The New York Berry News

CORNELL UNIVERSITY

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What's Inside

This winter was one of the snowiest and coldest we've seen in nearly 10 years. When this happens, one can't help to wonder how badly our raspberries and blueberries suffered. In Kevin Iungerman's newsletter (*Northeast Fruitlet*), he summarizes nicely what we should be looking for in both blueberries and raspberries. For blueberries he says, the basal tissue that connects the flower bud to the shoot is the part of the bud that is most easily injured by cold. Injury can be determined by slicing longitudinally through the bud from the tip thought the bud base with a sharp razor blade. Freeze-injured tissues have a brown, water-soaked appearance, while healthy tissues will be green or white. For best results, wrap tissues to be tested in a plastic bag and hold at room temperature for several days before slicing and examining for browning. For raspberries, look at the outside of the plant for signs of discolored laterals and stems. The inside of the stem (cut across) will be brown or black on one side or completely across. Healthy plants will be a normal red to reddish brown and green just inside the outer edge. As shoots emerge, some vegetative buds never grow, some grow to several inches and then collapse, and some produce flowers but fruits never mature. Some shoots or new canes may grow normally. A complete assessment of the injury is generally not made until late May or June.

In this issue of the NYBN, we are getting ready for a productive season with a series of articles from Marvin Pritts who discusses everything from mulching and row covers to marketing berries. We wrap up this issue with an early season berry calendar to pus everything into perspective and help you plan your spring!

Current News & Events:

March 27, 2003: A one-day workshop sponsored by the University of Guelph on *Growing Raspberries in Greenhouses* will be held in Simcoe, Ontario, Canada from 8:30 am - 4:30 pm. Speakers include: Adam Dale, Marvin Pritts, Doug Balsillie, Glenn Fox and Tom Wood. Doug Balsillie and Tom Wood are among the largest greenhouse raspberry growers in North America. From more information: Department of Plant Agriculture, 1283 Blueline Road. Phone: 519-426-7127 ext. 333 or email adale@ uoguelph.ca. Or you may contact Max Welcome (mw45) for a brochure.

March 29, 2003: *Promising Opportunities for Northeast Processing Berry Production* (see schedule on next page). This one day workshop is designed to help growers and potential growers select from a group of possible berry crops to be sold for processing. Time is running out! Send a check for $25 per person along with a list of enrollees and their phone numbers BY MARCH 25 to: Cornell Cooperative Extension of Columbia County, 479 Route 66, Hudson, NY 12534 or call (518) 828-3346 for more information. The $25 registration fee includes a gourmet lunch.

Clermont Processing Plant Offers New Options to Local Growers

Last spring, the fruit processing plant, previously known as Northeast Cranberry Traders, and Clermont was purchased by a new group of enthusiastic owners. Under the management of Bill Heafy, Clermont Fruit Processors, Inc. is interested in finding locally available fruit for processing. Over the past couple of years, fruit has come in from as far away as Maine, Michigan, and New Jersey, as well as Massachusetts. Processed fruit included blueberry, raspberry, and cranberry. This year the plant has worked with wild blueberries from Maine, black currants from Connecticut, and cranberries from Massachusetts. The owners are maintaining the relatively up-to-date plant, and have even installed a bottling line. One of their goals is to increase processing activities using more local, Hudson Valley products. They also can provide organic and Kosher certification for products processed at the plant.

Growing of processing berries is different from growing fresh fruit in a number of ways. For example, less labor is needed because harvest, and often pruning can be mechanized. This lowers labor costs dramatically to help make production feasible. Planting systems must be used to maximize yields, even though the visual quality of the fruit and size can be compromised. Lower prices are to be expected, and one must be sure that the savings in labor costs and potential yield levels justify growing the crop. As an example, strawberries might be a crop that is difficult to justify because of the need for hand labor, and lowers yields expected on the east coast. Raspberries could be more desirable due to their high yields, and the possibility of mechanization.

