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# Organic Wild Lowbush Blueberry Information

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## INTRODUCTION

This booklet has been produced in response to a growing number of requests for information on certified organic blueberry production. It is intended to provide information on selected aspects of organic blueberry management, in order to aid new or existing growers who are considering certified production.

In 1999 the Standards Council of Canada (SCC) ratified and published the <u>National Standard of Canada for Organic Agriculture</u> General principles of organic agriculture, as outlined in the National Standard, are:

- 1. Protect the environment, minimize soil degradation and erosion, decrease pollution, optimize biological productivity and promote a sound state of health.
- 2. Replenish and maintain long-term soil fertility by optimizing conditions for biological activity within the soil.
- 3. Maintain diversity within and surrounding the enterprise and protect and enhance the biological diversity of native plants and wildlife.
- 4. Recycle materials and resources to the greatest extent possible within the enterprise. . .
- 5. Maintain the integrity of organic food and processed products from initial handling to point of sale.

These principles form the core of the production, processing, and marketing system for organic foods. In addition, the National Standard specifies the minimum requirements that should be met when food products, agricultural inputs, and other products used in food production or processing are designated as organic. The National Standard is voluntary, but all certification bodies must follow this standard as a minimum requirement.

To keep current with national and international developments, the National Standard is being revised and the new version is expected to be adopted in 2004. Also being considered are national initiatives which may eventually allow the establishment of a national regulatory system. This national system would involve a mandatory minimum national standard and a regulatory framework.

Currently there are no specific standards for organic blueberries, but the general standards for crop production and processing will apply to certified organic blueberry enterprises. The development of recommendations for organic blueberry production is an ongoing process, and the future will likely see many developments in this area. Therefore, we recommend that you consult your certification body for information on the acceptability of the materials and methods you are using. You should also consult with organic specialists and other organic growers, to ensure your system combines the best options for your location, market, and farming goals.

We hope this booklet assists you in your organic venture.



## ORGANIC CERTIFICATION

Certified organic production involves producing a crop or livestock product in accordance with the standards of a certification body and being able to verify, on paper, that those standards have been met. The term "organic" has sometimes been misinterpreted or misused, and certification processes have been introduced to provide a way of verifying that products labeled "organic" have been produced in a manner that is in keeping with the philosophy and practices of organic agriculture. Organic certification is recognized by producers, processors, consumers, and the various organic organizations, and is considered crucial to the integrity of the organic production and marketing system.

## **Choosing a Certification Body**

It is essential that you understand the certification process before committing too much time and money to consideration of organic production. Whether you are a producer or a processor, there are several steps that must be followed once you have made the decision to become certified organic:

- You must first choose a certification body and obtain a copy of their standard. The certification body verifies that products have been produced according to a set of recognizable standards and each certification body has a certification committee and a logo or seal. The certification body arranges independent, third party inspections for its members, and also provides support and advice to the producer or processor.
- You should then review the standard to see that you can meet the basic requirements. The standards are central to the certification process, and all certification bodies must follow a standard that at least meets the National Standard. Some certification bodies have adopted their own standards, but these exceed the National Standard.
- If you think you can meet the basic requirements, you will need to submit an application for certification, with appropriate fees.
- The certification body will first review your application to decide whether or not you can/should proceed. They will then make arrangements for an independent, third-party inspector to review your operation.
- After inspecting your operation and auditing the operations, production, and financial records, the inspector will submit a report to the certification committee.
- The certification body will then determine your status, using their review procedures.



The selection of a certification body is critical in the organic certification process, and there are a number of certification bodies operating in Atlantic Canada (see Table 1). Until Canada has a mandatory national standard and a regulatory system for certification bodies, selecting the best-fit certification body will be very important for transitional and beginning farmers. You should consider the following points when choosing a certification body:

- Target market: Producers who plan to direct-market their products via the farm gate or farmer's market may not require a certification body that is accredited or nationally/internationally recognized by trading countries and buyers. However, producers or processors interested in exporting to other countries should consider using a certification body that is recognized or accredited by the national authorities in those countries.
- Cost of certification: Some certification bodies may have a flat fee that includes many, if not all, of the services associated with processing your application. Others have smaller initial fees, but may add user fees based on gross sales. Flat fees may also vary depending on level of production or the amount of acreage certified. Small local organizations usually have lower overhead costs and can therefore provide organic certification for a lower fee. Although larger certification bodies may have higher fees, they can often provide a faster turn around time for certification.
- Membership and non-membership organizations: Some membership organizations allow and encourage group interaction during the certification process. This allows farmers and processors to share production, certification, and marketing information with new organic farmers. Other certification bodies favor a discrete system that enables producers and processors to maintain some business confidentiality.
- Equivalency between certification bodies: Some certification bodies recognize organic certification status from other organizations whereas others do not unless adequate documentation is made available. Crossrecognition can enable producers to buy and trade with producers certified by a different certification body, and this can facilitate expansion of the organic industry. Equivalency between certification bodies is particularly important for those organic inputs or commodities that are not readily available in a particular region. (Note: In the case of products for export markets, equivalency will be determined by the accrediting agency.)
- Standards variability: Until Canada has a mandatory national organic standard there will continue to be some variation in the standards used by the different certification bodies. Also, some certification bodies have adopted specific standards for specialized areas of production. Specific standards have not yet been adopted for blueberries, but the general standards for organic crops apply to blueberries. These general standards will permit the certification of blueberry production and processing operations until specific standards for blueberries are developed.



**Table 1.** Certification bodies operating in the Atlantic Region<sup>1</sup>.

Organization	Contact Information
Maritime Certified Organic Growers (MCOG)	Al and Simone Geddry Telephone: (902) 769-3076 E-mail: <u>ageddry@nbnet.nb.ca</u> Rob English, Certification Coordinator Telephone: (506) 325-3850 Fax: (506) 325-3890 <u>rob@jollyfarmer.com</u>
Nova Scotia Organic Growers Association (NSOGA)	Danny Bruce PO Box 16 Annapolis Royal, NS B0S 1A0 Telephone: (902) 665-2119 Website: <u>www.gks.com/NSOGA</u>
Organic Crop Improvement Association (OCIA) NB Chapter	Karen Davidge, Chapter Administrator 730 Rt. 616 Keswick Ridge NB E6L 1T1 Telephone: (506) 363-3744 Fax: (506) 363-2783 E-mail: <u>davidgeb@nb.sympatico.ca</u> Website: <u>www.ocia.org</u>
OCPP/Pro-Cert Canada Inc <sup>2</sup> .	Larry Lenhardt, CEO RR 1, 1099 Monarch Rd Lindsay ON K9V 4R1 Telephone: (877) 867-4264 Fax: (705) 324-4829 E-mail: <u>ocpp@lindsaycomp.on.ca</u> Website: <u>www.ocpp.ca</u>

<sup>1</sup> The OACC (<u>http://www.organicagcentre.ca</u>) has a list of certification bodies operating in Canada. <sup>2</sup> Accredited by the Canadian Accreditation Authority.



## **Other Certification Requirements**

When assessing the potential for organic blueberry production on your farm, you should also consider the following aspects of certified organic production:

Transition (conversion) period: Organic certification requires that the producer go through a transition (conversion) period before full organic status is granted. During this time the operator must submit a conversion plan for approval by the certification body, and undertake the steps outlined in that plan. The length of the transition period may vary, depending on the certification body, the type of operation, and the individual circumstances. However, the standard transition period between the last application of a prohibited fertilizer or pesticide and the harvest of a certified crop is thirty-six months.

