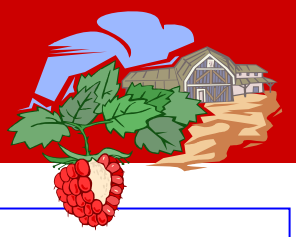
Utah Berry Growers Association Newsletter

July 2007
Volume 1, Issue 3



Inside This Issue

MONITOR FOR FRUIT-EATING INSECTS TO PROTECT BERRY HARVEST

by Diane Alston, USU Entomologist

Just as berry fruits approach maturity and are ready to pick, there are fruit-eating insects that can reduce the harvestable crop and contaminate the berry product. Some of the common fruit-eating insects observed in Utah include the stink bug, lygus bug, earwig, grasshopper, and several species of fruit-eating wasps. These insects suck or chew into the individual drupelets or may remove the entire fruits. Frequent inspections of ripening fruits (several times per week) by physically shaking the canes to dislodge insects onto a cloth or plastic tray can provide early-warning and help prevent fruit-eating insects from causing economic yield loss. If damaging insects are detected, the most common method of management is insecticide application. It is very important to carefully observe the pre-harvest or required time interval between application and picking fruits. Pre-harvest intervals are listed on product labels. Recommended insecticides that have low toxicity to humans include neem oil (Azatin) and spinosad (Success, Entrust). Conventional insecticides that will deter fruit-feeders include carbaryl (Sevin), malathion, permethrin, and esfenvalerate.

The consperse stink bug (*Euschistus conspersus*) and green stink bug (*Acrosternum hilare*) are large (1/2 to 5/8 inch long), brown or bright green bugs with a shield-shaped, flattened body. They feed on individual drupelets causing them to shrivel. Stink bugs release a bad odor and contaminate the berries at harvest. Lygus bug (*Lygus hesperus*) are small (1/4 inch long), green and brown bugs that are attracted to flowers and developing fruit. They cause misshapen fruit similar to stink bug by feeding on individual drupelets. They are usually present at low density and do not cause economic damage to raspberries.

The European earwig (*Forficula auricularia*) is ½ to 3/4 inches long, shiny brown, and with a pair of forceps-like claspers at the tip of the abdomen. They are nocturnal and their presence or damage may go unnoticed until harvest. Earwigs feed on fruit and foliage.

Foliage feeding is of little concern. Management requires the removal of daytime harboring sites and prevention of access to fruit before it ripens. Remove weeds from around the base of canes and vines. Keep rows clear of prunings and debris under which earwigs could nest. Earwigs can be trapped by using Tanglefoot® or a similar adhesive material applied to the base of canes to

Utah Berry Growers Summer Tours

Bear Lake Tour

Thursday, July 26, 5:00 – 7:00 p.m.
The tour will begin at Roger Earley's farm on West Round Valley Road in Laketown.
We will be looking at the USU variety trial at that location, discussing weed, disease and insect pest management, and irrigation scheduling. We are also planning additional stops in the Laketown area as time permits.
Driving directions: Turn South off Highway 30 in Laketown. Turn right at the stop sign onto Center Street/North Round Valley Road. Follow North Round Valley Road approximately 3 miles to the T intersection at West Round Valley / Meadowville Road. Turn left on West Round Valley and travel about 1.4 miles until you see the raspberry fields on the west side of the road.

Utah County Tour

Wednesday, August 22, 3:00 – 5:00 p.m.
Vern Stratton will be hosting the tour, with the first stop at his field just east of State Street (US 89) on 1360 North Street in Orem.
We will be looking at strawberry and fall raspberry production, and discussing insect pests and irrigation management. Vern will also be talking about his peach production, and has agreed to share some of his wealth of experience in growing and marketing fresh fruit.
Driving Directions: Take State Street in Orem to West 1360 North. Go one block east on 1360 North. The paved road turns to the left, but continue straight through the gate.

prevent their crawling into plants. To monitor for earwigs, place boards or rolled-up newspapers in the fields in spring and monitor weekly for earwigs that hide under the boards or in newspapers. Treat the ground and lower canes with carbaryl at the beginning of spring activity when earwigs are found.

In areas where berry fields are situated near open rangeland or undeveloped land, grasshoppers may move onto canes near harvest to feed on fruits and leaves. Fruit-protecting insecticide treatments described above may be effective. Placement of insecticide bait (bran coated with carbaryl or *Nosema locustae*, a protozoan biological control) around field borders when young grasshopper nymphs are first observed may also reduce grasshopper populations. Repeat applications of bait will likely be required to cover several months of grasshopper activity and to replenish baits after rainfall or irrigation events. Insecticide baits are not effective at killing adult grasshoppers.

Two types of wasps are common berry-eaters: the yellow jacket (*Vespula germanica*) and European paper wasp (*Polistes dominulus*).

They may also be a nuisance to workers by stinging them. Yellow jackets nest in the ground. If ground nests are detected, they can be treated with conventional insecticides, dug up and removed to destroy them. Also, placing commercial traps that contain heptyl butyrate bait at the perimeter of berry fields can reduce wasp numbers. The European paper wasp builds umbrella-shaped nests under the eaves of buildings and other protected sites. Paper wasps are not attracted to yellow jacket traps. Removal of nests and protection of fruit near harvest with one of the insecticides mentioned above may provide some control.

