

7 Supplemental Information

7.1 Bird Management

Damage to fruit by birds is a serious problem in many areas of New York. Visual scare devices such as whirlers, streamers, reflectors, and plastic hawk and owl models are seldom effective if used alone. They should be supplemented with sound devices such as exploders, alarms, or recorded devices. For sound devices to be effective, their location and the frequency of sounds should be changed daily. They also should be in place before the fruit ripens. The most effective sound device is Bird-Gard with species-specific bird distress calls programmed into the device. One unit with 4 speakers is effective on 10 acres. Some towns have passed ordinances regulating the use of sound devices.

Several types of netting, such as plastic, nylon, cotton, and polyethylene, are marketed for protecting fruits. A lightweight acrylic netting that can be draped directly over plants is available. It does not require support and it does not interfere with sunlight, pollination, or growth. Most netting is expensive, but it can be reused for many years.

Some growers are finding success repelling bird with newer formulations of methyl anthranilate (Fruit Shield and Goose Chase, EPA Reg. No. 66550-1-8708). Methyl anthranilate is an aromatic acid ester that occurs naturally in grapes. Synthetic methyl anthranilate is a food-grade compound that is used to impart “grape” flavor. Apparently, this flavor is offensive to birds, and they will not eat vegetation treated with it.

7.2 Rodent Management

Various rodents can damage a small-fruit planting, especially as they feed under bark in the winter. Closely mowing the area around the planting and between the aisles in early November will reduce the habitat for voles and mice. The habitats (woodlots) of predators that feed on rodents (hawks, owls, foxes) should be protected around the area. A number of poisonous baits are labeled for use in agricultural areas. To be most effective, baits should be placed in feeding stations that exclude large animals and are replenished throughout the winter.

7.3 Deer Management

Deer populations are at an all time high, and they can devastate berry plantings, particularly strawberries that retain leaves throughout the year. Multiple strategies are required to discourage deer from feeding on berry plantings. Refer to Reducing Deer Damage to Home Gardens and Landscape Plantings by P. Curtis and M. Richmond for recommended methods.

7.4 Harvesting, Handling, and Transportation Guidelines

Raspberries and strawberries ripen quickly; so harvesting the same planting frequently (once every two days) is critical. Fruit harvested before it is fully ripe will have a much longer shelf life than fully ripe or overripe fruit. The optimum stage of maturity for the raspberry occurs when the berry first becomes completely red, but before any darker hues develop. Strawberries with a white tip will retain their firmness much longer than those harvested fully ripe, and will lose less water during storage. Blueberries turn blue before they are at their peak of flavor and sweetness. Some training may be required to teach pickers the proper stage and appearance for harvesting. Fruit quality for fresh market raspberries usually declines as the season progresses. Be sure the marketing channels are open before the first berries ripen, as these will likely have the highest quality and largest size for the season.

Avoid touching a berry before it is ready for harvest. Place only undamaged berries with good appearance in the pack. Studies have found that the magnitude of injury caused by human pickers can be so great as to mask any other causes of deterioration.

Overripe berries are susceptible to mold. Once the mold growing on overripe berries sporulates, large amounts of inoculum will be present to infect other ripening fruit. Overripe berries also attract ants, wasps, and other pests. Do not dispose of rotten berries near the field, and pick them off the bushes. It may be more economical in the long run to pay pickers for harvesting rotten as well as marketable fruit. One could pay an hourly wage to a worker for harvesting only rotten berries so the other pickers will be less likely to harvest rotten berries with their marketable berries with fungal spores.

Harvest directly into small containers. Use half-pints for raspberries and blackberries, and pints for the other small fruit crops. Wide, shallow containers are better than deep containers. Check with the buyer to determine what type of container is preferable; each type has advantages and disadvantages. The pulp containers are inexpensive, but stain easily. Wooden containers also stain and are expensive. Solid clear plastic (polystyrene) containers will not stain, significantly reduce moisture loss when used with a cap, allow customers to see all the berries they purchase, and are inexpensive; however, juice can accumulate at the bottom. It is difficult to cool berries in either of these types, and mold tends to develop on the lower berries. The slotted plastic containers allow for rapid cooling, do not stain, and do not accumulate juice; however, if the slots are too wide, berries can be damaged. Large wholesalers, often use a narrowly slotted, plastic half-pint container with a plastic wrap.