The transition period is a critical time in certified organic production. During this time the producer will be adjusting to new production methods, but will not have full access to the premiums or marketing opportunities that certified organic production can bring. It is perhaps one of the most important considerations in the decision of whether or not to go into certified organic production.

- Records and audit trails: Maintaining good records is critical in certified organic production and processing. Certified organic products carry a label that guarantees compliance with the requirements outlined in a particular standard, and your records must be complete enough to verify this compliance. The audit trail established by the records must ensure that a product can be traced through the processing, transport, and production chain. Therefore, if you are considering certified organic production, you must be able to establish and maintain a record system that satisfies the requirements of the certification body you will be working with.
- Parallel production: For a number of reasons an operator may not wish to, or may not be able to, convert all production to organic production. He or she may choose to practice parallel production, in which organic and non-organic products are produced simultaneously by the same enterprise. In order to be certified for parallel production, you must be able to ensure separation and identification of organic and non-organic products. You must also have a record system that guarantees the traceability of the organic products, and a clear documentation of cleaning procedures for any equipment used on both the conventional and the organic crops. This can be quite complicated, so the certification body may not be able to certify for parallel production in all cases.



## THE BUSINESS OF TRANSITIONING

Ken Wichert and Orville B. Pulsifer

This section provides a brief outline of the issues that you should research and understand before committing time, effort, and money to transitioning to certified organic blueberry production. Unfortunately, there are very few organic blueberry producers, and while the nature of the business concerns can be described, there are no examples of what works well for a successful transition. However, the stronger your evaluation and the better your preparations, the greater your chance for a profitable transition.

## The Benefits

What is attractive about the organic blueberry market?

#### "The opportunity is there."

- The market for organic produce and products is quickly growing around the world. Demand is likely to exceed supply for several years to come.
- There are very few organic blueberry producers and therefore little to no organic competition at this time.
- Consumers value the health benefits of lowbush, or wild, blueberries and the current group of health and nutrition conscious consumers is expected to grow. Building on the market awareness that conventional growers have created, organic blueberry producers will be able to combine two messages:
  - Blueberries are nutritious and healthy.
  - Organic growing methods are healthy because they eliminate synthetic chemicals from food production, and they also promote sustainable agricultural practices.

These messages have a natural resonance that is likely to attract a higher price and generate consumer demand.

Conventional wild blueberries already have a strong export market. When better marketing support opens up organic blueberry export markets, opportunities and prices are likely to be strong.



#### What are the business advantages of producing organic blueberries?

#### "Some lower costs and price premiums."

- There are usually lower costs for capital equipment. Organic blueberry fields tend to be smaller and rougher, and are usually harvested by hand. There is a reduced need for sprayers in organic systems, and if mowing is used for pruning, small tractors can be used. These factors make equipment rental or custom work more feasible for organic operations. However, lower capital costs must be balanced against increased operating costs (e.g. rental charges, hand labour). Also, the feasibility of renting equipment will change with the size of the organic acreage.
- There are greatly reduced costs (or no costs) for pesticides and herbicides.
- Generally, there are premium prices for certified organic berries as compared to conventionally produced berries.

## The Risks

What is unattractive about the organic blueberry market?

#### "Well-established competitors."

- Conventional blueberry producers have already built strong supply chain relationships within established markets.
- A lack of processing and marketing infrastructure creates additional challenges. Leadership from organic blueberry producers is needed at this time to:
  - Develop marketing strategies that generate product awareness and increase demand from consumers (and from store buyers).
  - Increase production levels to a "critical mass." Entry into mainstream markets will need to address the challenge of selling to corporate buyers who require larger volumes of higher quality fresh product. These mainstream markets are difficult to enter because of the highly consolidated nature of the retail food supply chain, in which there are only a few buyers purchasing products for the large grocery chains.
  - Find organic blueberry processors, or encourage new ones (see below).



#### What are the production challenges facing this emerging industry?

- Currently most harvesting of organic blueberries is done by hand, and it can be difficult, sometimes impossible, to find and hire sufficient labour at harvest time.
- There is less immediate and direct control of weeds, insects, and diseases.
- Fields in transition will have some yield, but these berries cannot be sold as organic. Conventional market prices are likely to apply to these berries, and you will need to research ways to generate additional revenue from these products during the transition period.
- > There is also the question of who will process organic blueberries:
  - To ensure organic produce remains chemical and contaminant free, organic standards are very specific about the conditions under which organic produce is processed. This requires that a conventional processor have a dedicated organic processing line, or shutdown and stringently clean a conventional line before processing organic berries.
  - There are a few organic lowbush blueberry processors (see section on *Processing*). Currently, however, there is insufficient organic blueberry volume for these processors.

## The Investment

What investment is needed to transition a conventional field to organic?

"Three years, special equipment, and good help."

- The transition from conventional to certified organic production takes three years, and there is potential for decreased revenue during this period.
- > There are fees and costs associated with the certification process.
- Depending on the certification requirements and the size of the operation, there may be extra be costs for a burner and/or additional costs for straw.
- There will be a greater investment of hand labour for weeding and harvest. Organic berries are more expensive to produce, primarily because of this increased labour requirement.



## The Economics

#### Is there a minimal production level needed in order to be economically feasible?

#### "Making the pie large enough."

- The question of the optimal scale of production applies both to individual producers and to the industry as a whole. Smaller producers will have a better chance of selling and making a profit on their blueberries after a critical mass of production is reached in a region. At present, there is no indication as to whether the critical mass will be reached by a few large producers or by many smaller, coordinated producers.
- Organic fields tend to be smaller than conventional fields, and also have increased requirements for hand labour. However, at this point there is a lack of information on the optimal field or farm size for organic blueberry production.
- Depending on the yield per acre, an owner with 0.20 ha (0.5 acres) may possibly make a few hundred dollars working solo.

## The Market and the "5 P's" of Organic Lowbush Blueberries

*Markets:* Who buys organic blueberries? What is the estimated size of the market?

- The markets for organic blueberries include manufacturers of organic foods, wholesalers, small organic groceries, corporate grocery buyers, and farm-direct marketing to consumers.
- In Atlantic Canada, the domestic market for certified organic lowbush blueberries is currently supplied by fewer than five growers. Because the volume of organic blueberries is limited, the estimated size of the market is currently between \$10,000 to \$20,000 in the Maritimes.
- Although there are a few larger growers, most certified organic lowbush blueberry producers in Atlantic Canada have relatively small operations, with less than 4 ha (10 acres) in production each year. The smaller farms are often too small to add value by further processing the berries (e.g. jams, juices) because of the stringent HACCP requirements of the federal Food and Drug Inspection Agency. These factors will tend to limit most growers' markets for value-added products to the immediate local region.
- In the case of export markets, top prices will prevail when top quality products are available. Also, sales to export markets will require



international standard, food grade processing facilities. Therefore, it is anticipated that growers will have to work together to produce sufficient volumes of top quality product for export markets.

#### **Product:** What's better about organic lowbush blueberries as a product?

The organic blueberry combines the blueberry's antioxidant benefits with organic's no-spray benefits and delivers these to the customer in a single package.

# **Positioning:** What are the most unique and effective qualities, benefits, and values to communicate to blueberry markets?