Options are available to local growers, and would-be-growers, and Cornell Cooperative Extension will help the industry to select appropriate processing crops, and establish and maintain their production. As a start, we are planning a workshop on March 29, 2003 to be held at Cornell Cooperative Extension of Columbia County from 10 am to 4 pm. The workshop will include presentations by Dr. Marvin Pritts, Small Fruits Specialist from Cornell, Stephen Hadcock, Farm Business Management Extension Educator, Steven McKay, Small Fruits Extension Educator, and Bill Heafy, Manager of Clermont Fruit Processors. The cost of the function will be $25 per person, which will include a lunch featuring processed and fresh berry products. The workshop will include a session on selecting appropriate crops, what is involved in growing the crop, expected economic returns, a field trip of the plant, and what might be expected from the processing company in terms of possible contracts or assistance programs. Registration can be done by mailing a check for the conference to the CCE Columbia County office before March 25.

Meeting Schedule:

Optional, but recommended:

8:00 am	Meet at the CCE of CC parking lot to caravan to the Clermont plant on Route 9. OR
8:30 am	Meet at Clermont Fruit Processors at 1931 Route 9 in Clermont for a pre-workshop tour. Bill Heafy, Plant Manager

Main program:

9:45 am	Registration
10:00 am	Assessing the potential of berry crops for processing; explore advantages and disadvantages of each type of berry crop. Dr. Marvin Pritts, Steven McKay
11:00 am	Stages of planning and production common to all berry crops and dangers of planting before you are ready. Dr. Marvin Pritts
11:45 am	Lunch
12:45 pm	Bramble and blueberry production for processing. Dr, Marvin Pritts
2:00 pm	Ribes, aronia, and elderberry production for processing. Steven McKay
3:15 pm	Break
3:20 pm	Economics of processing berry production. Stephen Hadcock
4:10 pm	Clermont Fruit Processing: their vision, and program of cooperation with farmers. Bill Heafy
4:30 pm	End of talks

Optional Activity:

4:35 pm	Return to Clermont processing plant for followup tour and discussion. (If you could not make the morning tour, this would be a second opportunity.) Bill Heafy

Organic and Sustainable Foods Have More Polyphenolics Linked to Health Benefits

Organically or sustainably grown berries and corn contain up to 58 percent more polyphenolics, natural antioxidants that are a natural defense for plants and may be good for our health, according to a new study by researchers at the University of California, Davis. The work suggests that pesticides and herbicides may actually reduce the production of polyphenolics by plants. "This really opens the door to more research in this area," said Alyson Mitchell, assistant professor of food science at UC Davis, who led the research team. The researchers compared levels of total polyphenolics and ascorbic acid content in marionberries (a type of blackberry) and corn grown organically, sustainably, or conventionally, and in strawberries grown sustainably or conventionally. The fruits and corn used were frozen, freeze-dried, or air-dried. Frozen, sustainably grown, and organic marionberries and corn contained 50 to 58 percent more polyphenolics than conventionally grown crops from neighboring plots. Sustainably grown frozen strawberries contained 19 percent more polyphenolics than conventional fruit. Sustainably grown and organic produce also had higher levels of ascorbic acid. Frozen fruit and corn tended to have higher levels of polyphenolics than freeze-dried or air-dried foods. The polyphenolics in the organic crops were at levels you would expect to see in wild plants, suggesting that pesticide use reduces the need for plants to make these

chemicals, Mitchell said.

Polyphenolics are natural chemicals produced by plants as byproducts of other processes. When plants are stressed, for example by insects, they produce higher levels of polyphenolics, which can taste bitter, to drive away pests. Studies show that eating a diet rich in fruit and vegetables, which is high in polyphenolics, can reduce the risk of some cancers and heart disease. But scientists don't know exactly how polyphenolics cause these effects. "We know they're beneficial, but we don't know what types of polyphenolics are beneficial, or in what quantities," Mitchell said.

The organic foods were grown according to the definition set by the U.S. Department of Agriculture, without artificial pesticides or fertilizers used in conventional farming. Sustainably grown produce was grown with artificial fertilizers, but without pesticides. Total polyphenolics levels were slightly higher in sustainably grown produce, suggesting that a combination of organic and conventional practices yields the highest levels. Crops grown without using pesticides or herbicides might make more polyphenolics because they are more likely to be stressed by insects or other pests, Mitchell said. "This may reflect the balance between adequate nutrition in the form of fertilizers and external pest pressures because of the lack of pesticides and herbicides," she said.

