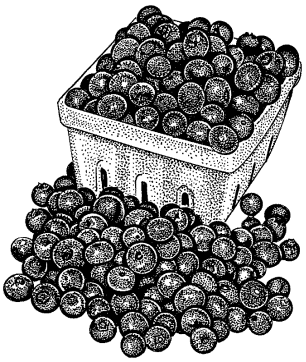

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BLUEBERRY PRODUCTION SUMMARY – 2007

Blueberry Varieties

The following are the varieties recommended for New York State. Standard, tried and true varieties are underlined. Other varieties are either older varieties that may not perform as well under New York conditions, or they are new (*****)varieties that look promising but we don't have years of experience on which to base a solid recommendation. Try them at your discretion.

Table 1. Recommended blueberry varieties.

Early Season	**Early Mid Season**	**Mid-Season**	**Late Season**
Bluetta	Bluejay	Bluecrop	Brigitta
Polaris	Northland	Blueray	Elliot
St. Cloud	Patriot	Chippewa	Jersey
Duke	Spartan	Sierra	Nelson
	*****Draper	Toro	*****Aurora
			*****Liberty

* New Cultivars. (A detailed description of varieties found at the end of the production summary)

The most widely planted varieties in New York are still Bluecrop, and Blueray. Both are winter hardy in our conditions. Both have big fruit with good flavor and good yield potential. Blueray ripens early to mid season and Bluecrop ripens late-midseason. New Jersey growers say that their top varieties are Duke and Bluecrop. However, there have been some new developed varieties, which also exhibit good fruit quality as well as excellent winter hardiness: Liberty, Aurora, and Draper. A detailed description of blueberry varieites is located at the end of the production summary.

Preplant and Planting Year Considerations

Blueberries can be a profitable investment but only if you aggressively handle, market, and manage manage them. They require lots of money to establish, and lots of work to keep going.

Before you plant, think about how you will market the fruit. If you plan to do U-Pick, consider how many other blueberry farms there are within a 30 to 40 mile radius of you. Evaluate your road frontage and accessibility. Think about whether you really want U-Pick customers on your farm. If you plan on wholesaling, consider that when New York blueberries are in season, New Jersey ones have been in stores for a while and are usually selling very cheaply. You will be competing with big growers that have an economy of scale advantage.

1. **Site preparation:** Blueberries grow best in soils with low pH, 4.5 is optimal. However blueberries perform great in a well drained, acid, sandy loams with a pH of 4.2- 5.5, with an organic matter content of at least 3.0%. Soils that are slightly above the desired pH can be adjusted with preplant applications of sulfur. Heavy soils with high exchangeable acidity (from the soil test) will be very difficult to change. Light sandy soils with high pHs will be easy to lower but will require sulfur every year or so to keep the pH low. General amounts of sulfur to apply are:

Table 2. Approximate amount of sulfur (lb/A) required to lower soil pH to 4.5

Current pH	**Soil Type**		
	Sand	**Loam**	**Clay**
5.0	175	530	800
5.5	350	1050	1600
6.0	530	1540	2310
6.5	660	2020	3030
7.0	840	2550	3830

Before planting, get a complete soil test and follow the recommendations for preplant applications of all nutrients except nitrogen. Nitrogen should be applied to the soil each spring. Since blueberries root 12 to 16", you should get a topsoil and subsoil sample for analysis. Shallow samples can give misleading results.

2. Planting: For best results, the planting deadline for blueberries is May 1st. In the bad old days, people used to cut 1/4 to 1/2 off the tops of the bushes at planting. There is no reason to do this if plants are well watered and not stressed. Instead, help the plant divert its energy into growing strong leaves and wood by rubbing off the fruit buds for the first two years. Plants are usually set at 4' within the rows and 12' between the rows (908 plants/acre). Twelve foot row spacing seems to be necessary once the plants mature and fill in the rows.

Established Plantings – Spring Jobs

1. Pruning: Pruning should be completed by early April. Early spring or February thaw is the best time to prune because winter injured wood is easily identifiable at this time and the carbohydrates produced in autumn have had enough time to move into the roots and crown for storage. Pruning will stimulate vegetative growth so weak bushes will usually require more pruning than vigorous bushes.

Remove any diseased or damaged canes at ground level and leave the two healthiest canes from each previous year until the plant is 8 years old. You should have a total of 10 - 20 canes per bush of various ages at maturity (8 years).

