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Berry Notes

Prepared by the University of Massachusetts Fruit Team

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http://www.umass.edu/fruitadvisor/berrynotes/index.html

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IN THIS ISSUE:

Message from the Editor:

Mummyberry Update: Massachusetts (and all the New England States) have submitted petitions to EPA for a Section 18 label for the use of Indar 75WP to control mummyberry in blueberries. At this writing, MA and NH have been approved for this label. The other New England States will likely follow. Go to www.umass.edu/fruitadvisor for a link to the Section 18 label and instructions.

Twilight Meetings: Spring and summer twilight meetings are being organized. I'll post them in this newsletter as I hear about them. Twilight meetings are a great way to hear the latest timely topic information and to get together with other growers to talk about the upcoming season. We hope to see you at some of these meetings.

Focus on Frost and Weeds: This issue of Berry Notes features some information on frost protection and weed management in various crops. It pays to plan ahead for both.

New Agriculture Tourism Map now Available: The Massachusetts Department of Agricultural Resources (MDAR) unveiled the new Agriculture Tourism Map at Agriculture Day at the Statehouse in March 10th. The map lists 295 Massachusetts farms that offer "Ag-tivities" for the whole family.

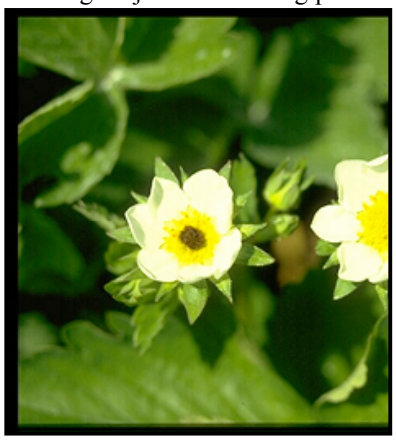
It was produced by MDAR with funding from USDA Rural Development Agency, along with in-kind support from Massachusetts Department of Conservation and Recreation and the Massachusetts Department of Fish and Game. To order a copy of the map(s), email your address to: agtourism.map@state.ma.us.

If you were not listed and would like to be listed on our list of Agri-tourism farms on-line, please contact Rick LeBlanc at 617-626-1759, or email Richard.LeBlanc@state.ma.us.

Frost Protection in Strawberries

Marvin P. Pritts, Cornell Univ., Ithaca, NY

Strawberry growers can ensure a full crop of berries only if they exert some influence on temperature during the year. Temperature control is especially important during the winter and early spring when flowers are susceptible to frost. Of all the factors that negatively affect strawberry production, frost can be the most serious. Frost can eliminate an entire crop almost instantaneously. Strawberries often bloom before the last frost free date, and if a frost occurs during or just prior to bloom, significant losses can result. The strawberry flower opens toward the sky, and this configuration makes the flower particularly susceptible to frost damage from radiational cooling. A black (rather than yellow) flower center indicates that frost damage has occurred.



Strawberry growers occasionally delay the removal of straw mulch in spring to delay bloom and avoid frost. Research has demonstrated, however, that this practice also results in reduced yields. Also, applying straw between the rows just prior to bloom will insulate the soil from the air. This will increase the incidence of frost injury as solar radiation will not be absorbed by the soil and re-radiated at night. If additional straw is to be applied between the rows in spring, delay its application for as long as possible before fruit set.

Overhead irrigation is frequently used for frost control because flowers must be kept wet during a freeze in order to provide protection. As long as liquid water is present on the flower, the temperature of the ice will remain at 32˚F because the transition from liquid to ice releases heat. Strawberry flowers are not injured until their temperature falls below 28˚F. This 4 degree margin allows the strawberry grower to completely cover a field with ice and yet receive no injury from frost. However, if insufficient water is applied to a field during a freeze event, more injury can occur than if no water was applied.

Table 1. Water application rate (in/hr) for a given humidity and wind speed.

	Wind Speed				
Temp (F)	**0-1**	**2-4**	**5-8**	**10-14**	**18-22**
Relative humidity of 50%					
27	0.10	0.20	0.30	0.40	0.45
24	0.10	0.30	0.35	0.45	0.60
20	0.15	0.35	0.45	0.60	0.75
18	0.20	0.40	0.50	0.65	0.80
Relative humidity of 75%					
27	0.05	0.10	0.20	0.25	0.25
24	0.10	0.20	0.30	0.35	0.40
20	0.10	0.25	0.40	0.45	0.60
18	0.15	0.30	0.45	0.55	0.70

FROSTPRO model from North Carolina State University

Several principles are responsible for the ability of ice to protect strawberry flowers from injury. First, although pure water freezes at 32F, the liquid in the strawberry plant is really a solution of sugar and salt. This depresses the freezing point to below 32°F. Also, ice crystals need nucleators to allow them to form initially. Certain bacteria serve as nucleators. Sometimes, in strawberry flowers, the bacteria that allow ice to form are absent, allowing the freezing point to be lowered. The temperature of the applied water is usually greater than the temperature of the plants, so this serves to warm the flowers before heat is lost to the air. As long as liquid water is continually applied to the plants, the temperature under the ice will not fall below 32°F. When one gallon of water freezes into ice, 1172 BTUs of heat are released.

Several factors affect the amount of water that is required to provide for frost protection, and the timing of application. At a minimum, apply water at 0.1 - 0.15 in/hr with a fast rotating head (1 cycle/min). Water must be applied continuously to be effective. A water source of 45 - 60 gal/min-acre is required to provide this amount of water. Choose nozzle sizes to deliver the amount of water required to provide protection under typical spring conditions in your location. Under windy conditions, heat is lost from the water at a faster rate, so more water is required to provide frost protection. For every gallon of water that evaporates, 7760 BTUs are lost. The application rate then depends on both air temperature and wind speed (see Table 1).

Under windy conditions, there is less chance of flower temperatures falling below that of the air because of the mixing of air that occurs at the boundary of the flower. Winds are beneficial if the temperature stays above the critical freezing point, but detrimental if the temperature approaches the critical point. Less evaporation (and cooling) will occur on a still, humid night. Under extremely windy conditions, it may be best not to irrigate

because the heat lost to evaporation can be greater than the heat released from freezing.

Stage of development: Strawberry flowers are most sensitive to frost injury immediately before and during opening. At this stage, temperatures lower than 28°F likely will injure them. However, when strawberry flowers are in tight clusters as they are when emerging from the crown, they will tolerate temperatures as low as 22°F. Likewise, once the fruit begins to develop, temperatures lower than 26°F may be tolerated for short periods. The length of time that plants are exposed to cold temperatures prior to frost also influences injury. Plants exposed to a period of cold temperatures before a frost are more tolerant than those exposed to warm weather. A freeze event following a period of warm weather is most detrimental.

Flower temperature: The temperature of all flowers in a field is not the same. Flowers under leaves may not be as cold as others, and those near the soil generally will be warmer than those higher on the plant. On a clear night, the temperature of a strawberry flower can be lower than the surrounding air. Radiational cooling allows heat to be lost from leaves and flowers faster than it accumulates through conduction from the surrounding air.

Table 2. Starting temperature for frost protection based on dewpoint

Dewpoint	Suggested starting air temperature
30 °F	32 °F
29 °F	33 °F
27 °F	34 °F
25 °F	35 °F
24 °F	37 °F
22 °F	38 °F
20 °F	39 °F
17 °F	40 °F

Soil also retains heat during the day and releases heat at night. It is possible that on a calm, cloudy night, the air temperature can be below freezing yet the flowers can be warm. Wet, dark soil has better heat retaining properties than dry, light-colored soil.