7.5 Postharvest Considerations

Much time and effort can be expended to produce and harvest a good crop of berries, only to have the crop deteriorate before it is sold. This deterioration is caused by respiration of the fruit. Respiration occurs in all living organisms and is the process by which food reserves are converted into energy. Respiration of fruits results in shrinkage and reduced sweetness. Raspberries and blackberries have a higher respiration rate than any other fruits, while strawberries follow closely.

Temperature is the easiest and most effective condition to modify for extended storage of fruits. Some large shippers on the West Coast use a high carbon dioxide atmosphere, and there have been some attempts to use low oxygen storage, much like is done with apples. In small fruits, however, bad-tasting aldehydes and alcohols will accumulate in the fruit when oxygen is limited, particularly with certain varieties. Work is currently being conducted on over wraps that accumulate carbon dioxide in the pack, but even this new technology is not very effective without good temperature management.

A 10 °F reduction in temperature reduces the respiration rate by approximately 50%. Furthermore, at 77 °F and 30% relative humidity, fruit will lose water 35 times faster than it would at 32 °F and 90% relative humidity. Prompt cooling, and maintenance of proper temperatures and humidity, is essential.

The cooling process should occur in two stages. Simply setting harvested berries in a cold room is not adequate because the field heat is not removed fast enough. Rapid movement of cold, humid air through the berries is essential during the first few hours after harvest. Brokers contend that for every hour delay in cooling, shelf life is reduced by one day. Growers can take advantage of night cooling by harvesting fruit as early in the morning as possible.

Large growers may have a separate pre-cooling facility specifically designed for removing the field heat, but inexpensive, effective improvisations can be adapted for any cold storage. If a grower only has a walk-in cooler, recently picked flats of berries can be set into a cardboard box that is opened at both ends. A household fan is then placed at one end of the box to draw air through the flats. Once the berries are cool, flats are removed from the cardboard and wrapped in plastic. The plastic will reduce water loss during storage, and prevent condensation on the berries when flats are removed from the cooler. The plastic should not be removed until the temperature of the berries warms to near the temperature of the display. Condensation will then form only on the outside of the plastic, while the berries inside will remain dry.

The storage room itself can be maintained as low as 30°F. Berries will not freeze at or above this temperature because the sugars in the fruit depress the freezing point. One may want to maintain the storage at a slightly warmer temperature (32°F) to allow some room for error. Major shippers, however, report that storage at 40°F reduces shelf life by 50% compared to 30°F.

The selection of a cooling unit is very important when designing a cooler. If the temperature difference between the air and the cooling unit is large, then the condensers will accumulate ice from moisture in the air. This drying of the air would not cause a problem for dry goods, but will severely dehydrate fruit. The atmosphere around the fruit should be humid to prevent shrinkage, so a cooler should be selected which can maintain a relative humidity of 90-95% at 32°F. These types of coolers are more expensive and less common than those for dry goods. Consult your agricultural engineering specialist for help with selecting a cooling unit and building a storage facility.

7.6 Transporting Berries to Market

The loss of soft fruits such as raspberries and strawberries from harvest to the consumer's table is estimated at more than 40%. A 14% loss occurs from farmer to wholesaler, a 6% loss occurs from wholesaler to retailer, and 22% is lost between the retailer and consumer. Much of these losses are due to poor handling of berries after harvest.

There are many steps in the distribution chain that can negatively affect fruit quality. A typical handling scheme might be transporting berries from the field to the pre-cooler, wrapping flats after pre-cooling, loading into a refrigerated truck, transporting to a distribution center, unloading into the warehouse, loading into a truck, transporting to retail store, unloading, handling in the backroom, and setting up the display. Mishandling at any point along this route can result in unacceptable berries.

Work to minimize the number of handling steps from field to display. Berries should remain cold and wrapped during each phase of transportation. Never allow the berries to sit on unrefrigerated loading docks. When loading a truck, stack flats on a pallet and away from the walls. Ensure that cold air is free to circulate around the sides of the pallet and across the top and bottom.

When flats of fruit are allowed to touch the floor or sidewalls, temperatures in the flats can rise as much as 20 °F. Do not stack flats directly over the rear wheels, and use strapping or stretch film to stabilize the load. Refrigerated trucks should be equipped with air-suspension systems rather than spring systems to reduce transit vibrations.

Most mechanical refrigeration equipment in current use is designed to maintain temperature, but lacks the air flow and refrigeration capacity for rapid cooling. Temperature regulating equipment in trucks does not have the accuracy to achieve temperatures below 40°F without danger of freezing. Furthermore, high-density loads are used to minimize transportation costs, but this inhibits cooling during transit. Thorough product cooling before loading is very important.