Pruning Blueberries . . . Points to Ponder

- Prune out canes older than six years old.
- Prune out weak, dead, winter injured, low growing or diseased canes.
- Shape the bush through pruning to create a more upright growing plant.
- Wood that rubs against other branches should be removed to prevent future canker infections.
- Remove canes that will not receive sunlight and become unproductive and stunted.
- Removing older canes will stimulate less regrowth than removing young canes.
- Detail prune to remove twiggy wood.
- Prune to the ground unless there is sparse cane growth, then leave a stub.
- Thin out new canes leaving a couple with the most vigorous shoot growth.
- The goal is to have around 10-20 healthy canes varying in age from one to six-eight years old.
- Young canes are more efficient producers than older canes.
- Blueberry leaves need to have 30% of full sunlight for maximum fruit production.
- In a recent study moderately, annual pruned bushes produced the highest yields.
- Weak plants should be detail pruned instead of whole cane elimination.
- Vigorous plants should have whole canes removed.
- Making cuts at ground level instead of leaving stumps will help protect against winter injury.
- Pruning has shown to increase the size and sweetness of berries.
- Pruning will not cost money, but save money if done correctly.

2. Weed Control: Preemergent herbicides are generally not needed in the spring if a good job was done in the fall. Postemergent herbicides can be used to touch up specific problems in the spring. Roundup can be used while the blueberry

plants are dormant, but the window is narrow since blueberries come out of dormancy early. The safest way to apply Roundup is at 2-3 oz/gal with a weed wiper. Avoid getting this product on berry canes or leaves. Gramoxone can also be used in the spring after weeds emerge, but before new canes emerge. Be just as careful not to get Gramoxone on the blueberries. Poast is a good post emergent grass herbicide. Both annual and perennial grasses can be controlled with Poast plus oil concentrate, but they must fit into a size window (before tillering or seed head formation) and must be actively growing. Fusilade is another post emergent grass herbicide, but it can be used on non-bearing plantings only (2 years prior to harvest), and is only effective on grasses between 2" and 8". Scythe is another product also available for use on annual and perennnial weeds in blueberry plantings. This product must be applied before new canes emerge in the spring or after they become woody. Do not allow product to contact berry foliage. For more information on weed management in blueberries see the Cornell Pest Management Guidelines for Berry crops. Always read the product label before applying any pesticides.

3. Spring fertilization: Blueberries have lower fertilizer demands than other fruit crops. They have low annual requirements and are sensitive to too much fertilizer. For mature plantings, a good all-purpose mix (per ton) is 1000 lbs of ammonium sulfate or urea, and 1000 lbs of Sul-Po-Mag. Use ammonium sulfate where soil pH is >5.0. Older recommendations often included iron or copper, but there is little evidence that these are needed. Apply fertilizer at the following rates:

Table 3. Fertilizer recommendations for blueberry plantings.

Age (years)	Amount of "mix" per acre (lbs)	Amount of "mix" per plant (oz)	Actual N supplied (lbs)
8	650	12	65
7	550	10	55
6	450	8	45
5	350	7	35
4	270	5	27
3	200	4	20
2	150	3	15

Split the total quantity of nitrogen into two applications;one at flowering in the spring and once again in June. Newly set blueberry plants may be fertilized 3 to 4 weeks after planting and again in 4 more weeks if the organic matter is less than 3%. Use 1 oz ammonium sulfate per plant in a circle 12" from the crown at each application.

Follow up your spring fertilizer with a leaf analysis during July or August to fine tune the program. You may find that only nitrogen is needed.

Magnesium is frequently low in blueberry plantings. Symptoms include yellow or reddish leaves with green veins in a "Christmas tree" pattern. A typical amount to apply in deficient situations is 200 lbs/A magnesium sulfate (epsom salts).

4. Irrigation: Trickle irrigation is a must for blueberry production in the Northeast Agricultural Engineering bulletins or your irrigation supplier can help you design a system. The system can be installed at planting, covered with sawdust mulch and left in place for the life of the planting. Check the pH of your irrigation water. You may have a problem if it is over 6.5.

5. Mulching: Mulching your blueberries can help retain moisture, provide weed control, as well as reduce disease. The mulch should be a 3" to 5" layer of well rotted softwood sawdust. Other materials such as wood chips, bark, straw, corn stalks and combinations of these materials can also be used. Replenish your mulch every 2-3 years. Blueberries perform best when mulched.