Using row covers: Row covers modify the influence of wind, evaporative cooling, radiational cooling, and convection. Because wind velocity is less under a row cover, less heat will be removed from the soil and less evaporative cooling will occur. Also, relative humidity will be higher under a row cover, reducing heat loss from evaporation. In addition, convective and radiational heat loss is reduced because of the physical barrier provided by the cover. Plant temperature under a cover may eventually equal that of the air, but this equilibration takes longer than with uncovered plants. In other words, row covers do not provide you with additional degrees of protection, but they do buy time on a cold night as flower temperatures will fall less rapidly inside a cover. Often the temperatures fall so slowly under a row cover that irrigation is not needed. If irrigation is required, less water is needed to provide the same degree of frost protection under a row cover. Water can be applied directly over the row covers to protect the flowers inside.

Turning on the water: Since cold air falls to the lowest spot in the field, a thermometer should be located here. Place it in the aisle at the level of the flowers, exposed to the sky, and away from plants. Air temperature measured at this level can be quite different from the temperature recorded on a thermometer at the back of the house. The dewpoint temperature measured in the evening is often a good indication of how low the temperature will drop on a clear night, and is related to the relative humidity. Air temperature will fall less if the humidity is high. If the air is very dry (a low dewpoint), evaporative cooling will occur when water is first applied to the plants, so irrigation must be started at a relatively warm temperature. Most local weathermen can provide the current dewpoint, or it can be obtained from World Wide Web-based weather information services.

Rules of Thumb

- Store sufficient water for 2 or 3 consecutive nights of frost protection
- Use small diameter nozzles (1/16 - 3/16 in. diameter)
- A 30 X 30 ft. staggered spacing of nozzles is preferable
- Use metal sprinklers to minimize icing
- Minimum rotation of once per minute

If the air temperature falls below 34°F on a clear, calm night, especially before 3 A.M., it would be wise to start irrigating since flower temperatures could be several degrees colder (Table 2). On the other hand, if conditions are cloudy, it may not be necessary to start irrigation until the temperature approaches 31°F. If conditions are windy or the air is dry, and irrigation is not turned on until the temperature approaches 31°F, then

damage can occur due to a drop in temperature when the water first contacts the blossom and evaporation occurs. Therefore, the range in air temperatures which indicates the need for irrigation at flowering is normally between 31° and 34°F, depending on cloud cover, wind speed and humidity, but can be as high as 40°F. Admittedly, these numbers are conservative. Flowers can tolerate colder temperatures for short periods of time, and irrigation may not be needed if the sun is about to rise. Obviously, one does not want to irrigate too soon since pumping is expensive, and excess water in the field can cause disease problems.

Turning off the water: Once irrigation begins, it should not be shut off until the sun comes out in the morning and the ice begins to slough off the plants, or until the ice begins to melt without the applied water.

Waterless frost protection agents: Future solutions to frost protection could lie in waterless methods, such as genetically engineered bacteria that do not promote the formation of ice. However, to date, these materials have not been consistently effective, so they are not recommended as the sole basis for frost protection. (***Source**: New York Berry News, Vol. 3, No.4*)

Increase Strawberry Productivity with Early Spring Row Cover

Lori Bushway, Cornell University

Many different cultural practices have been recommended to Northeastern strawberry growers over the years, but none has proven to be consistently beneficial to all growers. The exception to that may be the use of early spring row covers. Research at Cornell and elsewhere has repeatedly found spring row covers to positively impact plant develop carbohydrate reserves, and productivity in strawberry fields.

Straw mulch is applied over the strawberry planting in late fall to protect plants from winter injury. However, plants left under winter straw mulch into April show greater than 50% decline starch content, a loss of root biomass and subsequently lower yields. Creating a more favorable plant microclimate in late March and April by removing straw mulch and covering plants with synthetic row covers improves photosynthetic rates of leaves, enhances starch accumulation, accelerates plant development (including earlier fruiting) and increases total fruit yield. As a rule, March is an appropriate time to remove protective winter straw mulch and apply row cover. The row 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 covers are still in place and flower trusses have emerged, water can be applied directly over the row covers for frost protection. The economics of row cover use is favorable if the material is reused for several springs.

Details on spring microclimate studies can be found in the following article:

Lori J. Bushway and Marvin P. Pritts. 2002. Enhancing Early Spring Microclimate to Increase Carbon Resources and Productivity in June-bearing Strawberry. Journal of the American Society for Horticultural Science 127(3): 415-422. http://www.ashs.org/journal/. (***Source**: New York Berry News, Vol. 4, No. 1*)

RASPBERRY

Raspberry Weed Management

Courtney Weber, Cornell University

A combined approach using chemical controls, cultural practices, and selective hand weeding can be used to effectively manage weeds in raspberry. Herbicides provide good overall control of most weeds. The key to successful chemical control is a vigorous, healthy stand of canes to crowd out competing weeds within rows. Between row control can be managed using a cover crop with herbicide banding to limit spreading, mulches, cultivation, or broad-spectrum herbicide application.

Chemical control is most effective in combination with the establishment of a vigorous stand of canes. In the establishment year, care must be taken to eliminate perennial weeds such a Canadian thistle and field bindweed with a broad-spectrum herbicide such as glyphosate (RoundUp) before planting because these weeds can spread from root pieces moved during cultivation. Once established in a planting, they are very difficult to control.

After planting, a preemergent herbicide such as napropamide (Devrinol) should be applied to eliminate germinating weed seeds. Be aware that tissue culture plugs and young canes can show increased sensitivity to many herbicides until they are well established and reduced rates may be needed. Shallow cultivation is also recommended in the establishment year to eliminate young weeds while allowing the new canes to develop. Deep cultivation is not recommended as it can damage the root systems and turn up new weed seed that would not be controlled by the

preemergent herbicide. Turf can be seeded between rows late in the summer to crowd out weeds and can be managed successfully by banding with a grass herbicide along the rows as the planting matures. Mulches within the rows as well as in row centers can be used to keep weeds down but care should be taken to maintain soil fertility. Also, in less than optimally drained soils or when growing root rot susceptible varieties, mulches can retain excess moisture and exacerbate root rot problems. Bare ground can also be maintained between rows with shallow cultivation, mowing, and/or broad-spectrum herbicides, but erosion can be a problem. However, special care must be taken to avoid disturbing the raspberry roots with the cultivator, to avoid weed seed development through regular mowing, and to avoid spray drift onto the raspberries when maintaining alleyways.