The research, which was partly supported by a gift from Oregon Freeze-Dry Inc., was published in the February 26 edition of the Journal of Agricultural and Food Chemistry. Source: Andy Fell, UC Davis News Service, via Joe Kovach, Ohio State IPM Program, printed in the Ohio Fruit ICM News, Vol 7, No 10.

Starting the Berry Production Season

Marvin P. Pritts, Dept. of Horticulture, Cornell Univ., Ithaca, NY
[Edited by Bill Turechek]

As the strawberry season gets underway, growers are thinking about marketing their berries. One of the major limitations for northern growers is the short harvest season for most berry crops. Supermarkets, in particular, prefer to work with suppliers that can provide them with product on a year around basis, if possible. Even if one markets directly to consumers, e.g. PYO, short harvest seasons are undesirable because one or two rainy weekends during a three week strawberry harvest can be disastrous. A number of approaches are available to extend the season, and while they offer the opportunity to expand markets, the economics may not be favorable depending on costs and prices. A few of them are covered here; however, growers should carefully consider the additional costs and likely returns *before* implementing a new technique.

Planting dates: Berry crops are perennial, so one typically does not consider the effect of planting date on season extension. However, where summers are cool, it is possible to stagger the planting date of strawberries, allowing them to fruit in the planting year, and harvesting them throughout the summer. Plants are specially grown in the nursery the year before transplanting so they will attain an adequate size for fruiting the following year. This usually involves higher rates of fertilization and runner removal. Plants are cold-stored after excavation from the nursery bed, and transplanted into production fields at high densities from May through July. Plants produce fruit within about 60 days. This technique is called the "waiting bed." These plantings revert into a matted row in subsequent years. Unfortunately, when the summer is hot, waiting bed plants perform poorly.

Environmental modification in the field: Modifying the climatic environment of a field of plants can be challenging, and there are a limited number of techniques available to achieve this. Two of the most common are mulches/groundcovers and row covers.

Straw Mulch: Delaying straw mulch removal in early spring will also delay flowering and fruiting in strawberries, but it will also reduce yields. We do not recommend this practice in New York.

Row Covers: Row covers are perhaps the most effective method of accelerating flowering and fruiting in strawberries and primocane-fruiting raspberries. For strawberries, the straw mulch is removed from the plants early and replaced with row cover. As a general rule, March is an appropriate time to remove straw and apply the row cover. If snow still covers the planting, then

Straw mulch is applied over the strawberry planting in early winter to protect plants from winter injury. The straw is raked from the plants in early spring just before the plants push in the spring. Research has shown that straw should be removed soon after snow melts and the danger of severe cold temperatures is past. Usually this is late March in New York State. The additional light that the plants receive in early spring is extremely beneficial for growth and productivity. Growers concerned about cold temperatures can use a rowcover to protect plants after the straw mulch is removed. In Vermont, researchers removed straw in mid-March, mid-April and mid-May in each of 3 years. In each year, yields were highest with the earliest removal date. Similar results were obtained in New York.

obviously it is best to wait until melting has occurred. Similarly, if unseasonably cold weather persists in early March, then one should wait for warmer weather before removing the straw. The covers should be removed soon after flowers are observed. Without wind or bee activity, pollination will be reduced and fruit will be deformed. If cold temperatures (<30F) occur when the covers are still in place and flower trusses have emerged, water can be applied directly over the covers for frost protection. 'Earliglow' will fruit as much as 10 days earlier when rowcovers are used, especially when spring is cold and sunny.

For primocane-fruiting raspberries, rowcovers are applied in early spring as soon as snow melts and last year's canes are removed from the planting. Allow room under the covers for cane growth. Remove covers when canes are 18 inches tall. This practice accelerates harvest of Heritage from 10 - 14 days, and offers some degree of frost protection for new canes in early spring.