6. Pollination: Blueberries must be cross-pollinated to set large fruit. Plant at least two varieties. Honey bees may be beneficial, but wild bees are the best pollinators if they are present. You can encourage wild bees by managing surrounding habitats appropriately.

7. Spring disease control: Canker diseases and cane blights are some of the most important disease problems of blueberries. The best management solution is emoving any diseased, dead, or damaged canes to prevent inoculum build up.

Dormany applications of sulfur fungicides may also reduce inoculum. Do not use lime sulfur within 14 days of an oil application or when temperatures are over 75ºF. See the labels and the 2007 Cornell Pest Management Guidelines for additional details.

Mummyberry is becoming more prevelant in New York. In heavily infested areas, mummyberry can reduce yields by up to 30%. Infected berries ripen, turn salmon in color, drop to the ground, and become a berry-size black pumpkin-like structure (see picture). However, blighted leaf strikes soft in texture with purple mid ribs appear long before infected fruit. An application of urea fertilizer or shallow cultivation between rows and beneath infected bushes before bud break will greatly inhibit the production of the leaf infecting spores. See the 2007 Cornell Pest Management Guidelines for Berry Crops for appropriate fungicide applications.

Table 4. Relative resistance of blueberry varieties to mummy berry

Susceptible	**Somewhat Resistant**	**Most Resistant**
Earliblue	Rancocas	Burlington
Blueray	Weymouth	Collins
	Berkley	Jersey
	Bluecrop	Darrow
	Herbert	Rubel
	Coville	Bluetta
		Dixi

Newly labeled fungicides for production against cane mummy berry
Pristine (pyraclostrobin/boscalid) is registered in New York for management of mummy berry disease. There currently is no research data available under New York growing conditions, however other states such as Michigan and New Jersey have found this product to have good efficacy against several blue berry diseases.

Indar 75WSP and Orbit are two SI fungicides labeled for mummy berry disease in New York. Indar 75WSP has a long history of success against mummy berry. Orbit has not been used in New York, but a similar level of efficacy could be expected.

See the labels and the 2007 Cornell Pest Management Guidelines for additional details.

Established Plantings – Sumemr Jobs

1. **Summer disease control**: If mummyberry was not properly controlled before bloom, Indar, Orbit, or Pristine should be applied during bloom. This will also control Botrytis blossom and twig blight which may be a problem if a long period of wet weather is predicted during bloom. Switch or Captevate 68WDG are also good choices if disease pressure is low.

Anthracnose occurs sporadically in New York, primarily in seasons with abundant rainfall and warm temperatures. Berry infections are not usually apparent until fruit become ripe but can occur any time during and after bloom. In plantings with a history of anthracnose, chlorothalonil or Captan sprays can provide significant protection if applied when weather conditions are favorable for infection. Chlorothalonil is more effective than Captan but should not be applied after early bloom (and cannot be applied after petal fall) to prevent phytotoxicity on developing fruit. Pristine, Cabrio EG, and Abound, should have better efficacy against anthracnose than other fungicides, but may be more expensive. If there are apples nearby, avoid Abound all together. Even tank residues of Abound will cause severe phytotoxicity in “McIntosh” apples. See 2007 Cornell Pest Management Guidelines for Berry Crops for additional details.

2. Insect control: Cranberry fruitworm and **Cherry fruitworm** need to be controlled at petal fall. Adult moths of both lepidotera appear during bloom and lay their eggs at the base of newly set fruit. The larvae of both species attack green fruit. The damage appears as webbed berry clusters and tunnel into the berries, feeding internally. Several insecticides are labeled for use against these pests at petal fall and again 10 days later (see Cornell Recommends for formulations and rates).Most commonly used are Bacillus thuringiensis (Bt), Confirm, Malathion, *Imidan, Sevin, *Guthion, Spintor, and Entrust (organ-approved formulation of spinosad). Some of these sprays also control leaf hoppers and leafrollers. Use of pheromone traps is the best way to determine timing of application.

3. Blueberry maggot is another potentially serious pest of blueberries. It has not been as serious in New York State as in other blueberry growing regions. Larvae attack the berries (one per fruit) and may cause them to drop. The adults look like apple maggot flies and migrate in from nearby wild areas. Trap for these insects starting July 1st with yellow sticky boards baited with ammonium acetate (commrecially available) . If adult flies are detected, spray with Malathion, Sevin, Imidan, or *Guthion. Repeat sprays every 10 days as necessary. Do not spray if no adults are trapped, or if there is no history of maggot in the field.