In established plantings, much of the chemical control is done in the fall or in the spring before bud break. By late spring, chemical control is limited to sethoxydim (Poast) for grass control. Be aware that Poast has a 45 days-to-harvest period in raspberry and by late spring may not suitable for early season varieties that can fruit in June such as Prelude, Killarney, and Reveille. Spot treatments of glyphosate with a wick applicator can be used to treat problem weeds making sure to avoid contact with the raspberries. This herbicide will translocate and kill not only the cane touched but also ones connected by the roots and can be spread not only by the applicator but by treated weeds blowing into the canes while still wet. A well thought out herbicide program combined with timely mowing and selective hand weeding is an effective integrated approach to weed control in raspberry and can be used to successfully manage weed pests for maximum yields and profits. (***Source**: New York Berry News, Vol. 3, No.4*)

BLUEBERRY

Herbicide Options for Michigan Blueberries

Eric Hanson, Michigan State University

Preemergent herbicides should go on blueberries in late April to early May. The herbicide choices are described in detail in Extension Bulletin E-154. [**Editors Note**: *New England Growers can find this information in the New England Small Fruit Pest Management Guide*] Preemergent herbicides are soil-applied chemicals that kill germinating weed seeds or young seedlings. Many materials applied at high rates also kill established weeds. Properly chosen and applied preemergent herbicides will provide effective weed control throughout most of the growing season. Here are several considerations in using these materials effectively.

Princep 90WG (simazine), Karmex 80DF (diuron), Sinbar 80W (terbacil), Solicam 80DF (norflurazon). These are the workhorse preemergent herbicides in established blueberries. They are moderately priced, reasonably safe on blueberries, and control many germinating annual weeds for one to three months. Princep and Karmex tend to be stronger materials on broadleaf weeds, whereas Sinbar and Solicam are stronger on grasses. Use these only on established plants that have been in the ground for two years or more. Use rates per acre are 2.2-4.4 lb Princep 90 WG, 2-4 lb Karmex 80DF, 1-2 lb Sinbar 80W, and 2.5-5 lb Solicam 80DF. These rates are for an acre of treated surface area, so if you treat half the surface by spraying a strip beneath the plants, you will use half these amounts. To prevent injury to blueberries, use the lower rates on smaller plants or on sandy soils low in organic matter. This is particularly true of Sinbar.

Other preemergent herbicides labeled for blueberries are Casoron, Devrinol, Kerb, Surflan, and Velpar. The utility of Kerb, Casoron and Velpar in blueberries is limited by either cost (Casoron, Kerb) or crop safety (Velpar). Devrinol and Surflan are primarily grass materials that are very safe on blueberries (can be used on new plants), but have no postemergent activity and must be applied before weeds germinate.

Rely is a postemergent herbicide labeled on blueberries just last winter. This product may do a better job of killing some perennial weeds than Gramoxone, but appears to be safer to use in blueberries than Roundup. Rely will still kill any green blueberry stems or leaves, but it does not seem to translocate out of treated parts to injure the bush. Try Rely this year and learn what weeds it will control.

Rotate herbicides to avoid resistance

Continued use of herbicides from the same chemical families (see accompanying table) can result in weeds that are resistant to all herbicides in that family. Many weed species have developed resistance to the triazine family, which includes the blueberry herbicides Princep and Velpar.

Triazine resistant weeds may also be more tolerant of herbicides from other chemical families that share the same mode of action. For example, Princep, Karmex and Sinbar all affect weeds through the same mechanism; they kill weeds by inhibiting photosynthesis.

Triazine-resistant marestail and ladysthumb (a smartweed) are present in Michigan blueberries. If you suspect that triazine-resistant weeds are present on your farm, switch to herbicides with a different mode of action. Solicam and Surflan offer different modes of action and would be good choices to rotate with the photosynthesis inhibitors to control resistant types or to avoid the development of resistant populations. (***Source**: Michigan State Fruit CAT Advisory Vol. 19, No. 2, April 13, 2004*)

Table 1. Approximate Costs of Blueberry Herbicides[1]

Product	Common Name	Rate (Product per acre)	$ per Treated Acre[2]
Pre-emergent Herbicides			
Casoron 4G	dichlobenil	100 to 150 lb	200 to 300
Devrinol 50 DF	napropamide	8 lb	80
Gallery 75DF	isoxaben	0.7 to 1.3 lb	?
Karmex 80 DF	diuron	2 to 4 lb	8 to 18
Kerb 50 WP	pronamide	2 to 4 lb	80 to 160
Princep 90 DF	simazine	2.2 to 4.4 lb	9 to 18
Sinbar 80 WP	terbacil	1 to 2 lb	30 to 60
Solicam 80 DF	norflurazon	2.5 to 5 lb	50 to 100
Surflan 4AS	oryzalin	2 to 4 qt	45 to 90
Velpar 2L	hexazinone	2 to 4 qt	26 to 52
PostEmergent Herbicides			
Fusilade DX 2E	fluazifop butyl	1 to 2 pt	18 to 36
Gramoxone Max 3L	paraquat	1.7 to 2.7 pt	9 to 16
Poast 1.5E	sethoxydim	1 to 2 pt	9 to 18
Rely	glufosinate	3 to 5 qt	50 to 80
Roundup Ultra 4L	glyphosate	1 to 2 qt	18 to 36

[1] *Costs approximated from dealer quotes, 3/04. Actual costs will vary with source.*

[2] *Product costs for treating an acre of ground. If bandapplying under blueberry rows so half the ground surface is treated, costs would be half of those listed*

Table 2. Families and modes of action of blueberry herbicides

Herbicide	Chemical Family	Mode of action
Casoron	Benzonitrile	Inhibit cell division.
Surflan	Dinitroaniline	Inhibit active growth processes.
Princep/Velpar	Triazine	Hill reaction inhibitor (photosynthesis)
Karmex	Urea	Hill reaction inhibitor (photosynthesis)
Sinbar	Uracil	Hill reaction inhibitor (photosynthesis)
Kerb	Benzamide	Inhibit cell wall synthesis
Solicam	Pyridazinone	Inhibit carotenoid synthesis
Devrinol	Acetamide	Interferes with mitosis

GRAPE

How Cold Can Grapes Go?

Mark Longstroth, Michigan State University

Each Spring, I have growers ask me how cold does it have to be to hurt the grapes for the next frost? When we worry about spring frosts we worry about the growth stage of the plant and the conditions of the freeze. Growers can quickly determine the growth stage and for many fruit crops there are tables that give critical temperatures for each bud stage. Washington State and Rutgers Universities have both published tables to help growers determine the critical temperatures from growth stage.

Snow in a Van Buren Grape Vineyard in April 2001

These temperatures are determined by collecting buds in the field and putting them into a freezer. Usually large numbers of buds are collected and grouped into bundles of 10. The temperature in the freezer is slowly reduced. Temperatures are usually dropped one or two degrees in an hour and then held there for half an hour. One set of buds is removed and the temperatures in the freezer lowered another degree or two to another set point and more buds removed. The process is repeated as long as there are buds in the freezer. The bud bundles sit for a day at room temperature and are then examined for damage. This process is repeated at each growth stage and the entire collection and freezing process is repeated for several years. The more years the data is collected the better the critical temperature numbers. It is critical to have a good freezer and the ability to precisely control and monitor temperature.

The temperatures from WSU and Rutgers give 10% and 90% damage thresholds while the Rutgers temperatures give a 50% damage threshold and a temperature at which no damage occurs. Unfortunately these temperatures do not always agree. I will give you both so you will have something to compare to your field experience. The differences can be due to different factors when the buds were collected or to different varieties. The WSU numbers are for Concord grapes and the Rutgers numbers are for wine grapes.