- Health benefits: The outstanding advantage of the certified organic lowbush blueberry product is its unique combination of health benefits. The blueberry is considered to be one of the best antioxidant foods out of dozens tested by the USDA, and the organically produced blueberry is unencumbered by the fear expressed by many consumers about the use of pesticides, herbicides, and other synthetic chemicals. Personal health considerations are likely to be the major *raison d'etre* for the growth of this market for years to come. "Conventional" growers are unlikely to be able to compete.
- Values: On the personal level, the value is directly linked to the health benefits and pleasurable qualities of organic blueberries. On the bigpicture level, a consumer buys organic to support production methods that are environmentally sustainable and "good."
- Product qualities: These might include attributes such as the taste, colour, smell, and versatility of the product.
- Uniqueness: The marketing strategy for organic lowbush, or wild, blueberries will need to address and differentiate "lowbush" from "highbush" as much as it differentiates "organic" from "non-organic."

# **Pricing:** What is the premium earned on organic versus conventional blueberries?

The way that the berries are sold (called "placement") will determine the premium. For example, the premium on berries sold directly to consumers at the retail price can be as much as 200% higher than for berries sold through a wholesaler. A premium this high, however, would most likely be for a top quality product sold to a targeted market.



#### Placement: What channels are available for selling organic blueberries?

All of the following are possible marketing routes for certified organic blueberries:

- Farm direct marketing to consumers
- Some farmers' markets
- Organic cooperatives
- Limited wholesale marketing to small and medium sized organic and health stores
- Supermarket chains. To date these have imported organic blueberries from outside the region, and most have been highbush blueberries. Supermarket chains now prefer "one-desk" buying and selling, and also prefer a guaranteed volume from a single source (see MacVicar (2003)).
- Sales to buyers and processors for export. There are a number of opportunities to develop small niche markets that will pay premium prices, but it will require careful attention to product development, packaging, and promotion. The requirements for this market are likely to be the most stringent, requiring the highest quality product.

#### **Promotion:** What ways can you communicate with your markets?

There are no recommended or unique promotional strategies for organic blueberries. However, you should keep the following points in mind when developing a strategy:

- Work on your promotional strategy only after you've developed an understanding of your primary markets and the other four "P's."
- Promotional strategies need to send messages to, and receive feedback from, your markets.
- The ways to communicate range from a phone call, to a flyer or newspaper ad, all the way to trade shows and missions in other countries.

## Associations and Resources

There is no certified organic lowbush blueberry association in Atlantic Canada at this time. The following organizations represent conventional producers:

*The Wild Blueberry Producers Association of Nova Scotia (W.B.P.A.N.S.)* is located in Debert, NS. Website: <u>http://www.nswildblueberries.com</u>

*The Wild Blueberry Association of North America (W.B.A.N.A.)* also has representation in Atlantic Canada. Website: <u>http://www.wildblueberries.com</u>



## SITE SELECTION

#### Peter Burgess

The lowbush, or wild, blueberry is widespread throughout the Atlantic region and grows in run-out farmland and forest clearings. It is a forest succession plant that can be managed and produced as a commercial crop in almost any area of the Atlantic region. However, there can be a great variation in yield potential when looking at different sites or geographic regions.

Mechanical and cultural weed and pest control methods such as tillage and crop rotation are not an option in lowbush blueberry production. Many conventional blueberry operations on marginal to moderate lands have become dependant on chemical controls to maintain adequate yields. However, since the use of synthetic pesticides is restricted or prohibited in certified organic production, the initial selection of a suitable site is critical to the success of the organic operation. Proper site selection can limit weed and pest problems, facilitate crop management, and increase yield potential.

## Land Development Vs. Transition

When selecting a site for organic blueberry production it is important to first consider whether it is better to develop land from scratch, or to transition a well established field that is already in production (Table 2). In general, the cost of purchased land and the period to full production will have the greatest effect on the decision to develop new land or to transition existing blueberry fields.

**Table 2.** Comparison of the development of run-out fields or woodland vs the transition from conventional production.

Development		Transition	
Pros	Cons	Pros	Cons
No pesticides	Large weed	Small weed	Pesticides applied
applied recently	spectrum	spectrum	recently
Species in more of	Lower blueberry	High blueberry	
a natural balance	plant density	plant density	
If purchasing, land	Long period to full	Full production	If purchasing, the
can be relatively	production/slower	quickly/faster	initial cost of land
inexpensive	return on	return on	can be expensive
	investment	investment	
	Low initial yield	High initial yield	
	Low initial harvest	High initial harvest	
	efficiency	efficiency	



## **General Site Selection Criteria**

The basic site selection criteria for blueberry production are outlined in the *Lowbush Blueberry Fact Sheet – Evaluating Land for Wild Blueberry Potential* (McIsaac and King 2000). However, land that is used to produce blueberries under a conventional system may not be the best choice for organic production. Also, conventional producers can bring into production marginal land that for a number of reasons may not be suitable for organic production. For organic production, there are additional criteria that should be considered:

- ➢ 60% initial blueberry plant coverage
- Grasses are the predominant weed species present
- Not located on the floor of a valley or in a frost pocket
- Not located in a coastal region or in an area with excessive moisture through spring and early summer (botrytis susceptible)
- > Field is well drained, with few seepages or wet holes
- Adequate annual rainfall, with no history of repeated crop losses due to drought
- Low historical occurrence of monilinia blight, red leaf, and major insect infestations
- Good foraging areas for native pollinators near the field
- Adequate size of field:
  - Small isolated fields tend to be affected by deer, bear, and bird feeding
  - Larger, more open fields tend to have a lower percentage loss to vertebrate feeding
- Good yielding conventional fields nearby (not a primary criteria, but can provide useful information)
- Not directly adjacent to conventionally produced lowbush blueberry fields (insect pest and pesticide overlap)<sup>1</sup>
- Easy access to field

<sup>1</sup> Specific requirements for buffer zones vary, and will need to be assessed on a case by case basis.

None of the criteria listed above are critical requirements for successful blueberry production. However, if several of these criteria are not met, serious constraints to organic production can result. The relative importance of these criteria will vary from farm to farm and even from field to field, so you will need to consider all factors before you decide if the site offers the right combination for organic production. Careful consultation with organic specialists, other producers, and your certification body will also help in your assessment of the potential for organic production.



## SOIL AMENDMENTS FOR ORGANIC BLUEBERRY PRODUCTION

Phil R. Warman

In conventional blueberry production chemical fertilizers can be used to supply nutrients to the crop. However, these are not allowed under the standards for certified organic production. In organic systems, crop rotations, green manures, and applications of composted manures or other acceptable amendments are used to manage the nutrient supply to the crop and improve soil fertility. Since crop rotations and green manures are not suitable options for blueberry production, the organic blueberry producer will need to rely on applications of approved organic amendments for managing soil and crop fertility.

Table 3 lists the main organic amendments that are currently accepted by most certification bodies. These are used to provide specific nutrients that are deficient in the soil or that are in high demand by the crop, but they may also contribute other nutrients to the crop or to the soil. Organic standards and materials' lists are reviewed regularly so it is important that you consult with your certification body to ensure that the amendments you choose meet their requirements. You should also consult with an organic specialist when choosing amendments and calculating application rates, to ensure you are using the most cost-effective applications for your system.



Table 3. Summary of acceptable soil amendments for organic blueberry production<sup>1</sup>.