Allow berries to warm only when they are ready for display to consumers, and before removing the plastic wrap over the flats. Any condensation will then form on the plastic wrap rather than on the berries inside. Often the transportation of berries is beyond the control of the grower. To develop new and distant markets, receivers must be educated in proper handling procedures. Personal contact with the receiver before the first delivery is often useful. In other cases, handling instructions may be attached to the flats.

By using proper harvesting and storage techniques, it is possible to maintain quality raspberries for 7 days after harvest, and strawberries for 2 weeks. Blueberries can be maintained for 3 weeks after harvest. This is certainly enough time for growers to take advantage of distant markets throughout North America.

7.7 Useful Web Sites

2006 Pest Management Guidelines for Berry Crops

<http://www.fruit.cornell.edu/Berries/pestman/index.html>

An on-line version of this publication.

Cornell Fruit Website

<http://www.fruit.cornell.edu>

A comprehensive list of electronic resources and publications on horticultural subjects, including berry crops.

Nursery Guide

<http://www.hort.cornell.edu/nursery>

A comprehensive list of small fruit cultivars and the nurseries that sell them.

Berry Diagnostic Tool

<http://www.hort.cornell.edu/diagnostic>

A pictorial aid to diagnosing physiological disorders and pest problems of berry crops.

The Tree Fruit and Berry Pathology Website

<http://www.nysaes.cornell.edu/pp/extension/tfabp/>

New York State IPM Program

<http://www.nysipm.cornell.edu>

New York State Pesticide Product Registrations

<http://pmep.cce.cornell.edu/pims/>

IPM Fact Sheets for Berry Crops

<http://www.nysipm.cornell.edu/factsheets/berries/>

New York Berry News

<http://www.nysaes.cornell.edu/pp/extension/tfabp/newslett.shtml>

An on-line small fruit newsletter featuring berry-related news, views, and research information for New York and the northeastern United States.

Food Safety

<http://www.gaps.cornell.edu/>

Practical steps that a grower can take to minimize the risks of bacterial contamination of produce.

National Clonal Germplasm Repository for Berry Crops

<http://www.ars-grin.gov/cor/>

World's largest collection of varieties and selections of berry crops.

New York State Berry Growers Association

<http://www.nybga.org>

Wildlife Management Information

<http://wildlifecontrol.info>

7.8 Extension Specialists

Table 20. Cornell Cooperative Extension regional berry specialists located in New York State.

Regional specialists	County or region	Phone/email
Alison DeMarree Stephen Hoying 1581 Rt. 88 North Newark, NY 14513-973	Monroe, Niagara, Ontario, Orleans, Wayne, Wyoming	(315) 331-8415 amd15@cornell.edu sah19@cornell.edu
Deborah Breth 20 South Main Street Albion, NY 14411-0150	Monroe, Niagara, Ontario, Orleans, Wayne, Wyoming	(585) 589-5561 dib1@cornell.edu
Dena Fiacchino 3288 Main Street Mexico, NY 13114	Oswego	(315) 963-7286 x 203 dcf25@cornell.edu
Kevin Iungerman Saratoga Co. Coop. Ext. 50 West High St. Ballston Spa, NY 12020-1992	Albany, Clinton, Essex, Saratoga, Washington	(518) 885-8995 kai3@cornell.edu
Steven McKay 479 Rt. 66 Hudson, NY 12534-9706	Columbia, Dutchess, Rensselaer, Orange, Ulster	(518) 828-3346 sam44@cornell.edu
Molly Shaw 56 Main Street Owego, NY 13927	Chemung, Cortland, Schuyler, Tioga, Tompkins	(607) 687-4020 meh39@cornell.edu

7.9 Extension Faculty and Statewide Specialists

Table 21. Cornell Cooperative Extension faculty located at Ithaca and Geneva.