There are other factors that determine the severity of the freeze. There are two types of freezes; radiation freezes with clear calm conditions and advective freezes with windy conditions. Cooling of the ground by radiation of heat to the open sky causes radiation freezes. The cold air stays close to the ground and even moves downhill into low areas or "frost pockets". Wind machines, sprinklers and heaters can be used if the temperatures are not to cold (above 23F) to provide frost protection. The movement of a cold area mass into the area causes advective freezes. Clouds help to hold in the day's heat and keep the morning temperatures warmer. Winds mix warmer air with cold air next to the ground. I near worry too much if the forecast is for cloudy windy conditions. The dew point is very important but hard to determine since the weather service no longer gives that information. The dew point is the temperature at which the air is saturated with water vapor. The temperature will fall faster in dry air than moist air. Once the air reaches dew point water has to condense or freeze out of the air as the temperature falls so the rate at which the temperature falls is slower below the dew point than above it. The temperature will sometimes rise at the dew point, as water condenses from the air giving up heat to whatever it condenses on. One place to find forecasts is MSU's Ag Weather Site. Look under Forecast Products. Projected low temperatures are found both in Michigan Zone Forecasts and in Specific Minimum Temperature Forecasts. (***Source**: MSU Cold and Freeze Damage Articles, http://web1.msue.msu.edu/vanburen/frost.htm*)

Critical Temperatures for Grapes

Concord Grapes	Dormant	First Swell	Late Swell	Bud Burst	First Leaf	Second Leaf	Third Leaf	Fourth Leaf
10% kill	varies	13˚F	21˚F	25˚F	27˚F	28˚F	28˚F	28˚F
90% kill	varies	-3˚F	10˚F	16˚F	21˚F	22˚F	26˚F	27˚F

Weed Control In Vineyards

Alice Wise and Andre Senesac, Cornell Cooperative Extension of Suffolk County

Weed control, that is the management of weeds in the 2-3 ft. strip under the trellis, is a major challenge for vineyards. The first step in developing a management strategy is to know what you are dealing with.Weeds of the Northeast, the bible on weed ID co-authored by CCE Weed Specialist Dr. Andy Senesac, is a very useful reference for diagnosing weed species and developing management strategies.

How much weed competition can vines tolerate? Young vines with shallow, developing root systems may be negatively impacted by anything more than light weed cover. Older vines with deeper root systems can likely tolerate more weed competition, assuming the vines are not otherwise stressed. Between bloom and veraison is the most critical time to minimize weed competition. After veraison, it is not necessary to maintain a pristine strip under the trellis. Controlling tall weeds later in the season may be necessary so that they do not interfere with harvest. At any point in the season, controlling younger, smaller weeds is easier than older, lignified, deeprooted weeds. Also, allowing weeds to reach maturity only increases the number of propagules (seeds, tubers, rhizomes) that will be present to deal with in the future.

Weed control can be achieved without herbicides, although increased labor inputs will be required. Hand hoeing is fine periodically but an impossibility for long-term weed control in a commercial vineyard. Mechanical weed control can be effective if done properly; however, timing is everything. Once weeds become well-rooted and lignified, cultivation is much more difficult. Use of a cultivating implement requires a skilled tractor driver to avoid vine trunk and root damage and trellis destruction (it has happened). Mechanical weeding long term may be detrimental to soil organic matter and may increase soil erosion. Alternating cultivation with a timely postemergent herbicide such as glyphosate may be one way around that concern.

Growers are currently experimenting with mowing under the trellis. In one case, a swing away mower head has been mounted on a row middle mower. The main concern with mowing is whether the presence of permanent weed cover will offer too much competition. If vines suffer, a postemergent material or timely cultivation will be required to mitigate that competition.

Herbicides are divided into two groups: those that prevent weed seed from germinating (emerging), known as pre-emergent materials, and those that are applied to existing weeds, known as postemergent materials. It is also necessary to plan for control of broadleaf weeds like horseweed, dandelion, groundsel, pineappleweed etc., as well as grasses such as bluegrass, quackgrass, crabgrass etc.

If planning on using pre-emergent materials for both broadleaf and grass control, it is usually necessary to combine two materials. If weeds are existing in the vineyard, a postemergent material may also be included. Be aware that only Prowl, Devrinol and Surflan are labeled for non-bearing vineyards. For established vineyards, preemergent grass herbicides include Devrinol, Surflan and Karmex. Note that Solicam is no longer labeled for use on Long Island. Broadleaf herbicides for established vineyards include Princep, Goal and Karmex. Some points about each one follow. This is not a substitute for reading the label - read the label thoroughly for complete information.

Devrinol: Necessary to have 0.25 to 1.0" of rain within a few days of application. Under warm summer conditions, significant losses can occur if water incorporation does not occur. In the cooler early spring, this is not so much of a concern.

Oryzalin 4AS/Surflan: The standard for preemergent grass control, use 6 to 8 pts/sprayed acre in a tank mix with a broadleaf herbicide such as Princep or Goal.

Karmex: Considered to be tricky on Long Island because of the risk of damage on sandy soils. However on mature vines, the labeled rate for our soil types does provide good broadleaf weed control for most of the season.

Goal: Must go on before bud swell, can cause burning of foliage close to ground due to volatility and 'splash up' of treated soil onto green tissues.

Princep: Kills weeds by inhibiting photosynthesis after they emerge so it needs incorporation with rain though less time restricted than Devrinol.

A typical spring herbicide application might be Princep, Surflan and either Roundup or Gramoxone, the latter two being postemergent materials for established weeds. Postemergent herbicides will be covered in a future newsletter.

A new preemergent herbicide – Chateau – is currently in the registration pipeline. It will likely be available for 2006. Chateau has efficacy against both broadleaves and annual grasses. Like Goal, Chateau may burn foliage thus must be applied dormant or as a directed spray. The label may require protection for young vines. Additionally, several researchers have noted damage after application to young vines, leading to the speculation that there is root uptake. In

any case, it is not something we will have to worry about in 2005.

Calculation of area to be treated can be done by first noting the spray swath of the herbicide rig. For example, at the research vineyard, we use an 18" Enviromist. Since we drive this down both sides of the trellis, our spray swath is 36". For traditional application devices, measure the spray swath by filling the tank with water and turning on the unit while on pavement. Our row width is 8 ft. or 96". Our calculation for area to be sprayed is 36/96 = 0.375. Thus for every acre of vineyard, we will spray 0.375 acres with herbicide. This 0.375 acres is referred to as the "sprayed acre" on herbicide labels. Next week postemergent herbicides. (***Source**: Long Island Fruit & Vegetable Update, No. 3, March 2005*)

Post-Emergent Weed Control In Vineyards

Alice Wise and Andrew Senesac, Cornell Cooperative Extension of Suffolk County

Many vineyards are taking a hard look at their weed control programs with the aim of reducing herbicide use. More growers are using mechanical weed control and/or only postemergent materials, thereby reducing or eliminating the use of preemergent materials. As with weed control programs that focus on cultivation, postemergent programs tend to be more labor intensive and thus more expensive than preemergent programs. A rainy season and the use of irrigation will increase the frequency of postemergent applications.

Postemergent herbicides are used for control of established weeds. There are two types: those that burn back the above-ground portion but typically do not kill the root and those that are absorbed and are translocated through the plant, killing the root as well. It is feasible to eliminate use of preemergent herbicides and control weeds with several well-timed postemergent applications. The trick is to make sure weeds are no taller than 6". A wellestablished stand of weeds may require more than one application to effect decent control. Speaking from experience, dense stands of grasses such as crabgrass and quackgrass are particularly hard to control postemergent.

