.

If the pesticide mixing and loading area is located on your property, make sure the site has a

containment area where the spray tanks are refilled. Repeated leakage of small amounts of pesticide residues during refilling can lead to soil and ground water contamination that may require costly remediation. See Mixing and Loading BMP and references at the end of the section.

Provide secure, safe storage for pesticide containers.

The floor of the storage area should be made of treated concrete or other chemically impervious material. Designate a specific area in the storage facility for each group of pesticides (e.g., herbicides, fungicides, insecticides, and miticides). Keep bags and containers off the ground. See Pesticide Storage BMP and the references at end of the section.

Triple-rinse all empty pesticide containers before disposal.

Federal law prohibits re-use of pesticide containers. Liquid containers should be triple rinsed, or preferably pressure rinsed. The rinsate should be added to the spray tank. The pesticide label and MSDS contain instructions for safe container disposal. Do not store empty containers in your pump house, even temporarily. Inquire if your pesticide supplier will recycle clean, empty containers. Additionally, any container used for any pesticide purpose must be labeled appropriately.

Avoid excessive overlap of pesticide applications when low gallonage is applied.

To minimize phytotoxicity, vine stress, or burning, avoid excessive overlap when applying low volume sprays of Lorsban, diazinon, Pyrenone, and other pesticides containing oil based carriers. These problems are associated with some boom applicators, mist blowers, and aerial applications.

Protecting Water Quality

Water control structures should be in place and free of leaks to allow ditch water containing pesticide to be held for the required time specified on the pesticide label.

Determine the groundwater contamination susceptibility of the bog.

The potential for contamination is influenced by soil characteristics, depth to bedrock and water table, type of bedrock, and characteristics of surface deposits. Pesticide users need to know the potential for site contamination and include the risks to water resources as a criterion of pest management decisions.

Drop the water level in your ditches prior to application.

This will allow you more time to hold water in ditches once the pesticide is applied.

Retain water containing pesticide residues for the required or recommended times.

Regardless of application method, every effort should be made to keep pesticides confined to the bog. It is considered a best management practice to hold water for as long as feasible following a pesticide application. All waters in contact with the bogs should be retained for the length of time as required by the label. As holding times vary for each pesticide be sure to check the label. If possible, retain water within the bog system even longer to allow maximum degradation of pesticide residues. Refer also to the Northeast US Cranberry Pesticide Chart or the UMass Chart Book.

Release water slowly after the retention period has expired.

Allow water to flow over the top flume board first and then slowly remove each of the remaining flume boards until the water is at the appropriate management level.

Activated carbon filter technology is available and may be appropriate for use in certain situations. It is recommended to consult with a professional prior to using carbon filters on your farm.

Avoid direct spraying of ditches and waterways and surrounding non-bog areas.

Aerial application of pesticides may result in non-target application to ditches and waterways.

Choose flight paths that minimize direct spraying of water with pesticides. Take extra effort to insure that flumes or bulkheads are water-tight and ditches are drained as much as possible before an application.

Consider the use of spray guards to minimize application to non-target areas. Refer to the Water Resource Protection and Enhancement BMP in this series.

Methods of Pesticide Application

Chemigation

It is a violation of Federal law to introduce pesticides into an irrigation system through the suction side of the pump. Only fertilizer applications can be made from the suction side of the pump.

Chemigation is the most common method of pesticide application for the Massachusetts cranberry industry. Refer to the Chemigation BMP, University of Wisconsin Chemigation Bulletin and the CCCGA/Ocean Spray poster on chemigation for required components and design options available to cranberry growers.

Optimize irrigation system performance before using chemigation as a pesticide application technique. Even distribution of pesticides is important for efficacy and food safety concerns. See Irrigation BMP for information on recommended system improvements to enhance coefficient of uniformity.

The use of spotters is recommended when the bog is not visible from the injection site or the pumping area. Spotters can help to quickly identify problems in the system (e.g. clogged heads, broken lines) as they occur or alert the applicator should anyone accidentally enter the area.

Aerial application

Make sure your property is properly posted prior to any aerial pesticide application.