Various companies manufacture covering materials. The most useful have been lightweight (0.5 to 1.2 oz. per square yard), spunbonded materials with sewn seams. The cost ranges from $800 - $1700 per acre. Although this may seem expensive, if prorated over several years, the cost is not that great. A higher price for early berries and generally higher yields make row cover use a profitable choice for many growers on at least a portion of their acreage.

Black Plastic: Strawberries can be planted through black plastic mulch to achieve earlier fruiting in spring. However, runnering presents a problem because they cannot root through the plastic. Runner removal is expensive and this represents a loss of energy for the plant. Some growers in warmer climates are experimenting with late summer planting on black plastic to avoid the runnering which occurs during early summer. However, this technique is riskier in more northern areas because the weather may not be conducive for fall growth and the probability of early spring frost is greater.

Strawberry Plant Establishment

Marvin P. Pritts, Dept. of Horticulture, Cornell Univ., Ithaca, NY

Getting plants off to a good start will pay big dividends later when strawberry plants must deal with the stresses of weather and pests. Among the most important steps in site preparation is the elimination of perennial weeds. Few herbicides are labeled for use in established strawberries, and their activity on perennial weeds is limited. Therefore, weeds are most effectively controlled before planting.

Weeds. Weeds cause a greater economic loss than diseases and insects combined. In addition, weeds also encourage the establishment of other pest populations. Eliminating weeds the year before planting is much easier than controlling them later. Too many growers plant directly into a site in which perennial weeds were not eliminated the previous summer, and then spend the next several years trying to find the right combination of herbicides to undo the damage.

Rotation, coupled with the use of a broad-spectrum post-emergent herbicide the summer before planting, is an effective approach. Cover cropping the site again after the herbicide application will further suppress weed growth. Repeated cultivation or covering a site with black plastic for several months are also effective approaches. Growers should begin site preparation 2 or 3 years before the crop is planted to eliminate perennial weeds, especially if organic methods are to be used.

Fumigation at high rates will suppress weeds, although its use worldwide will likely be restricted because of environmental concerns, availability and expense. In some situations, nematodes, soil diseases, soil insects or intense weed pressure may justify fumigation. The soil should be friable, warm (>50F) and without decomposing plant material for fumigation to work properly. The best time to fumigate a strawberry field is late summer or early fall of the year prior to planting.

Nutrient amendments. Test the soil for pH, potassium, phosphorus, magnesium, calcium and boron. Sample soil in a V-shape pattern within the field, collecting from at least 10 locations. The sample should represent the profile of the top 10 - 12 inches. Plow the site, add the recommended amount of nutrients, then disc. Because soil testing procedures are not standardized across the region, follow the recommendations from the laboratory where the samples were analyzed. Do not use the test results from one laboratory and the sufficiency ranges from another.

pH. It takes one year for lime to raise, and for sulfur to lower the soil pH, so it is necessary to apply these one year in advance of planting. The more finely ground the sulfur or lime, the faster it will react with the soil.

If the soil pH must be increased, a liming agent such as calcite or dolomite should be applied. Liming agents differ from one another in two important characteristics which influence their effectiveness: 1) chemical composition which affects acid neutralizing potential and fertilizer value and 2) particle size which determines liming efficiency and ease of application. Consider the relative importance of these when selecting a liming agent. For example, even though dolomite has a lower

neutralizing value than calcite, it is often used at sites which require supplemental magnesium for adequate fertility. Moreover, finely ground lime is more difficult to apply than coarse particles, but it changes the soil pH more quickly.

Sulfur is effective at lowering soil pH, but time is required for bacteria to oxidize the sulfur into a usable form. Sulfur comes as a wettable powder or prills, with the former reacting faster top lower the soil pH. Aluminum sulfate is sometimes recommended for acidification because it provides an already oxidized form of sulfur, but it is expensive and six times as much is required to do the same job as sulfur. Also, aluminum toxicity can occur with large amounts of aluminum sulfate, so we do not recommend it.