Glyphosate (RoundupUltra and several other trade names) is a nonselective systemic herbicide which means that the spray must not contact green grapevine tissue. If that were to occur, the active ingredient may be translocated throughout the plant. This is particularly devastating to young grapevines. Note that uptake is enhanced after bloom, thus particular care must be taken in the bloom to late season sprays. Shielded sprayers are fairly effective (not 100% though) at preventing contact. Typically about 30 gallons of water/acre are used in application of these products, except for CDAs (controlled droplet applicators like the Enviromist), which typically apply 5-8 GPA. Glyphosate is attractive from an environmental standpoint as it has low human and mammalian toxicity. Also, once applied, it undergoes rapid degradation by soil microorganisms, resulting ultimately in CO2 and water. For those trying to avoid use of preemergents, well-timed applications of glyphosate offer an attractive alternative. The downside is that weeds can develop resistance to this material. Thus relying exclusively on glyphosate long term is ill advised.

Paraquat is a nonselective contact herbicide (Gramoxone Max and other trade names). Paraquat materials must also not contact green grapevine tissue. Short distance translocation through grapevine shoots is possible, though less likely. The contacted tissuehowever will be killed. Paraquat products are restricted use chemicals, meaning only licensed applicators may use them.

Sethoxydim (Poast, PoastPlus, Rezult G) is a selective postemergence herbicide that will control annual grasses very well up to 12 inches tall. Sethoxydim is labeled for use in nonbearing AND bearing vineyards (50 days PHI). Best success is usually obtained with early intervention on annual grasses not more than 6" tall. Weeds that are drought-stressed are much more difficult to control. Usually a Crop Oil Concentrate (1% v/v) is added for optimal control. Broadleaf weeds and nutsedge are not controlled by sethoxydim.

Scythe is a postemergent herbicidal soap (pelargonic acid) that ruptures the cells within green tissue. The initial effect on weeds is seen rapidly (within minutes), but the ultimate level of control may not be known for several days. As with the other products, green grapevine tissue should not be contacted. For effective control with Scythe, grasses should be very small (<3") and broadleaves should also be small. Do not expect to apply Scythe to a dense, well-established carpet of weeds and get adequate weed control. For best results, use≥ 60 gallons water per acre. No additional surfactants are necessary for Scythe. Scythe requires a high volume of water and thus will not perform well when used with CDA sprayers. Note that while Scythe is an herbicidal soap, it is not OMRI approved. It also has a rather pungent aroma.

Weed Specialist Andy Senesac as well as a few regional growers are experimenting with under the trellis groundcovers. The goal is to reduce herbicide use by establishing a minimally competitive cover that suppressesweed growth. Weeds that do break through can ideally be controlled by hand weeding or through reduced

rates of pre- or post-emergent materials. This is a tall order – competitive enough to suppress other weeds and withstand some herbicide use but not too competitive with vines. As with mowing natural weed cover, these groundcovers do have the potential to compete with vines and thus must be monitored closely. (***Source**: Long Island Frit & Vegetablle Update, No. 4, April, 2005*)

Viticulture in Vermont

Mark Chien, PennState University Cooperative Extension

I recently had the pleasure to make a trip to the Green Mountain State to present at a grape growers workshop hosted by Elena Garcia and Lorraine Berkett at the University of Vermont. They correctly describe their viticulture as "cold climate" and in the Burlington area, even hard by Lake Champlain, winter temperatures can drop to minus 20F, not a healthy environment for vinifera, yet I saw Riesling growing quite well in one vineyard. The current varietal focus is on the cold hardy Minnesota varieties like Frontenac, Prairie Star, Sabrevois, LaCrosse, Louise Swenson, Swenson White and LaCrescent, to name but a few. And I tasted the wines and can say that they absolutely have the wines to build a successful commercial wine industry upon. But it isn't easy given the conditions, both in the field and marketplace, they are starting pretty close to ground zero. Knowledge and experience are scarce but they are working hard to fill the voids. All of the basics are needed... university research and extension support, state legislature and agency support, industry unity, consumer awareness, all of those key ingredients when in the right amounts and properly prepared result in a vibrant wine industry. I was there to help with some of the viticulture basics such as pruning, canopy and crop management and just to give advice about how to get it all going. But these folks are adventurers, very much in the Green Mountain Boys tradition, they are independent and have figured out a lot on their own. They are certainly not bogged down with a lot of tradition and history. They are making their own! The quality of viticulture is good and vineyards I saw were well managed. The wines have very nice fruit and flavors and it is easy to see them selling well in tasting rooms. If there is a single problem with viticulture at the limit is the high acidity in the wines, a difficult problem to resolve in the vineyard and winery. Many of the wines had some bite, but they were tempered by a nice balance of sweetness. We also tasted Vidal Blanc and a new variety I have never encountered call Arctic Riesling. This, to me, is the essence of non-snobby wine appreciation which is to allow your palate to accept and enjoy wines without names like Chardonnay and Cabernet. Yes, we would all like to make great vinifera, but there sure can be a lot of pleasure found in a glass of Frontenac. If you are in northeast, north central or western Pennsylvania, these varieties may be of interest to you. Chris Granstrom at Lincoln Peak Vineyard and Nursery has these plants available for sale at www.lincolnpeakvineyard.com . If you like wine, maple syrup and cheddar cheese, as well as beautiful views of mountains and lakes, then the Lake Champlain area is a great place to visit! (***Source**: Pennsylvania Wine Grape Information Newsletter, April 1, 2005*)

General Information

Development and Testing of a Shrouded Flame Weeder for Non-Chemical Weed Control

Kevin Bittner and Ian Merwin, Cornell University

The first use of a flamer for agricultural purposes was in 1938 by Price McLemore who used a kerosene flamer for cultivation of his corn and cotton. In the early 1940s, Louisiana State University began testing the concept, and, by the middle of the decade, there were many flamers in use in Mississippi for desiccation of cotton. The flaming concept expanded from there through constant testing and experimenting with new uses and designs. Today, there are many applications on a variety of crops throughout the world that utilize this concept (Flame Engineering 2003).

Examples include weed control in strawberries and potatoes (Ivens, 1966), alfalfa, corn (Sullivan, 2001), and cotton (Seifert, S. and Snipes, 1998), seedbed sterilization, and pest control. Colorado potato beetles are easily controlled on young plants by using a flamer that kills the beetles without seriously damaging the plants (Cornell University, 2002).

Weed control is the primary use of flamers. Weeds are not completely burned by this technique. Rather, travel speed is adjusted so that surface vegetation is merely scorched, and essential enzymes are denatured, disabling the plants' metabolism. Weeds then wither and succumb over a period of several hours. If done properly, weeds will appear normal immediately after flaming, remaining green and still standing. It takes from a few minutes to a few hours until they start to wilt and die (Hickey, 2000).

Flaming conserves plant residues as organic matter and mulch for the soil. The key to effective weed control with flaming is that weeds must be shorter and more tender than the crop you are protecting. Flaming weeds at the same level of maturity as the crop plants may damage the crop. As crop

plants mature, they develop a hard outer coating on the stems.

Extreme caution should be exercised when flaming around tender crops such as potatoes, strawberries, and young grapevines and fruit trees. Even young trees and bushes can be harmed since they do not yet have a protective layer, and flaming can burn the cambium, xylem and phloem in the base of the plant. Flamers have also been known to ignite and burn mulches or other flammable materials, and may best be used following rain, or when there is dew on the surface vegetation to impede combustion of weeds (Young, et al., 1990). Engle, et al. (1988) concluded that flame weeding is comparable to contact herbicides in efficacy.