Amendment	Main	Comments
	Nutrients Supplied <sup>2,3</sup>	
Animal Manures	N, P, K, Ca	Apply in the year before harvest; see also composted animal manures, below
Rock Phosphate (e.g. Calphos; North Carolina; Kola Apatite)	P, Ca (S)	Content and reactivity of P varies with geochemical source
Granite/basalt dust	Ca, Mg, S (K)	From igneous rocks; very slow release of nutrients
Gypsum	Ca, S	The higher the S content, the lower the carbonate content
Colemanite	B, Ca	
Kieserite/Sul-Po-Mag	S, K, Mg	May be restricted after 2004
Trace/secondary element chelates or salts	Varies; Normally one or more of Cu, Zn, Ca, Mg, Fe, or Mn	Some may be restricted after 2004
Flowers of sulfur	S	Used for acidification
Calcitic or dolomitic limestone	Ca, Mg	The higher the Ca content, the faster the reactivity
Wood ash	Ca, K (Mg)	Very alkaline
Sawdust, woodchips, bark, shredded paper	С (К)	Wood by-products from pressure- treated wood, laminates, and other finished materials are not permitted due to the presence of contaminants.
Green manures	N, P, K	Legumes provide the highest N content
Meals (seaweed, alfalfa, non-GMO soybean, bone, blood, fish/crustacea, fish scale)	N, P, K	Seaweed is lower in P Fish is lower in K Blood is lower in P and K Bone is high in P, lower in N, and contains no K
Composted yardwaste	N, P, K	The higher the % grass clippings in the mix, the higher nutrient content
Composted animal manure	N, P, K, Ca	Poultry>swine>cattle, depending on the source and % of feedstocks in the mix
Composted fish, seaweed (kelp, etc.)	N, P, K (Ca)	
Composted, source- separated Municipal Solid Waste (MSW)	N, P, K, Ca	Check with your certifying body regarding acceptable sources of feedstock material
Compost teas	K (Ca)	Composition depends on the source of compost used

<sup>1</sup> It is generally recommended to apply 50 kg N/ ha in the growth year of a two-year cycle. Many growers also apply 50 kg/ha of  $P_2O_5$  and  $K_2O$  at the same time, as soil tests for P have not been proven accurate. <sup>2</sup> Nutrients in parentheses are present in relatively small amounts in these amendments.

<sup>3</sup>Blended or compound organic amendments contain variable macronutrient levels, depending on the formulation. An actual nutrient analysis should be used when calculating application rates.



## **PRUNING: EFFECTS ON WEEDS, INSECTS, AND DISEASES**

Leonard J. Eaton

Lowbush, or wild, blueberry plants must be regularly pruned to ground level in order to maintain the plant for the most optimum production. Pruning removes most or all above ground plant parts and forces the plants to send up new shoots from underground rhizomes or from the cut edges of existing shoots. Pruning is normally done at least once every two years, either in the spring or in the fall, following harvest. Maximum production usually occurs in the second growing season following pruning.

Weed, insect, and disease control can be major challenges in organic blueberry production since (a) crop rotations and tillage are not an option in blueberry production, and (b) most pesticides are restricted or prohibited in organic standards. Depending on the method used, pruning can provide some weed, insect, and disease control in organically managed fields.

## **Pruning Methods**

The two main commercial methods of pruning lowbush blueberries are burning and mowing. They appear to be equally effective for blueberry production and result in similar yields, so in conventional production the decision as to which of the two methods to use is based primarily on economics. Mowing is considerably less expensive than burning (see McIsaac and Reid 2000), so it is employed by the majority of producers. In addition, mowing can be accomplished without the problems of forest fires, excessive moisture, and smoke in the environment.

Pruning by mowing will control those weed species that are damaged by cutting to ground level, but it appears to have little effect on other weeds, or on insects and disease organisms. The heat generated by burn pruning, on the other hand, provides better control over weeds, insects, and diseases. The benefits of burn pruning will vary with the weed or pest and with the heat intensity. A high heat intensity will generally give better results, but will also require more fuel or straw.

The following is a summary of the effects of burn pruning in blueberry fields:

- Burning will kill or destroy heat susceptible weeds (e.g. conifers and shallow rooted grasses), as well as heat susceptible weed seeds near the soil surface.
- Burning will provide partial control of young herbaceous tree species but additional methods will be required to finish the job. It will remove the top growth of many deciduous saplings, but will not prevent regrowth from the underground parts.



- Burning may not control weed species with extensive underground rhizome systems similar to that of the blueberry.
- Burning is the only known control for the hair-cap moss (*Polytrichum commune*) in lowbush blueberry fields. The hair-cap moss will become a problem in some fields after repeated pruning by mowing.
- Burning may provide some control for insects such as the blueberry spanworm, flea beetle, and sawfly.
- The incidence of Monilinia blight (mummy berry) and Godronia canker are thought to be reduced where burning is practiced regularly.
- While burning is not likely to be of direct benefit in the control of Botrytis blight, it may destroy weeds (e.g sheep sorrel) that can serve as a source of inoculum for the disease.
- It is also possible that burning reduces many pest species in lowbush blueberries by removing surface material that provides cover for overwintering organisms.

## **Certification Requirements**

Pruning is an integral part of the blueberry production system, so you will need to ensure that the method you choose is both effective and acceptable to your certification body. Mowing is currently allowed by all certification bodies, but it is not as effective as burning for controlling weeds, insects and diseases. However, although burning is more useful in controlling weeds, insects, and diseases, there are additional considerations with regards to certified organic production:

- Burning with straw or hay would be acceptable to most certification bodies. Certified organic material is preferable, but if this is not available the certification body may allow the use of materials from conventional or transitional farms. Other materials (e.g. wood chips) may also be acceptable as long as they do not contain prohibited contaminants.
- The use of furnace oil as a fuel for pruning would be acceptable to most certification bodies, as long as the risk of spills is minimized.
- Propane is currently acceptable to most certification bodies. However, propane burners are not readily available, and only a few commercial growers are actually using them in the Atlantic region. Although there is a lower risk of fuel spills with propane, there are some safety concerns associated with its use. If you are considering using propane you should consult a qualified technician.



## POLLINATION

Leonard J. Eaton

The lowbush blueberry is generally not self-fertile and must be cross-pollinated in order to set viable fruit. Since the flower is tube shaped and hangs downward, it must be pollinated by insects. In commercial fields, pollination success can be improved by increasing the numbers of native pollinators, or by introducing managed pollinators such as the honey bee (*Apis mellifera* Linnaeus) the alfalfa leafcutting bee (*Megachile rotundata* (Fabricius)), or the bumble bee (*Bombus impatiens* Cresson).

Pollination management will be similar for both organic and conventionally managed blueberries, and the use of either native or introduced pollinators is acceptable to most certification bodies. However, individual certification bodies may stipulate that introduced pollinators be managed according to the requirements of the organic standard. If you are renting hives, it is advisable to check with your certification body so that you can ensure bee management practices meet their requirements.

## **Increasing the Number of Native Pollinators**

A number of native insects, particularly bumble bees, evolved along with the lowbush blueberry and are effective pollinators. Bumble bees in particular are effective pollinators because of their large size, weight, and hairiness, and because of their habit of sonication, or vigorous vibration of the blueberry blossoms while seeking nectar and pollen. In addition, bumble bees usually travel several metres between working clusters of blossoms, and this encourages greater cross fertilization between compatible clones. Other effective native pollinators include the halcitid and adrenid solitary bees and the sweat bees, although these are much smaller than bumble bees.

Native pollinators can be encouraged by methods that use a knowledge of their life cycles and habits. In general, it appears that small blueberry fields (i.e. less than 8 ha, or 20 acres) surrounded by a variety of native plants such as forest or scrub woodland will have more native pollinators than very large fields with little surrounding vegetation. In addition, Argall *et al.* (1998) suggest several ways to enhance pollination by wild bees:

- > Encouraging a diversity of flowering plants and forests around the fields
- Planting flowering plants such as clovers near the fields
- Establishing windbreaks
- > Maintaining water and mud sites for nest building pollinators
- Reducing pesticide use, especially during bloom<sup>1</sup>
- > Providing nesting blocks for solitary bees.