Faculty member	Area of specialization	Phone/email
James Bartsch Dept. of Agricultural and Biological Engineering Cornell University, Ithaca	Fruit storage facilities	(607) 255-2800 jab35@cornell.edu
Juliet Carroll NYS IPM Program NYS Agricultural Experiment Station, Geneva	Fruit-IPM, Berry diseases	(315) 787-2430 jec3@cornell.edu
Greg English-Loeb Dept. of Entomology NYS Agricultural Experiment Station, Geneva	Berry and grape insect pests	(315) 787-2345 gme1@cornell.edu
Larry Geohring Dept. of Agricultural and Biological Engineering Cornell University, Ithaca	Water management, irrigation	(607) 255-3156 ldg5@cornell.edu
Cathy Heidenreich Dept. of Horticulture Cornell University, Ithaca	Berry culture, small fruit pathology	(607) 255-2041 (315) 787-2367 mcm4@cornell.edu
Olga Padilla-Zakour NYS Food Venture Center NYS Agricultural Experiment Station, Geneva	Fruit processing, processing regulations	(315) 787-2259
Pesticide Management Education Program 5123 Comstock Hall Cornell University, Ithaca http://pmep.cce.cornell.edu	Pesticide registration information	(607) 255-1866 (607) 257-5706 wgs1@cornell.edu
Marvin Pritts Dept. of Horticulture Cornell University, Ithaca	Berry culture, nutrition, weed control	(607) 255-1778 mpp3@cornell.edu
Wen-fei Uva Dept. of Applied Economics and Management Cornell University, Ithaca	Marketing	(607) 255-3688 wl32@cornell.edu
Chris Watkins Dept. of Horticulture Cornell University, Ithaca	Postharvest handling	(607) 255-1784 cbw3@cornell.edu
Courtney Weber Dept. of Horticultural Sciences NYS Agricultural Experiment Station, Geneva	Cultivar development	(315) 787-2234 caw34@cornell.edu
Gerald White Dept. of Applied Economics and Management Cornell University, Ithaca	Farm business management	(607) 255-2299 gbw2@cornell.edu

7.10 Related Resources

The following popular Cornell Cooperative Extension resources were selected to complement the information in this publication. A series of Small Fruit publications provides basic information on many pests and diseases including life cycle and suggested management practices. Most contain full color photographs to aid in positive identification of pests or diseases. Contact the Cornell University Resource Center, address below, for a complete, free list.

Bramble Production Guide	123NRAES35	\$45.00
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The 116 color photos will help the serious hobbyist and established grower identify and diagnose bramble problems. Includes sections on site selection and preparation, plant selection, planting, pest and weed control, irrigation, economics, and marketing. 188 pp. (Revised version forthcoming)

Dayneutral Strawberry Production Guide	155IB215	\$0.95
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Will help serious hobbyists and commercial growers make the most of this recently developed cultivar. Plants flower and fruit continuously, yielding fresh strawberries through the summer into October. 9 pp.

Strawberry Production Guide	161S124	\$50.00
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A comprehensive resource for the commercial strawberry grower. Contains hundreds of photos, many tables, and a budgeting spreadsheet. 162pp.

Highbush Blueberry Production Guide	NRAES88	\$50.00
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Includes 168 color photos of blueberry varieties, diseases, pests, and growing techniques. Tables help to determine the financial feasibility of a planting. A key helps identify and diagnose blueberry problems and refers to relevant pests and photos. Includes work sheets for determining nutritional needs. Includes 3-ring binder. 200 pp.

Integrated Pest Management in Strawberries (Video)	132VIPMS	\$31.95
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Emphasis on control strategies for tarnished plant bug, strawberry bud weevil, two-spotted spider mite, and botrytis fruit rot (Minnesota Department of Agriculture). 17 min.

Integrated Weed and Soil Management in Fruit Plantings	142IB242	\$7.25
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Explains how various weed management systems affect fruit crops, soils, and groundwater. The advantages and disadvantages of various methods for managing weed competition are described. Action thresholds and other weed integrated pest management (IPM) strategies are covered. Mulches and other non-chemical weed controls, timing of control applications, ground cover management systems, and herbicide applicators are included. Color photographs show detail. 16 pp.

Cornell Guide to Growing Fruit at Home (2003)	142IB156	\$9.99
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In simple language and informative graphics, the “Cornell Guide to Growing Fruit at Home” tells you how to grow and harvest the freshest, highest-quality fruit right in your own backyard. You will learn about site selection, soil preparation, planting, pruning and training, pest and disease management, as well as how to choose the best varieties. From easy-to-grow berries that you can plant and harvest this season to grapes that are more challenging and fruit trees that can provide a lifetime of crops, it’s all here! There’s even a section on little known fruits that make handsome landscape plants as well as tasty harvests. 104 pp. Spiral bound. ISBN: 1-57753-302-X.

Strawberry IPM Scouting Procedures: A Guide to Sampling for Common Pests	102IPM203	\$10.00
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Useful anywhere strawberries are grown. The scouting methods can be applied anywhere to achieve IPM goals of reducing the use of chemical pesticides to the minimum level necessary to produce high-quality food and produce that will be competitive in the marketplace. Includes fact sheets with color pictures of pests and other problems, including botrytis fruit rot. 33 pp. plus charts.