Propane "flamers" may be useful to control weeds in situations where herbicides are not desirable. The model tested here was affordable with operating and material costs similar to that of a typical burn down herbicide application but without the soil or water residues. This technique could be particularly valuable in organic fruit production where herbicide use is prohibited.

One of the advantages of flaming is that the soil is not disturbed and buried weed seeds are not brought to the surface where they can break dormancy and germinate (Hickey, 2000). Tillage often results in serious weed problems reoccurring in just a few weeks. Problematic orchard weeds like pigweed (*Amaranthus* spp.) and lambsquarter (*Chenopodium album*) are especially prone to regenerate after tillage since these weed seeds can remain dormant in the soil for decades (Sullivan, 2001).

Flaming works relatively well for controlling annual weeds, but perennials such as quackgrass (*Agropyron repens*) may grow back rapidly after flaming or mechanical tillage (Williams and Peachey, 2001). Similar problems with weed regrowth can also occur with non-residual herbicides such as paraquat.

Propane flamers are potentially important pest control devices for organic farmers, providing a nonchemical method of controlling weeds and insect pests (Young, et al.,1990). Some commercial literature suggests that propane may also be more economical than the alternative herbicides (Flame Engineering, 2003) with no indirect farm worker hazard, reentry period, or necessity for pesticide applicators certification.

Types of Flamers

There are many different types of flamers currently available. They vary in size from the small handheld burner wands found in gardening catalogs, to tractor and truck mounted burners handling four rows of corn at a time. Red Dragon Company Inc. makes several of these including orchard, row crop and field or alfalfa flamers (Flame Engineering, 2003).

The orchard and vineyard flamers advertised on their website are trailer mounted and available in either single or double row models. The row crop burners range from two to

Figure 1. Shroud around burners.

Figure 2. Propane tank and carrier on forklift.

Figure 3. Flamer mounted on front of tractor.

Figure 4. Front view of unit on tractor. For scale, the tractor is 50 inches wide.

Figure 5. Operator's view of mounted flame weeder from cab of tractor

Figure 6. Flamer raised for easy transport and repairs or adjustments.

eight rows. They are sold in fully assembled three point mounted machines or in kits to build your own machine.

The kits include the burners, valves and regulators. Typically, the burners are set 30-60 degrees below horizontal. This directs them below the crop foliage and at the ground where short weeds are. Theoretically, the crop is only warmed slightly while weeds are scorched. The alfalfa flamers are meant to burn everything in an alfalfa field or other open fields to control pests and weeds. This allows the alfalfa to regrow without competition from weeds. Red Dragon Co. also markets a 12-foot unit to d r a g behind a trailermounted tank, as well as handheld burners. The cost of these flamers ranges from the $50 handheld unit to $11,000 for tractor mounted units.

Flaming speeds vary greatly depending on the application. Speeds are affected by the type of flamer, application rate, and atmospheric temperatures. On cold days, the flamer must travel more slowly to achieve the necessary minimum temperatures for weed control. It is more difficult to flame after a rain, because heat goes into evaporating the water before it can affect weeds or pests. However, the risk of combustion in weed residues, and smoke generation are also reduced in wet conditions.

The position of burners is also crucial. If directed too far apart, the flame will not cover all the treatment area. If positioned or directed too close together, the flames will overlap, wasting fuel and increasing the likelihood of undesirable combustion of plant residues (Flame Engineering, 2003). Proper spacing is essential for proper economical flaming.

Once the flamer setup is operational, it should work with any sized tank that is large enough to supply it for the length of time desired. In larger applications such as row crops and alfalfa, the only limit is the size and weight of liquid fuel tanks. Most tanks have gas coming out of the valve, while some flamers use liquid feed to the torch, and have the evaporator located in the burner. This eliminates having the tank ice up when large quantities of propane are being used. It also allows smaller hoses and valves to be used. The only difference between these tanks is a standpipe to draw liquid off of the bottom, instead of gas off the top of the reservoir.

TABLE 1
Percentage of groundcover killed using various tractor speeds and operating propane pressures.

Weed Control Treatment	Tractor Speed (mph)	Propane Pressure (psi)	Percentage of Groundcover Killed
1 qt Paraquat/Acre (Chemical Standard)			95
Shrouded Flamer	**2**	**20**	**60**
Shrouded Flamer	2	40	90
Shrouded Flamer	4	20	40
Shrouded Flamer	4	40	50
Unshrouded flamer	**2**	**20**	**30**
Unshrouded flamer	2	40	40
Unshrouded flamer	4	20	20
Unshrouded flamer	4	40	20

The intent of this project was to refine and test a prototype shrouded flame weeder custom designed and built specifically for orchards and vineyards by Ian Merwin. The flamer is unique in that the flame torches are enshrouded within a metal casing that concentrates the heat, reduces the amount of propane required, and protects the trees, vines and irrigation lines from heat damage. We attempted to determine the best operating speed and pressure for this machine with and without shrouding. The research was conducted at Singer Farms, operated by the Bittner family in Barker, NY, from January to September 2001.

Flamer Setup and Modifications

The initial components were the tank, valve assembly, two burners, control solenoids, and a skid mounted steel shroud (Fig. 1). A plate was welded to a set of rear pallet forks for the tank to sit on (Fig. 2). The forks with the tank went on the back of the tractor while the burners went on the front of the tractor. The burner unit was mounted on a mounting bracket for a Muller rototiller and brush sweeper. This allowed the burners to float freely over the ground surface. A frame was then built near the balance point of the shroud to support it from two points, one on each side (Fig. 3). This was welded to a square tube that fits the Muller bracket. The bracket has its own single action hydraulics for lifting and allows the shroud to float over clumps of sod and groundhog holes (Figs. 4-6). This bracket arrangement also allowed a width adjustment for different orchard or vineyard row spacings. Alternatively, the burner unit could be mounted on the end of a weed sprayer bar that fits on the forks of a tractor with a front mounted lift mast or front-end loader.

The burners were bolted to the back of the shroud facing inward. A hinge previously welded onto the shroud allowed the burners to be adjusted for angle. Roundstock skids were then made up to assist the shroud in floating over any rough areas as well as to provide replaceable wear points. For use on larger trees, the right side of the shroud can be unbolted and the burners can be angled towards the trees, enabling control of weeds in between the trees. As long as the flamer was traveling fast enough there was no damage to established trees.

A hose was routed along the hood of the tractor connected the tank in the back with the burner unit in the front. All the electronics and valves were relocated inside the cab of a tractor, to protect them from the weather and tree branches.

Protecting these components may help extend the life of the machine. If located outside the cab they should be protected.

Weed Control Trials

January through May 2001, we operated the machine in empty lots to ensure proper operation. On July 11, 2001, we tested the flamer under field conditions in a uniform 10-acre block of Montmorency tart cherries on Mahaleb rootstock, spaced 22 by 20 ft. In previous years, the block had had rotating paraquat and glyphosate herbicide applications with excellent control of established weeds. Prior to the flame weeder treatments, the ground cover was mowed to three inches in height.