These recommendations are in keeping with the requirements for organic management so organic production should generally increase the number of native pollinators. In cases where pollination by native species is inadequate, however, managed pollinators will need to be introduced.

## Introduced Pollinators

#### Honey Bees:

Honey bees are the most commonly used managed pollinators placed in commercial blueberry fields. When compared to native pollinators, they are relatively poor pollinators of blueberry blossoms because they prefer other species and because they transfer smaller amounts of pollen from flower to flower. Also, honey bees move out from the hives in concentric circles, and have been shown to move 150, 400, and 560 m from the hive in three successive days. They may forage as far as 3 km from the hive in search of fresh blossoms. Diseases and parasites may also significantly alter the effectiveness of honeybees as blueberry pollinators by weakening hives and reducing the number of foraging workers. However, honey bees do increase fruit set because of the very large numbers of worker bees that forage for nectar and pollen.

The most important pollination time is during the middle (second) week when most flowers are in bloom, so timely introduction will be important to pollination success. Proper management of honey bee hives in blueberry fields will further increase their effectiveness as pollinators, and the following practices are recommended:

- Ideally, the bee hives should be spread evenly throughout the fields, but this may not always be possible. It is especially important to place the hives in sunny locations where they are exposed to the morning sun. However, they should also be protected from the winds. In small fields, they may be placed close to woods, as long as they are not shaded.
- Maximum pollinating benefit can be obtained by moving the hives to a new location after four to five good flying days. The new location should be at least one half mile from the previous one. Such a move would help to keep the bees from straying from the hives and make them more effective pollinators. In this way, the same hives can be used to pollinate two or more fields during the same pollination season. Moving colonies results in some losses of workers, but this can be reduced by careful management and the use of colored supers to help the bees reorient themselves.



#### The Alfalfa Leafcutting Bee:

The alfalfa leafcutting bee is a solitary bee that is used extensively in western Canada and the United States to pollinate alfalfa for seed production. The bee is quite easily managed using artificial nesting blocks and large shelters. First introduced into blueberry fields in 1991, it appears to have adapted quite well to spring weather conditions and serves as a viable alternative to honey bees as a managed pollinator. The leafcutting bee is, individually, a better pollinator than the honey bee, and will not move very far from the nesting blocks. However, it is somewhat more sensitive to weather conditions, especially colder temperatures, than the native pollinators and honey bees. More research is required to evaluate the economic viability of the alfalfa leafcutting bee as a blueberry pollinator.

#### The Bumble Bee:

The bumble bee, widely employed as a pollinator in greenhouses, was introduced on an experimental basis to Nova Scotia and Prince Edward Island in 1993. The managed bumble bee may have some potential as a lowbush blueberry pollinator, but low numbers in individual hives and high rental costs have prevented its use in commercial fields.



## WEED CONTROL

#### Peter Burgess

The lowbush or wild blueberry plant is a perennial plant forced into a biennial production cycle by above ground pruning every second year. Although this does force a higher yield, it also permits the establishment of other native perennial plants such as lambkill, bunchberry, rhodora, and goldenrod. All of these can reduce yields and negatively affect harvest efficiency.

Weeds are generally considered to be the greatest constraint to economical lowbush blueberry production and the variety of weed species present on blueberry land is perhaps the most problematic aspect of an effective control program. The presence of woody ericaceous (acid loving) perennials, perennial and annual grasses, and perennial and annual broadleaf weeds can make treatment solutions complicated. Also, the blueberry plants occur naturally and are not planted in regular rows, so the usual non-chemical control methods such as cultivation are not feasible. Crop rotations are not used in lowbush blueberry production systems, further limiting the range of effective weed control methods.

Conventional blueberry producers use broadcast residual herbicides that can suppress weeds for extended periods of time. When combined with spot applications of more specific herbicides, nearly 90% weed control can be obtained in many fields. However, the use of conventional synthetic herbicides is prohibited in certified organic production. Therefore, the organic producer must employ other tactics to keep weeds at levels that do not greatly reduce yields or significantly affect the harvestability of the crop.

## Weed Control Options

None of the options listed below will be effective as the sole weed management strategy for a blueberry operation. You will need to use a combination of methods in order to manage the weeds effectively. Also, not all of these control options will work in every situation, so you will need to develop and implement individualized weed management plans on a field by field basis. These should be updated regularly, as new recommendations on weed control strategies for organic blueberry production become available.

#### Site Selection:

Start with a site that is relatively free of weeds. Either transition from a well established conventional field or develop an organic site from a run-out field with a high density of blueberry plants and a predominately grass population.



The age, location, and previous management of a field will determine the weed population so it is recommended that you identify the specific weeds that are present in your fields, along with their lifecycles. In general, the predominant weed species in run-out hayfields and pastures will be annual and perennial grasses and herbaceous perennial broadleaves. The predominant weed species in forested areas will be woody perennials.

#### General Sanitation:

- Steam clean/pressure wash equipment after leaving each field.
- > Inspect machinery for weed seeds before entering a new field.

#### Mowing:

- Develop tramlines in your field and use a sickle bar mower to cut weeds above the blueberry plants. (This may only be practical on relatively flat fields.) Mowing is an effective weed management tool since it can reduce energy stores and vigour, prevent flowering, and reduce harvesting difficulties. It will, however, be of limited use for those weeds that regrow from points below the level of the blueberry plants.
- Weeds such as bracken fern, sweet fern, bayberry, lambkill, wild rose, and Prunus spp. can be managed by mowing. However, at least two mowings per summer are required.
- Cut the tops off flowering annuals (lamb's-quarters, pigweed, sheep sorrel, etc.) before seeds are produced in mid summer.

**Note:** Sheep sorrel acts as a host for Botrytis blight in areas prone to this disease (e.g. Parrsboro, NS). It is a shallow rooted perennial that may be killed by burning or other management practices. The plant may only live one year, producing viable seed. However, if conditions are optimum it could live longer than one year.

- Cut the tops off tall perennials (e.g. goldenrod, spotted knapweed, bracken fern, lambkill, alders etc.) a couple of times each season. This will reduce weed root reserves and will also make harvesting the blueberry crop easier.
- For harvest efficiency place a sickle bar mower on the front of the harvester. This will remove tall weeds and to allow the picking head to pick cleaner.



#### **Burn Pruning:**

- Prune by burning at least once every 4 years. This can be done either in the spring or in the fall, following harvest. It may not be economical or beneficial to burn every cycle, since burn pruning is more costly and since the need for burn pruning will depend on the weed, insect, and disease levels in the field. Frequent burn pruning can also decrease the organic matter content in the upper soil layers. However, burn pruning every few cycles will:
  - o reduce annual weed seed levels; and
  - o damage some perennial species.
- Burn pruning can be done using straw, furnace oil, or propane. Check with your certification body to see which methods are acceptable. Use organic materials that are as weed free as possible, to prevent further infestations.
- Burning will kill or destroy heat susceptible weeds (e.g. conifers and shallow rooted grasses), as well as heat susceptible weed seeds near the soil surface.
- Burning will provide partial control of young herbaceous tree species but additional methods will be required to finish the job. It will remove the top growth of many deciduous saplings, but will not prevent regrowth from the underground parts.
- Burning may not control weed species with extensive underground rhizome systems similar to that of the blueberry.
- The hair-cap moss (*Polytrichim commune*) is controlled by regular burn pruning, and will become a problem in some fields after repeated pruning by mowing.