Orchard Nutrition Management (1991)	142IB219	\$4.25
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Helps fruit producers analyze orchard nutritional status by correctly interpreting soil sample test results, analyzing leaves, and visually inspecting the orchard. Color photos show symptoms of deficiency or injury to trees, leaves, and fruit. 22 pp.

Reducing Deer Damage to Home Garden Plantings (1994)	147DD	\$3.75
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Provides comprehensive information on practical, proven deer damage management programs. Covers historical changes in numbers of white-tailed deer, their feeding habits, food requirements, and behavior and social organizations. Landscape plants that are rarely, seldom, occasionally, or frequently severely damaged by deer, such as rhododendrons or English ivy, are listed. 22 pp.

Visit the Cornell Cooperative Extension Catalog of publications and videotapes at: <http://www.cce.cornell.edu/store/>.

THE RESOURCE CENTER



Cornell University
Cooperative Extension

The Resource Center is the publications enterprise of Cornell Cooperative Extension. Of the 750+ titles offered by The Resource Center, well over 450 are related to agriculture. All agriculture titles offer practical, research- and experience-based knowledge for specific topics, with many priced under \$10.00 and most priced under \$20.00. Take some time to search our online bookstore for answers to and guidance for virtually any Northeast U.S. agricultural related issue.

Cornell University's College of Agriculture and Life Sciences is the flagship agriculture institution of New York State, and is highly regarded throughout the United States and the world for its research and outreach programs.

- Cornell Farm Account Book - \$10.95
- Cornell Farm Business Record - \$16.00
- Cornell Farm Inventory and Depreciation Book - \$3.95
- Cornell Field Crops and Soils Handbook - \$6.25
- Cornell Recommendation Record Book - \$11.95
- Writing an Employee Handbook: A Guide for Farm Managers - \$7.75
- Farm Employee Wage Record Book - \$8.75
- Farmers Employment Workbook: Job Skills Development for Farmers - \$12.75
- Establishing & Operating a Garden Center: Requirements and Costs - \$14.95
- Facilities for Roadside Markets - \$7.95
- Farming Alternatives: A Guide to Evaluating Feasibility of New Farm Enterprises - \$7.95
- Produce Handling for Direct Marketing - \$7.95
- Building Soil for Better Crops - \$19.95
- Cover Crops for Vegetable Production in the Northeast - \$5.95
- Detection of Potato Tuber Diseases and Defects - \$2.90
- Vegetable Production Handbook - \$12.60
- Growing Alfalfa the IPM Way - \$10.50
- Integrated Pest Management for Onions - \$18.75
- IPM of Onions – Video - \$24.95
- Keys to Soil Taxonomy – Video - \$26.95
- Low Input Sustainable Agriculture: Practices for Field Crop Production in the Northeast – Video - \$20.95
- Natural Enemies of Vegetable Insect Pests - \$15.70
- Organic Grain: Another Way (3 Video Set) - \$31.50
- Pest Management Guidelines for Tree Fruit - \$29.95
- Potato Late Blight – Video - \$24.95
- Scouting for Common Alfalfa Disease – Video - \$20.95
- Snap Bean Pest Management: A Guide to Regular Field Monitoring NY - \$10.50
- Snap Bean Pest Management: A Guide to Regular Monitoring in New York – Video - \$22.95
- Soil Taxonomy: A Technical Language of Soil Science – Video - \$26.25
- Sustainable Vegetable Production From Start-Up to Market - \$37.95
- Genetically Engineered Foods in the Marketplace (11 Fact Sheet Set) - \$9.95
- The First 100 Years of the New York State Agricultural Experiment Station at Geneva, NY (1882-1982) - \$30.30

Additional copies of this publication and dozens of related titles may be purchased from:

The Resource Center
Cornell Cooperative Extension,
365 Roberts Hall, Ithaca, NY 14852-3884.

Phone: (607) 255-2080

Fax: (607) 255-9946

E-mail: resctr@cornell.edu

Or shop securely online at www.cce.cornell.edu/store

For other Cornell Cooperative Extension titles, ask for a free catalog from the same address, or from any Cornell Cooperative Extension Association office. All titles may be viewed online at: www.cce.cornell.edu/store.

Tips for Laundering Pesticide-Contaminated Clothing

Air

Hang garments **outdoors** to air

Prerinse

Use one of **three methods**:

1. Hose off garments outdoors.
2. Rinse in separate tub or pail.
3. Agitate in automatic washer.

Pretreat (heavily soiled garments)

Use heavy-duty liquid detergent.