Treatments included:

1) One quart paraquat/acre;
2) Shrouded flamer at 2 mph and 20 psi;
3) Shrouded flamer at 2 mph and 40 psi;
4) Shrouded flamer at 4 mph and 20 psi;
5) Shrouded flamer at 4 mph and 40 psi;
6) Unshrouded flamer at 2 mph and 20 psi;
7) Unshrouded flamer at 2 mph and 40 psi;
8) Unshrouded flamer at 4 mph and 20 psi; and
9) Unshrouded flamer at 4 mph and 40 psi.

Effectiveness was measured by assessing ground cover height before and after each application, making a visual estimation of percentage of treated ground cover affected by flaming, and by observing the types of weeds that recovered the quickest.

Results and Discussion

Paraquat was the best treatment with 95 percent of the groundcover area treated killed (Table 1). The next best treatment was the shrouded flamer at 2 mph and 40 psi resulting in 90 percent of treated foliage killed. The shrouded treatment at 4 mph and 20 psi was roughly equivalent to the unshrouded treatment at 2 mph and 40 psi with 60 percent and 40 percent respectively of the ground cover treated killed. The unshrouded flamer operated at 20 psi and 4 mph was ineffective. The effect of shrouding was significant since the shroud appeared to nearly double the effectiveness of the flamer at equivalent speeds and pressures.

Although only one replication was run on the Singer farm, the results were encouraging. The economics of this flamer are affordable and the cost of propane was comparable to that for herbicides. It takes the same number of operator-hours per acre, but the propane does not create a chemical soil or water residue. This technique would be particularly valuable in organic fruit production where herbicide use is prohibited.

On our farm, we found that it was desirable to wait a few hours after rain before flame treatments, depending on wind and sun conditions. One of the advantages of flaming relative to tillage is that flaming is possible when soils are too wet for effective cultivation. The addition of a shroud around a burner reduced the amount of fuel necessary, since it contained the heat so that the wind did not dissipate the heat energy. Inside the shroud the heat is also more uniform and constant.

Besides weed control, flaming weeds in orchard crops may also have other positive side effects in pest management resulting in economic benefit for farmers. Secondary pests such as Tarnished Plant Bug and Lygus may be killed (Seifert and Snipes, 1996). In contrast, when weeds are mowed or sprayed with herbicides, insect and mite pests typically move up into the canopy.

Flaming may have many uses in agriculture. It could provide an economically sound and environmentally friendly way of controlling certain pests and weeds on farms where crops are grown organically. But it may also be useful in conventional farming due to its environmental and economical benefits.

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This research was conducted as an independent research project by Kevin Bittner, an undergraduate student in the Plant Science major at Cornell's College of Agriculture and Life Sciences. Ian Merwin advised this project and is an associate professor of horticulture at Cornell University who specializes in orchard ground cover management.

(**Source**: NY FRUIT QUARTERLY • Vol. 11 No. 1 • 2003)

Massachusetts Farmers' Markets Seeking Vendors for '05

From MDAR Farm & Market Report

The following Farmers' Markets are seeking vendors this year:

- **Adams**, Wednesday, 1:00 pm – 5:00 pm, Contact Emma Morin, 413-743-5613, Seeking eggs, breads, baked goods
- **Ashfield**, Saturdays, 8:30 am– 12:30 pm, Contact Amy Klippenstein, 413-625-0011 or amy@greenspacecollaborative.com. Seeking cheese, whole grain breads, tree fruit other than apples.
- **Auburn**, Saturdays, 9:30 am – 2:00 pm, Contact Ray Samek, 508-867-7363.
- **Ayer**, Saturdays, 8:00 am – 1:00 pm, July 30 to October 29, Contact Ruth Rhonemus, 978-772-5890 or ruth_rhonemus@netzero.net, Seeking fruit, vegetables, herbs, cut flowers, baked goods, honey, tasting opportunities.
- **Barre**, Saturdays, 9:00 am – 12:30 pm, May 7 to October, Contact Lisa Holloway, 978-355-0140 or lisa_d_Holloway@yahoo.com, Seeking produce.
- **Brockton/Downtown**, Friday afternoons, Contact Jeff Cole, 781-893-8222 or jeff@massfarmersmarkets.org.
- **Brookline**, Thursdays, 1:30 pm – dusk, June 16 to October 27, Contact Arlene Flowers, 617-566-8005, Seeking vendors from June 16 to July 14.
- **Charlestown**, Wednesdays, 2:00 pm – 7:00 pm, July 20 to end of October, Contact Colleen Justice, 617-241-8866.
- **Chelmsford**, Thursdays, 2:00 pm – 6:00 pm, July 7 to October 20, Contact Chris Laughton, 978-251-4001 or chris@laughtonnursery.com
- **Easthampton**, Tuesday, 2:30pm–6:30pm, May 3 - Oct. 25, Contact Jane Pepin, 413-527-5989, Seeking fruit.
- **Fitchburg**, Tuesdays, 3:00 pm – 6:00 pm and Fridays, 8:45 am to Noon, Contact Clayton Ayotte, 978-597-6995, Seeking fruit.
- **Framingham**, Wednesdays, 3pm – 6pm and Saturdays, 9:00 am – Noon, Contact Joe Pratt, 508-435-4147. Seeing vegetables and fruit.
- **Haverhill**, Saturdays, 8am – 1pm, July 9 to October 29, Contact Stephanie Lesiczka, 978-373-4377, Seeking eggs, cheese, breads and specialty products.
- **Holden**, Tuesdays, 3:00 pm – 7:00 pm, Contact Jacqueline Marsh, 978-874-0244.
- **Hopkinton**, Fridays, 1:00 pm – 6:00 pm, June 24 to October 15, Contact Beth Mezitt, 508-435-6335 or bethm@westonnurseries.com, Seeking produce vendor and ethnic greens.
- **MA Turnpike Markets**, Various locations at 11 service areas along MA Pike, Opening May 19, Contact David Fenton, 781-431-5192 or dave.fenton@mta.state.ma.us.
- **Melrose**, Thursday, 10:00 am – 3:00 pm, Contact Sally Frank, 781-324-9648 or sallywallace@comcast.net, Seeking eggs, poultry, cheese and preserves.
- **Middleboro**, Saturdays, 9am – 1pm Contact Donna Blischke, 508-866-7799 or dblischke@adelphia.net, Seeking fruit, berries and bread.
- **Natick**, Saturday, 9:00 am – 1:00 pm, Contact Debra Sayre, 508-653-6596 or debra@sayre.com, Seeking value added/novelty products.
- **North Adams**, Contact Everett Randall 413-743-3111 or Rod Bunt, 413-664-6180 or tourist@bcn.net.
- **North Easton**, Tuesdays, 2:00 pm – 7:00 pm and Saturdays, 10:00 am – 2:00 pm, May 17 to October 29, Contact Jean Crandell, 508-238-6049, x10 or jdewatnart@aol.com, Seeking cheese and bread
- **Orleans**, Saturdays, 8:00 am – Noon, May 21 to October 8, Contact Gretel Norgeot, 508-255-8374 or greteln@capecod.net, Seeking produce
- **Pittsfield**, Wednesdays only, Contact Ken Wirtes, 413-499-1012. Seeking maple syrup, cheese, asian produce.
- **Plymouth**, Thursdays, 2:30 pm – 6:30 pm, Contact Barbara Anglin, 508-732-9962 or sgardener@aol.com, Seeking small organic growers and food crafters such as cheese, tarts and pies made with local produce, earth based artisans, as well as seafood and other meats
- **Quincy**, Fridays, 11:30 am – 5:00 pm, Contact Anneli Johnson, 617-479-1601 or annelijohnson@netzero.com. Seeking eggs, cheeses, flowers, plants, tree fruit.
- **Roslindale**, Saturdays, 9:00 am – 1:00 pm, Contact Janice Williams, 617-327-4065 or rossie@verizon.net
- **Roxbury/Dudley Town Common**, Thursday, 4:00 pm – 7:00 pm, Contact Danielle Andrews, 617-442-1322 or dandrews@thefoodproject.org, Seeking vegetables, fruit, baked goods, honey
- **Sheffield**, Fridays, 4:00 pm – 7:00 pm, Contact Sandra Snyder, 413-258-3397 or phoenixpharm222@earthlink.net, Seeking fruits, maple syrup, produce
- **Springfield/Tower Square**, Fridays, 10:00 am – 4:00 pm, June 3 to September 30, Contact Synthia Scott Mitchell, 413-263-6500, X 6518 or synthiam@springfieldpartnersinc.com
- **Sturbridge**, Thursday, 11:00 am – 3:30 pm, Contact Andy O'Keefe, 508-753-7761, Seeking vegetable farmer and auxiliary products.