4. Bird control: There are no foolproof options to manage these pests. Netting is expensive (2,000/acre) and difficult to put up and take down, but it can be appropriate for smaller acreages. One suppler is J.A. Cissel Co. (1-800-631-2234). The Bird-X Company, 730 West Lake Street, Chicago, IL 60661, phone (312) 226-2473 or (800) 662-5021 for orders; sells all kinds of bird control goodies like propane cannons, scare-eye balloons, repellents, mylar tape and netting. Another company that also sells this type of stuff is Reed-Joseph International, Box 894, Greenville, MS 38702, phone (800) 647-5554. These are not endorsements, they are just names of suppliers I have come across.

Bird Gard has been effective for about 10 days in blueberry fields. This device emits species-specific bird distress calls which are difficult for birds to get used to. This device is particularly effective when supplemented with hawk kites or other visual scare devices. Call 800-555-9634 for information.

No one technique alone will do the job. A combination of auditory (distress calls, cannons) and visual (inflatable "eyes", fake owls) frightening devices is probably the best control we have, but birds habituate easily and are not deterred by these for long.

Sugar. Applications of sugar syrup have been shown to repel birds from blueberry plantings. This may be due to the inability of many bird species to digest disaccharides. (Most bird-dispersed fruits contain simple monosaccharide sugars.) The sugar is applied when the fruits begin to turn blue, and reapplied after episodes of rain. We dissolved 230 lbs of sugar in 21 gallons of hot water, yielding 40 gallons of solution. Bird damage was 50% less where sucrose was applied. Although each treatment cost $40 - $50 per acre, and we applied sugar 4 times during the season, the total expense ($160) was far less than the losses to birds that an adjacent field experienced. In field trials, the sugar also repelled birds, although an increase in Japanese beetles and yellow jackets was observed in treated plots.

5. Leaf Analysis: Sample 30 healthy leaves during July or August. Do not mix different varieties of different ages. You get a complete fertilizer recommendation on the printout. The exact price for leaf analyses will not be available until after July 1st. Contact Cooperative Extension for details on submitting samples. Leaf analyses will also tell you if iron is low. Iron deficiency (which gives the plants yellow leaves) is a sign that the soil pH is too high. If this is the case, iron chelate or iron sulfate can be applied to "green up" the plants. Follow the manufacturers directions. This only cures the symptom. To cure the problem, apply 200 lb sulfur in the row after harvest and repeat in spring until the pH drops to 4.5.

Established Plantings – Fall Jobs

Weed Control: There are two strategies for fall weed control. They should be alternated with each other to prevent the buildup of herbicide resistance in weeds. The first strategy is a mixture of 2.2 lbs/acre of Princep 90WDG plus either (A) 5 lbs/acre of Surflan DF, (B) 8 lbs/acre of Devrinol 50DF or (C) 2-4 lbs/acre of *****Kerb 50W or (D) 2 lbs/acre of Sinbar 80WP. Surflan is not recommended on high organic matter soils;1/2 to 1" rainfall or irrigation is required within 21 days of application. *Kerb is useful for quackgrass control. Solicam 80DF is labelled and could technically be a fifth option to mix with Princep, but it is expensive and injury is possible.

During the planting year, wait at least unit the soil is well settled around the plants before applying herbicides. Devrinol and Surflan are good, safe options. Use a low rate of Princep the first year, and don't use any Sinbar.

The second strategy that should be part of your weed control rotation is 100-150 lbs/acre (1.5 to 2.25 oz/plant) of Casoron. Casoron is a granular that must be spread evenly. A hand-crank granular spreader works well. DeCran Ag Supplies sells hand-crank spreader (508) 295-2731. For larger acreage, perhaps the thing to do is rig up a Gandy-type box on the back of an ATV or tractor. Casoron is expensive and should be applied between October and April when daily temperatures hold below 45ºF; March is best if the snow has melted and the soil isn't frozen.

Along with the fall preemergent weed control program, a fall touch-up of Roundup is effective if quackgrass, goldenrod or other perennial weeds are a problem. It should be applied when 90% of the leaves are off the blueberry plants, but before the first heavy frost.

For more information on weed management in blueberries see the Cornell Pest Management Guidelines for Berry crops. Always read the product label before applying any pesticides.