#### Spot Weeding:

- Hand weed patches of problem weeds (e.g. lamb's-quarters, St. John's wort, creeping vetch, hemp-nettle, spreading dogbane etc.). Hand weeding is most effective for annual weeds. Hand weeding should be done before seed maturity, and plants must be removed from the field.
- To inhibit weed growth, use organic mulches (sawdust, woodchips, straw, compost etc.) in areas between the blueberry patches. The mulch should be 2 4 inches deep, and should be acceptable to your certification body.



Use black plastic over small problem weed areas. The mulch will smother the weeds, but the blueberry will regrow from the high carbohydrate reserves in the blueberry rhizomes.

**Note:** Mulches will work better for annual weeds than for perennial weeds, as some perennial weeds can regrow from roots or rhizomes.

Seed a grass species into bare areas, to choke out broadleaf weeds.

## Soil pH/Fertility Control:

When weed populations are high, careful management of soil pH and fertility can be used to control some weeds:

- Decrease soil pH to < 5.0 when heavy herbaceous weed populations are present (i.e. annual grasses, annual broadleaves, and herbaceous perennials like Solidago spp.).
- Limit nitrogen additions to 22.4 kg/ha (20 lbs/acre) of actual N every 2 years when weed populations are high.

However, raising soil pH and limiting N additions when weed pressures are low can promote increased weed establishment. Also, decreasing soil pH and limiting nitrogen additions may reduce yields. You should therefore consult a specialist and try a combination of other weed control methods before altering soil pH or fertility status for weed control.

#### Chemical Control:

- Top-kill herbicides (e.g. herbicidal vinegars, fatty acids) and seedling inhibitor herbicides (e.g. corn gluten meal) may offer some potential for weed control in the future. However, at this time the use of many organic weed control products is experimental and may not be permitted by the certification bodies.
- Remember that any products used to control weeds must be registered with the PMRA (Pesticide Management Regulatory Agency) as well as being acceptable for certified organic production. Acetic acid, for example, is not registered for use at a concentration greater than 5%.

## **Biological Control:**

Promote populations of insects that feed on specific weeds (e.g. the chrysolina beetle on St. John's wort). The effective use of biological controls, however, depends on a good knowledge of individual weed and insect species. They are best used in conjunction with other weed control methods.



## **DISEASE CONTROL**

Paul Hildebrand and Richard Delbridge

There are several diseases of lowbush blueberries that are important in Atlantic Canada. Since organic producers rely primarily on cultural methods for reducing disease incidence, an understanding of the organisms that cause these diseases and of the factors favouring their development is important for an effective disease control strategy for an organic farm.

## Monilinia Blight

Monilinia blight or mummy berry disease, which is caused by the fungus *Monilinia vaccinii-corymbosi,* is the most economically important disease of lowbush blueberry production. It is common throughout all of the Maritime provinces, and is especially destructive during seasons with extended wet periods following bud break. Crop losses vary from slight to almost complete in isolated fields in some years.

#### Symptoms and Disease Cycle:

The fungus overwinters as infected berries or mummy berries that were produced in the previous cropping season. In the spring, the mummies germinate to produce spore cups or *apothecia* that release *ascospores*, and the production of these spores coincides with the development of the blueberry plant. The plant becomes susceptible to infection when the vegetative buds have expanded to about 2 - 5 mm in length and the scales of the flower buds have started to expand and separate. If the plant tissues are exposed to frost, which occurs commonly at this time of year, the susceptibility to infection is greatly increased. Heightened susceptibility lasts for about 4 days after the frost.

The ascospores require free moisture in order to infect the plant tissues. Infection can occur at temperatures as low as 2°C, with the severity of infection increasing with increased temperatures and a longer duration of the wet period. If infection has successfully occurred, disease symptoms appear about 10 - 17 days later.

The first sign of infection is a wilting of the expanding leaves, followed quickly by death of the tissues. Usually all flowers within a cluster will become infected and turn a dark purple-brown in colour and shrivel. A whitish-grey mass of spores called *conidia* develops on the midrib of infected leaves and at the base of infected blossoms. These spores are transmitted by wind and pollinating insects to healthy blossoms, where they germinate and eventually colonize the developing green berries. Infected berries remain symptomless until a few weeks before harvest, when they begin to shrivel, harden, and turn salmon in colour.



The blueberry skin eventually becomes silver in colour and the affected berry is easily dislodged from the plant. The skin is eventually sloughed off in the autumn, exposing a hard black fungal mass called a mummy berry. The mummy berry overwinters and can germinate the following spring, or it may survive in the soil for several years before germinating.

#### Control Strategies:

Once Monilinia blight is established in a field it is difficult to eradicate, so land that is to be developed for new production should be inspected to get an indication of future disease potential. The best time to observe new fields is a few weeks before the existing blueberries are ripe and when developing mummy berries can easily be seen. Established blueberry fields can be inspected at this time also.

Monilinia blight tends to be more severe in fields with heavy soils or numerous low lying wet areas because germination of mummy berries in the spring is favoured by high soil moisture. Therefore, procedures to improve soil drainage should be implemented. Fields that are prone to spring frosts also tend to have a higher incidence of this disease.

The method of pruning may also affect Monilinia blight levels. Burn pruning either in the spring or the fall tends to destroy the mummy berries, but conditions must be dry to achieve a good burn. While mowing is less expensive than burning, it has no effect on control of this disease.

## **Botrytis Blight**

Botrytis blight, caused by *Botrytis cinerea*, is an occasional but destructive disease of lowbush blueberry production. It occurs mostly in regions where coastal fogs cause prolonged wet periods. Crop losses as high as 35% have been recorded in Nova Scotia.

#### Symptoms and Disease Cycle:

The fungus has a wide host range, including weeds, ornamentals, cereals, berry crops, and vegetable crops. It can overwinter on any of these crops as dormant *mycelium* or as *sclerotia*. Surprisingly, the fungus does not overwinter well on blueberry debris, but can be easily found on weeds in blueberry fields. Weeds that have been observed to be sources of inoculum are blackberry, wild strawberry, pearly everlasting, *Potentilla* spp., narrow leafed golden rod, rough golden rod, and especially sheep sorrel.

During wet weather, fungal spores are produced on overwintered diseased tissue and are wind blown to developing blueberry flowers. However, blueberry flowers



become susceptible to infection only after they open. Infection can occur at temperatures as low as 4°C, but at this temperature a wet period of about 48 hours is required for moderate disease development. With an increase in temperature to 20°C, severe infection can occur in as little as 10 hours.

Early flowering clones may be the first to become infected because they come into bloom first. They then serve as a source of infective spores for later flowering clones. Infected blossoms turn brown prematurely and a fuzzy, brown-grey growth may be visible. Under prolonged wet conditions, entire blossom clusters may be affected and the infection may grow down into the twigs, causing twig blight. If infected blossoms drop and become lodged on the foliage and wet weather persists, the leaves may become infected as well.

#### Control Strategies:

Site selection for organic blueberry production is an important factor in reducing the incidence of this disease. Fields that are located inland have a much lower risk of being seriously affected by Botrytis blight because prolonged foggy periods occur less frequently in these areas.

While burn pruning may help to control some diseases, the effect of this management practice on Botrytis blight is not likely to be of direct benefit. However, controlling weeds, especially sheep sorrel, will help to reduce inoculum sources of the pathogen.

## Red Leaf

Red leaf disease, caused by the fungus *Exobasidium vaccinii*, occurs in most lowbush blueberry fields, but the incidence of diseased stems is usually low. A recent survey of fields in Nova Scotia indicated that the average incidence of diseased stems was 3.6%, but a level as high as 15.3% was also observed in some fields.