Aerial applications of all pesticides within 500 feet of a sensitive area (e.g., residential, business, public way, school, park, playground, etc.) must be posted with the EPA Worker Protection sign. Post signs at conspicuous points no less than 200 feet away from one another and at every principal entrance fronting a public road.

Be sure that your property is clear of people and pets before starting the application.

Aerial application of pesticides on bogs adjacent to a public road must comply with certain regulations.

Aerial applications made within 150 feet of public way owned or maintained by a government entity must comply with 333 CMR 13.04. Please consult a current copy of these regulations for specific information.

Observe buffer zone recommendations.

Aerial applications of liquid materials must not take place within 150 feet of a protected area (e.g. roadway, school). A buffer zone of 50 feet is required for granular pesticides. (see 333 CMR 13.04)

Ground application (granular applicators, boom sprayers, mist blowers, hand-held sprayers, etc.)

Make sure application equipment is properly calibrated and operated.

Yearly calibration is advised to check for changes in output due to wear of equipment components. Since products may vary in particle size and/or density, calibrate the herbicide spreader every time a new material is used. Refer to Wisconsin reference and see example on page 6.

Limit non-target application when using boom or mist blowers.

Shut off boom and mist blowers when crossing waterways and ditches to minimize contamination in the bog system.

Do not operate these sprayers in windy conditions as small droplets are more prone to drift. Consider the use of drift reduction additives.

Inspect O-rings, seals, and nozzles on backpack and hand-held sprayers annually.

Since the backpack sprayer is in direct contact with your body during application, be certain that the sprayer is not leaking. Wear the appropriate PPE during application.

Use brass nozzles instead of plastic ones. Flat fan nozzles are recommended for general area spraying. Install a pressure gauge on all sprayers when possible.

Triple rinse the sprayer after application and rinse the hoses with clean water.

Calibrating granular herbicide spreaders.

If possible, use a device to collect herbicide from *each individual* output of the herbicide rig. You could use a sock or bag that attaches to the output. Be sure to weigh each device *prior* to calibrating the spreader. It is recommended to label each device to correspond to each output, so if there is a problem, you can easily tell which output is malfunctioning (see example below).

1. Run the spreader over a measured distance (e.g. 20-50 ft). Collect the output of herbicide from this measured area. If you are using a device for each output, weigh each device + herbicide. To determine the weight of the herbicide, subtract the weight of the device from this number.

If you are running the rig over a tarp, simply collect all of the material that falls onto the tarp and weigh it.

2. Calculate the area to which the herbicide was applied. Multiply the length of the swath you used in Step 1 by the width that the spreader covers. Calculate the acreage this represents by dividing this number by 43,560 (all measurements need to be in feet for this to be correct).

3. Next, multiply the rate in lb/A that you want to apply by the number you got (square feet/43,560) from Step 2. This is the amount in pounds that you should have collected in Step 1. If you determined the weights in a unit other than pounds, convert to pounds and then compare the numbers.

4. If you are off by an appreciable amount, total up the weights from the left and right sides separately (this can only be done if you used individual collection devices). Take half of the

swath area and determine the pounds delivered. If one side is off, look at the individual hose weights to determine which one(s) is off. Check for a clogged hose, etc.

If both sides are off, make an adjustment to the setting and repeat the process until you get the correct amount.

If you used the tarp method, you have no direct way to determine where the problem is when your numbers are off. Adjust the settings and repeat the process until you get the correct amount.

Example (all weights in grams to start).

Bag # Bag+herb bag herb Left side

- 1 88.3 52.0 36.3
- 2 87.5 51.3 36.2
- 3 83.9 50.2 33.7

4 87.2 51.5 35.7 Total weight for the left side = 141.9 g

Right side

- 5 86.0 52.6 33.4
- 6 80.4 52.8 27.6
- 7 82.0 53.8 28.2

8 79.0 50.7 28.3 Total weight for the right side = 117.5 g

Grand Total Weight = 258.7 g

Weight of herbicide collected in pounds = $258.7 \times (1 \text{ lb}/454\text{g}) = 0.57 \text{ lb}$.