***Restricted-use pesticide - may be purchased and used only by certified applicators or used by someone under the direct supervision of a certified applicator.*

In A Nutshell

March	Apply preemergent herbicides if this was not done in the fall.
April	Scout for mummyberry "cups" (apothecia) at bud break.
May	Apply fertilizers, split between bud break and one month later.
June (bloom)	Apply malathion, Sevin or Guthion or Confirm for cranberry and cherry fruitworm at petal fall, and again 10 days later, if necessary.
July	Get bird control devices in place before the birds get used to eating blueberries.
August	Take leaf samples for analysis.
Oct./Nov	Apply fall herbicides.

Educational Resources for Blueberry Growers- Print Publications

1. *The Highbush Blueberry Production Guide* NRAES bulletin 55. This 200 page guide contains 168 full color photos. Edited by Marvin Pritts and James Hancock, with contributions by many blueberry specialists in North America. Available through our office for $45.00. Call (315) 963-7286.

2. *Compendium of Blueberry and Cranberry Diseases* Published by the American Phytopathological Society, St. Paul Minnesota. Call 1-800-328-7560 for ordering information. The price is around $37.

3. *Cornell Pest Management Guidelines for Berry Crops* Available from any County Extension Office for $18.
4. *Pocket Guide to IPM Scouting in Highbush Blueberries* from Michigan State University. For purchasing information contact the MSU Bulletin Office, East Lansing, MI Phone: 517-353-6740

5. *Midwest Small Fruit Bulletin 861* Published by Ohio State University Extension. For purchasing information contact Media Distribution Columbus, OH 614-292-1607

Educational Resources for Blueberry Growers- Web-based Information

1. *Cornell Fruit Resources Page – Berry Section* - http://www.fruit.cornell.edu/berry.html. These pages include production and pest management information on the major small fruits including strawberry, blueberry, blackberry and raspberry, currants and gooseberries. Other specialty small fruit information is also provided. Also included are links to small fruit information from other Cornell and Non-Cornell sources. Pages featuring post harvest handling and marketing are also available.

2. *Cornell Pest Management Guidelines for Berry Crops* - http://ipmguidelines.org/BerryCrops/ . This is an on-line version of the print publication.

3. *Cornell Berry Diagnostic Tool* - http://www.hort.cornell.edu/department/faculty/pritts/BerryDoc/Berrydoc.htm .Dr. Marvin Pritts has done an excellent job developing a web-based diagnostic tool to help the grower/educator determine what might be wrong with their berry plants — from pest injury to herbicide injury to nutritional

deficiencies. By answering a series of questions about symptomology, one is led to a possible cause. The site uses lots of photographs, so it can be a little slow with a modem. To access the site go to:

4. *Cornell Small Fruit Nursery Guide* - http://www.fruit.cornell.edu/Berries/nurseries/index.html To find a source for a particular cultivar, go to the site, select a crop, find the cultivar of interest, note the nursery links, then click on those links for address, phone number, email addresse, web sites and FAX numbers, etc. for a particular nursery. This guide is updated annually.

5. *New York Berry News* - http://www.nysaes.cornell.edu/pp/extension/tfabp/newslett.shtml .This is a monthly on line small fruit newsletter which covers all aspects of berry production. Available also in low resolution format for easy of downloading.

Educational Resources for Blueberry Growers- Grower organizations

1. New York State Berry Growers Association. Be sure to join this important political voice. Contact Jim Altemus at (716) 657-5328 or goodberries@frontiernet.comfor more information. Visit their website at: http://www.hort.cornell.edu/grower/nybga/index.html .

Blueberry Varieties

While blueberries are not widely grown in NY there are regions with suitable soil and they are more widely grown in other regions in the northeast. They exhibit a wide range of hardiness that must be taken into account when selecting cultivars.

Early Season

Bluetta is very hardy but has small dark berries that are difficult to machine harvest. The large scar on the berry is also a problem. Suitable for Zones 3-4.

Polaris is hardy with medium large berries with a very firm, crisp texture. The berries have an intense aromatic flavor and store very well. It requires a second cultivar for pollination. Suitable for Zones 3-4.

St. Cloud is hardy with medium sized, firm berries. It does not machine harvest well. It requires a second cultivar for pollination. Suitable for Zones 3-4.

Duke is considered the best early season cultivar available. The fruit size and quality is very good but the flavor can be bland if picked late. It can be machine harvested. Frost tolerance and winter hardiness is good. Suitable for Zones 5-6.

Early Mid Season

Bluejay has high quality fruit that can be machine harvested but may be less productive than other cultivars. Suitable for Zones 5-6.

Northland, as the name suggests, is very winter hardy. It is a half-high bush with small, dark, soft fruit. It is productive but requires heavy pruning. Suitable for Zones 3-4.