## Symptoms and Disease Cycle:

The precise time of infection of blueberry stems is not completely understood, but probably occurs during early summer. Spores of the fungus infect young stems and the infection then becomes systemic and perennial in the shoots and rhizomes. The leaves of diseased shoots turn a brilliant red colour, making them conspicuous in fruiting fields from late May to about mid-July. During June and July, white felt-like masses of spores are produced on the undersides of leaves. After the spores have been produced the affected leaves wither and fall, so the disease becomes inconspicuous until new shoots emerge from systemically infected rhizomes in the following year. Diseased stems usually fruit poorly and may eventually die.



#### Control Strategies:

The highly conspicuous nature of red leaf disease will always elicit concern among growers, but the disease spreads very slowly, at only 0.1% per year. The level of disease in a given field will remain more or less stable, and the overall threat of the disease is minimal.

Site selection is an important factor in managing this disease. A site to be brought into production should be inspected carefully for the incidence of red leaf in the natural population of blueberry stems, to get an indication of future disease potential. This is best done in June when the infected foliage is most obvious. Infected plants in sites with a low disease incidence can be rogued by hand.

Because the fungus grows systemically within the shoots and rhizomes, burn pruning has no effect on this disease.

## Godronia Canker

Godronia canker is caused by the fungus *Godronia cassandrae*. The name *"Godronia"* refers to the sexual stage of the fungus, but this stage is not easily found in blueberries. Rather it is the asexual stage, *Fusicoccum putrefaciens,* that causes the actual disease. In the past Godronia canker has not been a problem in lowbush blueberries and when it did occur, it was confined to the edges of fields where burn pruning was incomplete. Recently, however, the incidence of Godronia canker has increased. This is probably attributable to the decreased use of burn pruning as a management practice.

#### Symptoms and Disease Cycle:

Lesions of Godronia canker first appear in cropping fields in late May or early June and result in tip dieback. The dieback may appear in patches, or it may also be seen randomly on individual stems throughout the field. A lesion can usually be seen midway up the stem and it is almost always centred around a leaf bud. The lesion is dark orange-brown in colour and surrounded by a purplish border. The centre eventually turns a tan colour and small black fruiting bodies may be visible. The lesion may be small or up to 2 cm in length.

Developing leaf buds above the lesion become stunted and begin to die, followed by complete stem death above the lesion. Leaf buds below the lesion begin to grow vigorously so that by the end of July a severely infected field can look deceptively healthy. However, it will have a reduced yield. Lesions that develop later may not result in tip dieback but the stem will become unthrifty, with reddish leaves and small berries.



Very little is known about the conditions that encourage the development and spread of this pathogen in lowbush blueberries. It is believed that sprouts become infected during the summer months and that the infections remain latent until the following spring, when the lesions begin to expand. Weather conditions that favour infection, lesion expansion, and spore production have not yet been determined.

#### Control Strategies:

A recent survey showed that burn pruning was important in reducing disease incidence. Fields that had been burned in the recent past had substantially lower levels of this disease, and fields that have been severely affected have recovered in the next crop cycle following a burn. Therefore, although burn pruning is more expensive than mowing, a periodic burn appears to be valuable in reducing the incidence of this disease.

## Phomopsis Canker

Phomopsis canker, caused by the fungus *Phomopsis vaccinii*, occurs in most blueberry fields but the incidence of diseased stems is usually low.

#### Symptoms and Disease Cycle:

Phomopsis canker can be easily observed in sprout fields from late July or early August through to the end of September. Symptoms may be seen on random, individual stems, on groups of a few stems, or on many stems in patches up to 1 m in diameter. Lesions are not well defined and appear as brown blemishes near the base of the sprouts. Within a few days the entire stem begins to turn brown and the leaves turn a dark orange-brown that stands out against the lush green colour of healthy sprouts. After this colour change, the leaves fall off quickly. Unlike Godronia canker which kills the upper portion of a stem, Phomopsis canker kills the entire stem because the infection point is usually at the base.

Little information is available on the life cycle of this pathogen. It overwinters on dead infected stems and produces spores that infect and kill sprouts from July through to early October. Late fall infections do not kill sprouts, but these infections overwinter and then continue to develop in the spring, killing the cropping stems. The disease produces similar symptoms in cropping fields, but it occurs less frequently than in sprout fields.

#### **Control Strategies:**

Because the life cycle is somewhat similar to the Godronia canker pathogen, it would be safe to assume that burn pruning would control Phomopsis canker. However, no work has been conducted to verify this.



## Miscellaneous Diseases

A number of other diseases occur in lowbush blueberry fields, but they are generally regarded as nuisance diseases that seldom affect yields. The following diseases may be observed in some fields or in some years:

- There are several leaf spotting organisms (Septoria spp., Pucciniastrum vaccinii, and Gloeosporium spp.) that can cause premature defoliation of sprouts or cropping stems, but they have not been attributed to yield reductions.
- Witches' broom, caused by the fungus Pucciniastrum goeppertianum, causes plants to develop broom-like masses of swollen, spongy shoots with few or no leaves. An alternate host for this pathogen is the balsam fir, but it is usually not practical to remove balsam fir near blueberry fields because of the high prevalence of these trees within forests throughout the Maritime provinces.
- Powdery mildew, caused by Microsphaera vaccinii, appears as a white powder on the upper or lower surfaces of leaves beginning in midsummer. On some clones, numerous chlorotic spots surrounded by red borders may be evident. Affected leaves may pucker and eventually fall off the plant, and some clones that are heavily infected with powdery mildew may become completely defoliated by harvest time. Historically, powdery mildew has not been regarded as a serious disease, but recently it has been observed to reduce yields through severe, premature defoliation in northern New Brunswick.



## **INSECT CONTROL**

Sonia Gaul

Insect control can be a major challenge in organic blueberry production since (1) crop rotations and tillage are not an option in blueberry production, and (2) synthetic pest control products are either restricted or prohibited in certified organic production. Because of these limitations, the organic blueberry producer must rely on a variety of cultural and physical methods to control insect pests. These include the selection of a suitable site, using visual inspection, sweep nets, and insect traps to monitor fields for the presence of insects, burn pruning (where required), and field sanitation.

## General Insect Control Strategies

The measures listed below will help reduce the incidence of insect pests in organic blueberry fields. However, it is important to remember that recommendations on insect control strategies for organic blueberry production are still being established, so further general and specific techniques may become available in the future.

- Site selection: Choose the site carefully, and if possible establish in a field in an area with a history of low infestation of insect pests.
- Life cycle/biology: Information on the life cycle and biology of the insect pest can aid in positive identification of the pest. Knowledge of the pest can also increase understanding of more vulnerable life stages.
- Monitoring: Monitoring for the presence of larvae or adults can ensure proper timing of any control measures. Follow current recommendations for monitoring for the presence of adults and larvae. Methods include visual inspection of the fields, the use of sweep nets to determine the species and numbers of insects present in the fields, and the use of insect traps.
- Sanitation: Promptly compost or burn any refuse that is gathered at collection centres, to ensure destruction of insect pests that may be transported with the blueberries.
- Burn pruning: Burning reduces the population of several insect pest species in blueberry fields by destroying eggs (blueberry flea beetle, spanworms) and pupae (sawflies), and by removing surface material that provides a site or a cover for overwintering organisms.



Pest control options: There may be selected pest control products that can be used in conjunction with other insect control methods. Always check with your certification body as to which products are acceptable. All products used for pest control must be registered with the <u>Pesticide</u> <u>Management Regulatory Agency (PMRA;)</u> as well as being acceptable for certified organic production.