Nitrogen and Phosphorus. Certain nutrients, like phosphorus, are very insoluble in water and move very slowly through the soil. It may take years for phosphorus applied to the soil surface to reach the root zone of the plant and be taken up. For this reason it is imperative to apply a sufficient amount prior to planting and mix it into the root zone. Animal manures and legumes offer a good source of slowly released nitrogen when incorporated prior to planting. Animal manures are a potential source of weed seeds, however. Manure applied to fields should be well-composted and worked into the soil prior to planting to minimize any risk of fruit contamination from pathogenic bacteria.

Irrigation. The irrigation system should be in place prior to planting because transplants probably will require immediate watering. Any preemergent herbicide applied after transplanting will need to be watered in by rain or irrigation to be effective. For these reasons, the irrigation system should be operational prior to planting. Also, in early spring, the irrigation system will be a necessary tool for frost protection.

Preplant cover crops. Seeding a cover crop on the site the year before planting is an excellent way to improve soil structure, suppress weeds, and if the proper cover crop is grown, suppress nematode populations. Benefits of a cover crop are greatest when the soil is sandy and/or the soil organic matter content is low. Most cover crops grow under the same soil conditions as strawberries. Except for additional nitrogen (40 lb/A prior to seeding) and perhaps phosphorus, other amendments are not likely to be required.

Minimum seeding rates are used when the objective is to supply an acceptable stand for harvesting the grain or straw. But when a vigorous, dense stand is desired for weed suppression and organic matter, higher seeding rates are recommended.

Preplant cover crops are usually plowed under in the late fall or early spring prior to planting. Those with low nitrogen contents (grains and grasses) should be plowed under early in the fall to allow adequate time for decomposition, unless the soil and site are prone to erosion. Legumes contain more nitrogen and decompose quickly, so they can be turned under within a month of planting. Many plant species are suitable as preplant cover crops, and each has certain advantages. In some cases, mixtures of crops are used to realize the benefits of both.

The Strawberry Production Guide (NRAES-88) provides many details on site selection and preparation, and on suitable preplant cover crops for the strawberry planting.

Marketing Strawberries

Marvin P. Pritts, Dept. of Horticulture, Cornell Univ., Ithaca, NY

The majority of matted row strawberry growers do not ship their berries to distant markets. Berries are sold wholesale to local grocery stores or other retail outlets, or sold directly to the consumer through farm stands or pick-your-own operations.

Direct marketing

Successful direct marketers recognize that they are not just in the business of selling berries, rather they are in the business of selling the sights, sounds, smells, and atmosphere that are associated with the purchasing experience. Consequently, some strawberry farms charge customers for a visit, even if they do not purchase anything. Supermarkets are able to obtain large volumes of strawberries from elsewhere and sell them for less than the local farmer can. However, supermarkets cannot offer a pleasant farm experience, even though many are now designing the produce section to resemble a farm market and are featuring photos of local farmers in the stores.

Outstanding direct markets provide additional opportunities for customers to enjoy the farm experience. These might include a petting zoo, maze, horseback riding, or hayride. Anything that enhances the farm experience will likely increase sales. Few customers who patronize a direct market are motivated by price. Most are interested in quality. Growers, first and foremost, must assure customers that their berries are of the highest quality.

Quality includes primarily freshness and flavor, and secondarily color and size. Low prices are often perceived as associated with low quality; growers can rarely recoup profits by lowering prices to increase sales. Strawberry customers usually do not shop around for the best price, rather they develop a loyalty to a particular grower and trust her to set a fair price. Proper pricing requires a thorough knowledge of production costs.

Successful Direct Markets Have These Attributes:

- **Clean and attractive fields and stands**
- **Clean restrooms**
- **Friendly and courteous employees**
- **Good signage**
- **Easy and adequate parking**
- **Fresh produce**

Direct Marketing Options

Strawberries are typically sold via one of three marketing channels: customer harvest ("pick-your-own"), fresh market (retail or wholesale), and processed (frozen, jams, jellies, wines, etc.). Most growers utilize more than one marketing channel, and offer a succession of crops. Providing recipes and information on making jams and jellies, or even wine-making, can increase sales and encourage repeat customers. Considerable demand also exists for organically grown strawberries, especially at retail markets.