Patriot is winter hardy but frost sensitive. It is a smaller bush but still productive but must be pruned hard for large fruit. It must be fully ripe for best flavor. A recent disease problem resembling virus infection has taken it off the recommend list.

Spartan produces large, good quality fruit with good flavor. It can be machine harvested, but it needs cross pollination for good yields and can be difficult to grow in some sites. Suitable for Zones 5-6.

***Draper** is an early mid-season cultivar out of MSU program. It has high fresh market quality and prolonged storage life. The plants are vigorous and upright. Fruit quality is very good with moderate size.

Mid Season

Bluecrop is a commonly planted cultivar in New York. It has good flavor and fruit size and firmness. It has high yield potential. It is hardy in most of NY and can be machine harvested. The canes tend to be weepy. Suitable for Zones 5-6.

Blueray is also one of the more widely planted cultivars in New York. Fruit size is very good with good flavor and high yield potential. Extra pruning is needed with this spreading bush. Suitable for Zones 5-6.

Chippewa is a very winter hardy cultivar that is productive with large firm fruit. This half-high bush is relatively new and has not been widely tested. Suitable for Zones 3-4.

Sierra is productive and has large firm berries that can be machine harvested. It is less hardy than other cultivars. Suitable for Zones 5-6.

Toro is a productive cultivar with large fruit that ripen uniformly. The clusters tend to be tight which makes picking harder. The canes tend to be too upright and thick. Competes with Bluecrop, which is probably better. Suitable for Zones 5-6.

Late Season

Brigitta is a large flavorful fruit that stores well. It is vigorous but can be less hardy because it grows late into the fall. Excess nitrogen will make this worse. It is susceptible to Phomopsis. Suitable for Zones 5-6.

Elliott is a very late season berry with very good shelf life, 30-45 days in a Modified Atmosphere. The fruit is large and firm but can be tart. It is a good producer. Suitable for Zones 5-6.

Jersey is an old (1928) cultivar that is adapted to a wide soil range. It has high yields of machine harvested fruit but the berries are small and soft. Suitable for Zones 3-6.

Nelson is productive with firm, attractive, good flavored that can be machine harvested. The fruit can hang on the bush for extended periods. It is a vigorous, hardy bush with wide soil adaptation. Suitable for Zones 5-6.

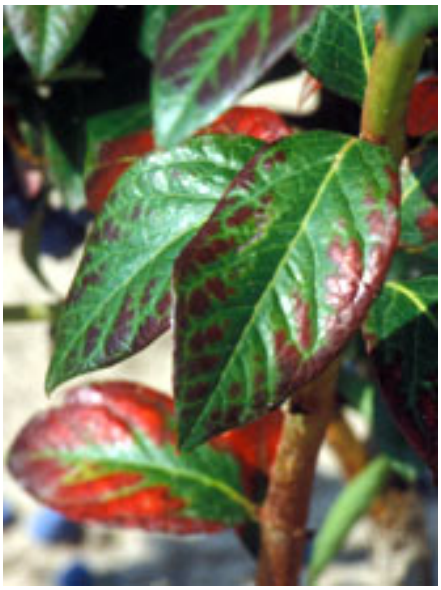
***Aurora** is a late season cultivar out of the MSU program. The plants are vigorous uprights with numerous moderately branched stems. The fruit is moderately large with excellent quality. Also has excellent winter hardiness.

***Liberty** is a very late season cultivar out of MSU program. The plants are vigorous and upright with numerous, moderately branched canes. The fruit is very firm with good flavor. Storage life is very good.

*New cultivars

This production summary is intended to be a brief overview of the steps involved in growing blueberries using the simplest and most economically conservative methods. Information on production systems, organic production methods, etc. can be found in detail in NRAES-55 " Highbush Blueberry Production Guide". Furthermore, to apply pesticides, you should consult the legal recommendations for your state as labels vary by state. In New York, the official source is the Cornell Pest Management Guidelines for Berry Crops.

Mummy berry Top: Shoot strikes Bottom: mummified fruit with apothecia (makes infective spores)
Source: C. Heidenreich - Cornell University



Magnesium deficiency.
Source: Michigan State Extension

Tomato ringspot. Earliblue' highbush blueberry infected with tomato ringspot virus but exhibiting uneven symptom distribution; some shoots are defoliated; some have necrotic, distorted leaves; and some have apparently normal leaves. *Source: R. H. Converse*