## The Blueberry Maggot

The blueberry maggot, or blueberry fruit fly (*Rhagoletis mendax* Curran), is the most important insect pest in lowbush blueberry production in the Maritimes. It is currently not found in the major lowbush blueberry production areas in Quebec or in Newfoundland. For this reason, shipments of fresh fruit from the Maritime provinces to Newfoundland or British Columbia are prohibited, and shipments of fresh fruit to all other noninfested areas in Canada and parts of the United States must be certified to be free of maggots.

The female lays an egg under the skin of the berry, and the developing larva or maggot feeds within the berry. The larva destroys the pulp and causes shriveling of the berry, which may drop prematurely. Most importantly, the presence of the larva in the berry makes it unacceptable for both fresh and processing markets.

#### Identification/Monitoring:

The adult is a fly, slightly smaller than a housefly, with black bands across the wings and white lines on the abdomen. Yellow sticky cards can be used to monitor for the presence of the fly in blueberry fields. There are several techniques used to monitor for the presence of larvae in the fruit. These involve mashing the fruit to liberate the larvae, using hot water or a sugar density gradient to separate the larvae and fruit, and visual identification of the creamy white larvae. Detailed descriptions of how to identify and monitor the adult and larval stages of this pest can be found in:

Detecting Maggots in Wild Blueberry Fruits (Chiasson and Argall 1997)

The Blueberry Fruit Fly (Crozier 1995)

Blueberry Maggot (Maund et al. 1997)



### Control Strategies:

The measures listed below will help reduce the incidence of the blueberry maggot in organic blueberry fields. However, it is important to note that recommendations on organic control strategies for this pest are still being established. In many blueberry fields, the threshold of adult flies may be exceeded, and the use of an acceptable control product, if available, may be indicated.

- Site selection: Choose the site carefully, and start with a field with a history of low infestation of *R. mendax*.
- Monitoring: Follow current recommendations for monitoring for the presence of adults.
- Sanitation: The blueberry maggot overwinters in the soil after exiting the blueberry. Removal of as many of the berries from the field as soon as possible, before larvae exit the berry, will reduce the number of overwintering insects. Prompt composting or burning of any refuse that is gathered at blueberry collection centres will also help ensure destruction of the larvae.
- Pruning: The pupae of R. mendax are insulated in the soil and are therefore protected from destruction due to burn pruning.
- Pest control products: Certain pest control products may provide physical protection of the fruit. Products containing kaolin clay are being investigated in research trials and may become an acceptable option in organic production systems. Kaolin clay provides a physical barrier on the fruit.

## **Other Insect Pests in Blueberry Fields**

Several insect species have been identified which cause damage in blueberry fields and reduce yields through destruction of the fruit buds and leaf tissue. These include:

- Moths: the blueberry leaftier (Croesia curvalana (Kearfott)), the blueberry spanworm (Itame argillacearia (Packard)), and the chainspotted geometer (Cingilia catenaria (Drury));
- Beetles: blueberry flea beetle (Altica sylvia (Malloch)) and blueberry case beetle (Neochlamisus cribripennis (LeConte)); and
- Blueberry thrips (Frankliniella vaccinii Morgan and Catinathrips kainos (O'Neill).



The blueberry flea beetle and the blueberry spanworm are important insect pests in New Brunswick blueberry fields. Although these pests can greatly reduce yields, they do not impact the quality of the fruit. Therefore, there are no inspection or quarantine restrictions because of these pests. Other insect pests may also be present, but these will rarely achieve damaging populations.

General insect control strategies should be used to help control these pests. Populations of moths and beetles, where identified through monitoring as present in high numbers, may be reduced by burn pruning. Refer to the following publications and websites for detailed information on identification, monitoring, and control strategies for individual blueberry pests:

Lowbush Blueberry Production: Insect Pests (Neilson and Crozier 1989)

New Brunswick Department of Agriculture, Fisheries and Aquaculture. <u>Wild</u> <u>Blueberry Factsheets</u>

Nova Scotia Department of Agriculture and Fisheries. <u>Wild Blueberry Factsheets:</u> <u>Insects</u>.

The Wild Blueberry Network Information Centre. <u>Wild Blueberry Factsheets:</u> <u>Insects</u>

Agrapoint International <u>*Wild Blueberry Insect and Disease Management</u></u> <u><i>Schedule*</u>. (Delbridge and Rogers 2002, revised by Burgess 2004).</u>



## PROCESSING

Organic blueberry processing requires certification by an appropriate certification body and compliance with a recognized standard. In addition, all procedures and precautions that apply to the harvesting and handling of conventional blueberries will equally apply to organic blueberry harvesting, packaging, and distribution. This includes adherence to all applicable building codes, OHSA and HACCP protocols, and standard hygiene procedures. Construction of the physical packaging plant will require the use of stainless steel vessels and conveyance systems, as well as the use of non-porous construction materials throughout. Professional expertise and input is absolutely necessary, prior to and during construction, to ensure the building will meet current requirements. This is especially important if you anticipate exporting out of province or to foreign markets.

To be certified for organic processing, the processor must be able to ensure:

- Segregation of organic and non-organic products during transport, handling, processing, and storage
- Maintenance of a record system that can trace the organic product through the purchase, processing, handling, storage, and transport chain
- The provision of facilities and equipment (transport, handling, and bulk storage) that are free of non-organic residues
- Maintenance and cleaning procedures that are appropriate to the product, and that use only organically approved materials
- > The use of only organically approved food additives and processing aids
- The use of appropriate food-grade packaging materials that can, where possible, be recycled or reused
- > Pest control practices that are consistent with the standard
- Proper labeling of the product with regards to the listing of organic/nonorganic ingredients.

A major concern with regards to processing organic blueberries is the careful washing of all equipment, both in the plant and in the field where hand rakes, mechanical harvesters, and field boxes are used. This is especially important in conventional facilities that do not have a dedicated organic line. You will need to discuss cleaning materials, procedures, and supporting documentation with your certification body, to ensure you meet the requirements of the standard.



Organic blueberries can be processed in a facility that processes conventional blueberries, as long as these requirements can be met. The berries would have to be certified organic, and the processor would need to be able to verify the source of the berries and trace the handling/transport of the berries prior to their arrival at the plant. This will require a detailed records system and careful monitoring of harvest and transport.

#### Processors

The following companies currently process, or would be interested in processing, organic blueberries:

#### **Glenmore Industries**

P.O. Box 178 Middle Musquodoboit, NS B0N 1X0 Telephone: (902) 384-2734 Fax: (902) 384-2734 E-mail: j.j.burgess@ns.sympatico.ca

#### McFetridge Farm

85 South Cove Rd., RR#2 Stewiacke, NS B0N 2J0 Telephone: (902) 673-2471 Fax: (902) 673-2215 E-mail: pulsifer@ns.sympatico.ca

\* These two are currently the largest processors of organic blueberries in Nova Scotia. They have been buying no-spray and certified organic berries out of the field since 2001.

#### Oxford Frozen Foods Ltd.

4881 Main St. Oxford, NS B0M 1P0 Contact: Craig Wilmot, CA Telephone: (902) 447-2100 Ext. 299 Fax: (902) 447-2102 E-mail: <u>cwilmot@oxfordfrozenfoods.com</u> Website: <u>http://www.oxfordfrozenfoods.com/</u>

\* Currently has certified organic wild blueberries.

#### Van Dyk's Health Juice Products Ltd.

c/o AAFC, 32 Main St. Kentville, NS B4N 1J5 Telephone: (902) 679-5346 Fax: (902) 679-2311 E-mail: randymacdonald@vandykblueberries.ca Website: www.vandykblueberries.ca

\* Would be interested in organic products if sufficient quantities of good quality organic wild blueberries were available.



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