Pick-Your-Own. The pick-your-own (PYO) market for strawberries has proven successful for many growers, but can be highly dependent upon a farm's location. In order to attract an adequate number of customers to a PYO farm, the farm is best located within 20 miles of a densely populated area. Competition within that market area should be evaluated carefully. About 350 - 500 PYO customers are required to harvest one acre of strawberries.

Pick-Your-Own fields are most successful when located near a major roadway and easily accessible, although there are examples of highly successful PYO farms that are located in less than ideal locations. Farm roads to the fields must be suitable for customer vehicles or transportation, such as a wagon ride, should be provided. Ample parking space should be available, as well as toilet facilities, drinking water, shade, and some seating. Some form of entertainment, especially for children, is often expected. Directions and rules should be clearly visible. The PYO customers can be directed to alternative ways of purchasing berries.

Although one of the major advantages of PYO marketing is reduced harvest labor, field supervisors must be employed to direct and help customers with parking, harvesting, and check out procedures. Supervisors should be courteous and friendly, and have a thorough knowledge of the farm. Check out areas should be neat and efficient. Customers should not be made to wait in long lines to pay.

Most growers charge by weight of fruit rather than by volume to avoid arguments over what constitutes a full quart. Electronic scales can make weighing proceed very quickly. Growers may need additional insurance for a PYO operation.

Retail farm markets. Marketing a farm experience at a stand is more challenging than PYO, but it is possible if the setting retains the rustic farm look. A farm market can enhance a PYO business. As with PYO, farm markets should be clean and uncluttered, and offer fresh produce in attractive displays. Increasingly, farmer's markets are appearing in cities where several farmers from the local area gather to sell their products. Strawberries are a popular item at these markets, and offer the opportunity to promote strawberries to a large audience.

Growers with a retail stand are finding ways to market strawberries outside of the normal season. Some freeze berries so they are available to customers throughout the year. Others are making value-added products with the strawberries such as jams, syrups and wine. Growers who process the products themselves must follow appropriate state and federal sanitation and labeling regulations. This may include regular inspections, purchasing of stainless steel equipment, and water treatment.

Advertising. Strawberry growers do not have a marketing order to promote their product as do dairy and beef producers. Therefore, most do their own advertising. The best form of advertising is the word-of-mouth recommendation that a satisfied customer passes on to others. The potential benefit from a good farm experience is immense; it generates lots of customers and many of a farm's best patrons. However, it is said that a person with a bad experience will tell ten others.

Advertisements should represent how the grower wants the customers to view the operation, and they should focus on the entire farm experience - not just the price of berries. They should be tasteful and of high quality. Most customers to PYO farms are educated, middle-aged women with children, and come from within 20 miles of the farm. Advertising outside of this area may not pay off. Advertising also should be focused in the densest population areas. Ads should emphasize the benefits of visiting the farm, and the quality, freshness, flavor, and nutritional value of its products - not price. For PYO operations, the emphasis should be on the fun, recreation and education that a trip to the farm provides, and the ad also should give directions, days and hours of operation, and a phone number. Keep ads simple, attractive and recognizable. Most potential customers will only give an ad a few seconds of attention.

Signs are important for directing customers to the proper location. They need to be visible, legible and contain few words. They need to be far enough away from the parking lot to allow drivers to read the sign, make a decision to stop, then slow down and turn.

One of the most effective advertising tools is a customer mailing list. A postcard, sent out at the appropriate time, indicating the opening date and the high quality of your fruit, gets better results than nearly any other form of advertising. To establish a mailing list, names and addresses of customers are collected when they come to the farm or call regarding farm products.

Many people read the local newspaper every day, so this provides a good way to reach customers. An ad should be placed where your clientele is most likely to see it, such as the weekly food, marketplace or recreation section. Ads should be kept short and simple to prevent losing the customer's interest. Photos and logos can grab a reader's attention and increase the effectiveness of an ad. Radio is good at creating awareness, but may not be effective at directing people to the farm if directions are complicated. Repetition is the key to radio advertising. It is better to buy ten spots on one station than one spot on ten stations. Television advertising is typically quite expensive. In addition to air time costs, production expenses can be very high. However, prices during some time slots on local channels may be cost effective if a lot of potential customers are likely to be watching. Daytime ads can be effective at reaching the homemaker, and are much less expensive than prime time ads.