- **Topsfield**, Saturdays, 7am – Noon, Jane Cook, 978-922-1648, Seeking vegetable and fruit growers.
- **Williamstown**, Saturdays, 8:00 am – Noon, Contact Anne Guzzi, 413-458-3365.
- **Waltham**, Saturday, 9:30 am – 2:30 pm, Contact Marc Rudnick, 781-899-5344 or wfm@inspectorhomes.com, Seeking turkey vendor.
- **Worcester Westside**, Mondays, 9:30 am –2pm, June to October, Contact Andy O'Keefe, 508-753-7761, Seeking vegetables and auxiliary vendors.

Proposed New Markets:

- **Boxborough**, Thursdays, 4pm – 8pm, May 5 to October 20, Contact Dawn Pavone, 978-263-1628 or pavonegang@net1plus.com.
- **Brighton**, Dennis Minihane, 617-254-1130
- **Brookfield**, Saturdays, 8 – 1pm, June 25 to Oct. 15, Contact Sarah Heller, 508-867-8494 or gohls@mac.com, Seeking fruit and vegetable growers, especially organic.
- **Chelmsford at Pine Hill Nursery**, Karen Bagni, 978-250-5960 or kmb3g@comcast.net.
- **Dewey Square Market** (South Station Boston), Monday and Thursdays, 11:30 – 7, Contact Jeff Cole, 781-893-8222 or jeff@massfarmersmarkets.org. Sponsored by the Boston Public Market Association.
- **Dorchester/Four Corners**, Natalie Jean, 617-287-1651 or fourcms@hotmail.com.
- **East Boston**, Tuesdays, Contact Jackie Rosatto, 617-833-3304 or Jackie_rosatto@hotmail.com.
- **East Cambridge**, Risa Mednick, 617-461-0532 or r.mednick@comcast.net.
- **East Chelmsford**, Friday and Saturdays, June to October, Conact Gary at 978-453-1100 or gary@garysicecream.com.
- **Lexington**, Sonia Demarta, 781-860-0729, or maranatha@rcn.org, Seeking, seafood, turkey, cheese and dairy products.
- **Medfield**, Laura Einbinder, 508-359-2268 or laura_einbinder@yahoo.com.
- **New Bedford/Brooklawn Park**, Mondays, July 11- October 31, Contact Karl Glosl, Jr, 508-995-5019 or karlglosl@prodigy.net.
- **Otis**, Jeanette Myer, 413-269-9931 or turtlerunfarm@webtv.net.
- **Peabody**, Contact Jean Delios, 978-538-5770 or jean.delios@peabody-ma.gov.
- **Provincetown**, Fridays, Rex McKinsey, 508-487-7115 or piermanager@provincetown-ma.gov.
- **Roxbury**, Riche Zamor, 617-541-3900, x231 or rzamor@madison-park.org.
- **Wareham**, Susan Lauerman, 508-742-3104 or slauerman@admakepeace.com.
- **Wayland**, Thursdays at Russell's Garden Center. Melissa Szathmary, 508-358-2283, x386 or Melissa@russellsgardencenter.com, Seeking cheese.
- **West Barnstable**, Wednesdays, Jim Miller, jmiller@capecod.edu.

For more information on selling at farmers' markets contact David Webber at 617-626-1754,david.webber@state.ma.us.

Upcoming Meetings

Fruit Twilight Meetings

Program for all meetings:
5:30 PM Farm tour.
6:30 PM Speaking program will include updates of current cultural practices and integrated pest management approaches.

Pesticide-license recertification credit (2 hours) will be offered.
Please be there on time to receive pesticide credits.

A $10/person ($20 maximum/orchard) registration fee will be charged (at the door) for the April 12 and 14 meetings. Light refreshments will be served.

April 12 **Clarkdale Fruit Farms**
330 Upper Rd., W Deerfield, MA
Directions: I-91 to Exit 25. Then Route 116 west 1.5 miles to Stillwater Rd. on right. Take Stillwater 2.2 miles to left on (Lower) Upper Rd. Cross bridge, then app. 2.5 miles to Clarkdale Fruit Farms on left. If these directions are not clear, call Wes Autio at 413-545-2963; Jon Clements at 413-478-7219; Tom Clark at 413-772-6797.

April 13 **Brookdale Fruit Farm**
36 Broad St. (Rte. 130), Hollis, NH
Directions: Take Route 13 north out of Leominster into New Hampshire. Go app. seven miles, turn right on South Main St., go 0.7 miles, turn right on Cross Rd., go 0.2 miles, then right on Pepperell Rd. (Route 130). Keep left to follow Route 130, go for app. 3.5 miles to Brookdale Fruit Farm, app. 1/2 mile east of the town center. If these directions are not clear, call Wes Autio at 413-545-2963; Jon Clements at 413-478-7219; George Hamilton at 603-641-6060.

April 14 **Keown Orchards**
9 McClellan Rd., Sutton, MA
http://www.keownorchards.com/
Directions: Take Mass Pike to the Millbury/146 exit 10A. Follow Rt. 146 South to Central Turnpike East, take your second left at Dodge Hill Rd to your first right on McClellan Rd. (From Providence, take Rt. 146 North to Central Turnpike East, take your second left at Dodge Hill Rd to your first right on McClellan Rd.) If these directions are not clear, call Wes Autio at 413-545-2963; Jon Clements at 413-478-7219; Artie Keown at 508-865-6706.

Spring Grape Grower Workshop
April 20, 2005

You are invited to participate in a spring wine grape grower's workshop. Come visit with old friends, make some new ones and spend the day talking about grapes!

Place: Westport Rivers Vineyard and Winery, Westport MA (www.westportrivers.com)
Date: April 20, 2005
Time: 9:00 – 4:30
Cost: $20 (*Checks made payable to the Univ. of Massachusetts*)
6:00 Dinner at 'The Back Eddy' (http://www.thebackeddy.com/) in Westport on the water by pre-registration and additional fee (about $40)
For more information and to pre-register, contact Hilary Sandler at 508-295-2212 ext 21 or email hsandler@umext.umass.edu.

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