Washer Load

Wash garments **separate** from family wash.
Wash garments contaminated with the **same** pesticide together.

Load Size

Wash only a **few** garments at once.

Water Level

Use **full** water level.

Water Temperature

Use **hot** water, 140°F or higher.

Wash Cycle

Use **regular** 12-minute wash cycle.

Laundry Detergent

Use a **heavy-duty** detergent.
Use amount recommended on package or more for heavy soil or hard water.

Rinse

Use a **full warm** rinse.

Dry

Line drying is preferable, to avoid contaminating dryer.

Clean Washer

Run complete, but empty, cycle.
Use **hot water and detergent**.

Rewash

Rewash contaminated garments **two or three times** before reuse for more complete pesticide removal.

Other Tips

Remove contaminated clothing **before** entering enclosed tractor cabs.

Remove contaminated clothing **outdoors** or in an entry. If a granular pesticide was used, shake clothing outdoors. **Empty pockets and cuffs**.

Save clothing worn while handling pesticides for that use only. Keep separate from other clothing **before, during, and after** laundering.

Wash contaminated clothing after **each** use. When applying pesticides daily, wash clothing **daily**.

Never use the “sudsaver” feature on your machine when laundering pesticide-soiled clothes.

Clean gloves, aprons, boots, rigid hats, respirators, and eyewear by scrubbing with detergent and warm water. Rinse thoroughly and hang in a clean area to dry.

Take these **precautions** when handling contaminated clothing:

- Ventilate area.
- Avoid inhaling steam from washer or dryer.
- Wash hands thoroughly.
- Consider wearing chemical-resistant gloves.

Prepared by Charlotte Coffman, Department of Textiles and Apparel, telephone: 607-255-2009

PESTICIDE EMERGENCY NUMBERS

Pesticide Spills and Accidents

CHEMTREC

1-800-424-9300

Pesticide/Information Emergencies

National Pesticide Telecommunications Network

1-800-858-7378

Report Oil and Hazardous Material Spills

NYS Department of Environmental Conservation

(in NYS) 1-800-457-7362
(from outside NYS) 1-518-457-7362

Agricultural Nurse Program

Western New York

1-800-388-6536

Central New York

1-800-343-7527

Eastern New York

1-518-436-5511

Information on Symptoms and Treatment

You can obtain prompt and up-to-date information about the symptoms and treatment of cases resulting from exposure to toxic agricultural chemicals by telephoning any of the centers listed below and asking for "Poison Control Center."

When you are unable to reach a Poison Control Center or obtain the information your doctor needs, the office of the NYS Pesticide Coordinator at Cornell University, 607-255-1866, may be able to assist you in obtaining such information.

Poison Control Centers

Western New York 1-800-888-7655
Finger Lakes Region 1-800-333-0542
Central New York 1-800-252-5655

Eastern New York 1-800-336-6997
New York City 1-212-340-4494
Long Island 1-631-542-2323

The Pest Management Guidelines for Berry Crops aids berry growers with general nutrient guidelines, general site selection and preparation information, as well as insect, mite, disease, and weed management decisions. Detailed cultural and chemical management practices are provided for blueberry, raspberry, blackberry, strawberry, currant, and gooseberry production.

Insect pests and diseases are associated with stages of plant development in table form to aid in timeliness of identification and treatment. Harvesting, handling, transportation guidelines, and post harvest considerations, as well as useful web sites and contact information for berry specialists lend balance to this valuable text. General pesticide safety information, tips for laundering pesticide-contaminated clothing, and pesticide emergency numbers are included. Chemicals regulated in New York State include brand name/formulation, EPA registration numbers, and restrictions.

Information for the integrated production and maintenance of berry crops is drawn directly from Cornell University research, extension demonstrations, and on-site experience. Commercial growers, those who advise, sell, or provide services to these professionals, as well as small-scale growers can use this text as a guide to choosing safe and

effective weed, insect, wildlife, and disease management programs for berry crops.

This publication is issued to further Cooperative Extension work mandated by acts of Congress of May 8 and June 30, 1914. It was produced with the cooperation of the U.S. Department of Agriculture, Cornell Cooperative Extension, New York State College of Agriculture and Life Sciences, New York State College of Human Ecology, and New York State College of Veterinary Medicine, at Cornell University. Cornell Cooperative Extension provides equal program and employment opportunities. Helene Dillard, Director.

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