Advertising should be timed around the crop. Light advertising should begin just before the harvest season. The heaviest advertising should occur at the beginning of the season, and then taper off as the season progresses. Growers should not wait for slack sales to begin advertising. As a general rule, PYO advertising should be budgeted at 5% of gross sales (up to 10% for a new operation).

Local Wholesaling

Wholesaling is an option for growers if 1) their operation is not adapted to customer harvest, 2) their location is not easily accessible, and 3) they have large volumes of berries. Generally, the wholesale price is about 30% less than the fresh market price, so profit margins are less with wholesaling.

Wholesaling involves:

- Properly cooling the berries prior to delivery
- Contacting buyers well before the harvest season to set up delivery schedules, container preferences, labeling requirements and payment policies.
- Obtaining dependable harvest labor

Most growers pay pickers piece-work by the quart or pound, rather than an hourly wage. Bonuses offered for a certain number of quarts will provide more incentive. Pickers should be trained to harvest only fruit of good quality at the proper stage of ripeness, and how to properly handle the fruit. Maintaining a good working environment is crucial to keeping good labor. Growers should generate enthusiasm for their farm and products, and make workers feel like they are part of a team. Workers attitudes will show in the quality of the harvested fruit.

It is best to start picking as early as possible in the morning, provided the fruit is dry, and quit before noon. This will assure the fruit is picked at its best quality, and that pickers are not forced to work during the hottest part of the day.

Postharvest handling of the fruit is a critical part of dealing with the fresh market. Growers must be able to deliver a high quality crop with a maximum shelf life. This can mean a considerable investment in packing, storage and transportation facilities.

Cultivar selection has an important influence on the quality of product in the market. Good matted rows varieties for wholesale are Allstar, Holiday, Honeoye, and Jewel. Fruit from plants that are nutritionally stressed will have a shorter shelf life than fruit from healthy plants. It is essential that adequate potassium and calcium are available to the plant, and that nitrogen is not too high. For example, a strong relationship exists between nitrogen availability and fruit softness in strawberry. A leaf analysis aids in fine-tuning the fertilizer program.

Fungicides applied during bloom will significantly reduce the number of moldy berries. Gray mold (*Botrytis cinerea*) readily infects the blossoms and grows from them into developing fruit before it ripens. Such berries may have no visible signs of infection until harvest. Thus, timely petal fall sprays are essential, especially during cool, humid weather. Some insects, such as sap beetles, cause minor physical damage when feeding on the fruit, but even small wounds are sites for fungal infection. Certain insects may spread bacteria and fungi from fruit to fruit. If insecticides are used to control these pests, be sure to consider the days-to-harvest restrictions. Berries in the supermarket are occasionally sampled by the state and federal governments for pesticide residues.

Harvesting the same planting frequently (once every two days) is critical for the wholesale market. Strawberries with a white tip will retain their firmness much longer than those harvested fully ripe, and will lose less water during storage. Long intervals between harvests will result in too many fully to overripe berries in the pack. These may look attractive, but shelf life will be greatly diminished. Some training may be required to teach pickers the proper stage and appearance for harvesting. Fruit quality for fresh market 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.

Pickers should harvest directly into small containers to avoid rehandling. 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, they significantly reduce moisture loss when used with a cap, customers can see all the berries they purchase, and they 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. Slitted plastic containers allow for rapid cooling, do not stain, and do not accumulate juice; however, if the slits are too wide, berries can be damaged. A narrowly slitted plastic half pint container with a plastic wrap is often used by large wholesalers.

Strawberries for wholesale are usually picked into quart containers; one full quart weighs about 1.5 lb. These are placed into flats, and the flats are weighed to ensure that they are at least 12 lbs. Flats are then placed in a cool area until they can be transported out of the field for further cooling. Berries destined for the wholesale market should be cooled 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. 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. Once the berries are cool, flats are wrapped in plastic and retained in a cold room (35F) until delivery.