Length of swath = 50 ft Herbicide width = 18 ft Area covered: $50 \times 18 = 900 \text{ sq.ft}$ Portion of an acre: $900/43,560 = 0.021 \text{ A}$

Desired rate of herbicide = 32 lb/A

Should have collected: $0.021\text{A} \times 32 \text{ lb/A} = 0.67 \text{ lb herbicide}$ % difference: $(0.67 - 0.57)/0.67 = 14.9\%$

The herbicide is putting out ~15% less than desired. Let's examine both sides to see if we can identify the source of the problem.

Half of the desired area rate: $0.67 \text{ lb}/2 = 0.33 \text{ lb}$ Left side: $141.9 \text{ g} \times (1 \text{ lb}/454\text{g}) = 0.31 \text{ lb}$ % difference: $(0.33 - 0.31)/0.33 = -6.1\%$

Right side: $117.5 \text{ g} \times (1 \text{ lb}/454\text{g}) = 0.26 \text{ lb}$ % difference: $(0.26 - 0.33)/0.33 = -21.2\%$

The right side seems to be the problem area. The weights of bags 6,7,and 8 appear to be low. Look for blockages in these hoses.

For more information:

Chemigation - key guidelines for best performance. Poster. Cape Cod Cranberry Growers Association (CCCGA) / Ocean Spray Cranberries, Inc.

Flashinski, R. and D. Wixted. 1993. **Pest management principles: chemigation.** Pesticide Applicator Training Bulletin, University of Wisconsin-Extension.

Kammel, D. W., R. T. Noyes, G. L. Riskowski, and V. L. Hofman. 1995. **Designing facilities for pesticide and fertilizer containment.** Bulletin. MidWest Plan Service, Agricultural and Biosystems Engineering Department, Iowa State University. MWPS-37, 120 p. (515) 294-4337.

Northeast United States Cranberry Pesticide Chart. Published annually by the Cranberry Institute, Wareham, MA.

On-farm agrichemical handling facilities. Bulletin. Northeast Regional Agricultural Engineering Service, Cooperative Extension, Ithaca, NY. NRAES-78. (607) 255-7654.

Pesticides and groundwater: a guide for the pesticide user. 1995. Bulletin. Northeast Regional Agricultural Engineering Service, Cooperative Extension, Ithaca, NY. NRAES-34. (607) 255-7654.

Sign posting. Bulletin issued annually by the CCCGA, Wareham, MA.

Worker Protection Standards information, Massachusetts Department of Food and Agriculture, Boston MA (617) 626-1700.

See **Chemigation BMP** in this series.

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Pesticide Applications Checklist

✓ **IMPORTANT PHONE NUMBERS**

Massachusetts Poison Control System. 1-800-222-1222. Chemtrec. 1-800-424- 9300.

Prior to the Application

✓ **Worker Protection:**

Have all appropriate Personal Protection Equipment (PPE) ready to use. Have labels and MSDS on-hand Have decontamination kit stocked and ready for use.

✓ **Appropriate notification:**

Neighbor relations. Sign-posting. WPS and REI notification.

✓ **Environmental concerns:**

Address any public drinking water recharge area restrictions. Check to see that the planks are in place. Check the weather forecast.

Transport the pesticide in a legal manner. Applicator must have the appropriate license for application. Verify that all equipment is working properly. Observe pre-harvest intervals. Have your Emergency Action Plan on-site.

✓ **After the Application Record keeping done? Containers rinsed and disposed of appropriately? Excess pesticides properly stored? Clothes properly washed after application?**

✓ **Equipment that may be helpful to have on hand:**

- 5-gallon bucket
- Knife
- Measuring cup
- Duct tape
- Injection port rinse device
- Stopwatch
- Mixing stick
- Portable communication devices (e.g., cellular phones)
- Bungee cords (to hold hose, etc.)
- Assorted tools (pliers, screwdriver, wrench, etc.)
- Clean water in jugs
- Pesticide clean-up kit (5 gallon is good)
- WPS decontamination kit