There are many steps in the distribution chain which 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. Berries should remain cold and wrapped during each phase of transportation. 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. By using proper harvesting and storage techniques, it is possible to maintain quality strawberries for up to two weeks after harvest. A long shelf life is an important component of quality, and a quality product is an essential element of marketing.

Early Season Berry Calendar

Cathy Heidenreich and Bill Turechek
Dept. of Plant Pathology, Cornell Univ., Geneva, NY

Many small fruit growers produce more than 1 crop. In doing so, it can be difficult to keep track of what needs to be done and when; particularly if growing berry crops is new to you. The calendar below is an attempt to organize the necessary chores by month for each listed crop. One must consider, however, that some of the activities are phenology and/or weather dependent. e.g., removing the straw mulch. In situations such as these, the activity is classified in the month when it most likely to occur in New York. Lastly, where additional information is available within past issues of the New York Berry News, reference is made to the issue.

	March	April	May
Strawberry	**1.** Remove straw mulch in late March or early April. **2.** If desired, you can cover your planing with a spun-bound row cover to promote earlier cropping after straw removal. **3.** Set up sprinklers prior to bloom for frost protection.	**1.** Replenish bare or lightly-covered spots with straw mulch. This is necessary in plantings with a history of anthracnose. **2.** Scout for the foliar diseases leaf spot, leaf scorch, and leaf blight on over wintered leaves. Consider an early season fungicide application for fields with a history of heavy disease pressure (see NYBN vol. 1, no. 1 for more detail). **3.** Scout for strawberry clippers when temperatures routinely exceed 65 F.	**1.** Scout for tarnished plant bug. **2.** Apply gray mold fungicides. Elevate, Switch, and Rovral are excellent gray mold choices. However, if anthracnose or foliar disease are of concern, you will want to tank-mix with Captan. Next month's issue of the NYBN will provide more detail on managing berry rots in light of several new fungicide registrations.
Raspberry	**1.** Scout for cane diseases anthracnose, spur and cane blights. In late March or early April, apply a "delayed dormant" spray of lime-sulfur for control of these disease if necessary (i.e., this is at budbreak). **2.** Delayed dormant sprays are not needed on fall bearing raspberries if previous year's canes were removed from the planting and thoroughly shredded.	**1.** Complete pruning. **2.** Apply Ridomil for Phytophthora root rot if necessary. **3.** Scout for orange rust on the under surfaces of new leaves of black and purple raspberries, and blackberries. Remove rust-infected plants. **4.** Apply pre-emergent herbicides (see NYBN vol. 1, no. 3 for more detail).	**1.** Apply nitrogen fertilizers to both summer- and fall-bearing raspberries. Calcium nitrate should be used on new plantings; urea or ammonium nitrate on older plantings. Applications can be split between May and June if desired. **2.** Apply Sevin for fruitworm and sawfly control where necessary.
Blueberry	**1.** Complete pruning. **2.** Apply a "delayed dormant" spray of lime sulfur for phomopsis **3.** An application of oil may be needed at this time if scale insects were a problem. However, this spray should not be applied in the same 14-day period as the lime sulfur spray because oil and sulfur when applied next to each other is extremely phytotoxic.	**1.** If additional mulch was not applied, lightly rake or disk soil beneath bushes just prior to bud break to disturb production of mummyberry spores. **2.** Green tip sprays: Mummy-berry, botrytis blossom and twig blight (see NYBN vol. 1, no. 2 for more detail). **3.** If you are clean cropping (no mulch) consider making a pre-emergent herbicide application.	**1.** Split application of ammonium sulfate or urea fertilizer between May and June. Do not fertilizer newly planted blueberries.

Questions or Comments about the New York Berry News?

Send inquiries to: Dr. William (Bill) Turechek, New York Berry News, Editor
Department of Plant Pathology, New York State Agricultural Experiment Station
630 W. North Street, Geneva, NY 14456
OR *Email*: wwt3@cornell.edu