HARVESTING SMALL FRUIT: POST-HARVEST POINTS TO PONDER

By Cathy Heidenreich, Small Fruit Extension Support Specialist, Department of Horticulture, Cornell University's College of Agriculture and Life Sciences, Ithaca, NY

Excerpt from an article in the New York Berry News, Vol. 6, No. 5

Small fruits are probably the most perishable of all fruits. Production of high quality small fruit requires special attention to a number of pre-harvest and post-harvest factors, as well as the mechanics of harvest itself. Pre-harvest factors to consider include cultivar selection, growing site, plant health and nutrition, and disease and pest management. For more information on these important topics, see the references listed at the end of this article. Harvest conditions should also be considered for maximum berry quality. For example, avoid harvesting wet berries whenever possible. Waiting a few hours after rain or heavy dew to begin harvesting can significantly reduce post harvest diseases and improve fruit quality. Visible decay can develop in less than 12 hours on warm, wet berries.

Along the same lines, temperature can play a significant role in berry quality. Berries harvested early in the morning or in the evening when temperatures tend to be cooler have better shelf life. Harvested small fruit should never be left in the sun; their dark color readily causes them to absorb heat. Berries also continue to respire after harvest, generating their own internal heat, and causing shrinkage and reduced sweetness. Low temperature is one factor that helps to slow the respiration process, which is much faster in berry fruit than oranges or apples, for example. Berries should be cooled no later than 4 hours after harvest; sooner if possible. You'll get a much better return on your investment by making several trips to the cooling facility, than by making only one or two trips per day!

Shaded picking cart used for strawberry harvest in Australia (Photo by Brent Black).

Strawberries

Strawberries ripen quickly under field conditions (28-30 days after full bloom) and at an even more rapid pace after harvest. To maintain good strawberry fruit quality during harvest, attention must be paid to two key factors: 1) stage of berry ripeness at harvest and 2) handling.

Strawberries should be harvested before they are fully ripe to extend shelf life and berry quality in storage. It is critical to harvest fields once every two days to minimize over ripened berries. Bright red berries harvested with a

slight white tip will retain their firmness longer than fully ripe fruit; they also loose less water in storage. However, that intense strawberry flavor is not fully developed at this stage, and it becomes a compromise between flavor and storage potential.
This may be minimized to some degree by selection of appropriate varieties.

Train workers in strawberry harvest, demonstrating the desired degree of ripeness and manner in which fruits should be harvested to minimize damage. Consider hiring pickers on hourly wages to harvest and remove over ripe and/or rotting berries to prevent other pickers from contaminating marketable berries during the harvest process. Be sure to dispose of cull berries away from the field to prevent recontamination of ripening berries.

Because of the fragile nature of strawberry fruit, container choice is also critical to berry quality. Wider, shallower containers help to minimize berry damage and crushing. Berries should be picked directly into market containers, not into larger containers then transferred to market containers later. Strawberries should be harvested in early morning after fruit have dried. Retain caps on harvested fruit for best shelf life.

Rules For Strawberry Pickers

Keep your hands clean at all times. Wash hands after each visit to the restroom.
Harvest only bright uniformly red berries. Be sure to keep berry caps intact while harvesting.
Berries should be removed by snapping the stems between the thumb and forefinger, keeping the hand cupped under the berry to avoid dropping it.
Select berries of uniform ripeness to fill containers.
Do not mix berries of different ripeness in containers.
Place berries gently into containers to avoid bruising.
Do not overfill containers.
Do not put trash or cull berries into the container.
Never allow harvested fruit to remain in the sun.
Move harvested berries to cold room or cooler as soon as possible.

Harvesting Brambles
Bramble fruits, raspberries and blackberries in particular, are very perishable. However, careful attention to harvest and post harvest handling and storage should provide reasonable shelf life for marketing and consumption. Raspberries ripen quickly, but not uniformly over the plant or planting. This necessitates harvest on as tight an interval as every other day. For best fruit quality, raspberries should be harvested before they are fully ripe. They should be picked when they are uniformly bright red in color, but before any darker color develops. Because of their highly perishable nature, brambles should always be picked directly into market containers. Half pint containers are preferable; containers should never hold more than 4 layers of berries to prevent crushing of fruit.

Rules For Raspberry Pickers

Keep your hands clean at all times. Wash hands after each visit to the restroom.
Do not touch berries before they are ready to harvest.
Harvest only light colored berries. Leave immature fruit for the next harvest.
Berries should be removed with the thumb and forefinger, keeping the hand cupped under the berry to avoid dropping it. Don't overfill your hands to avoid bruising or crushing fruit
Do not put trash or cull berries into the container.
Never allow harvested fruit to remain in the sun.
Move harvested berries to cold room or cooler as soon as possible

In Conclusion
After a season's worth of effort getting high quality berries ready for harvest, have your harvest game plan in place to avoid dropping the ball in maintaining fruit quality. Keep fruit in the shade until it can be transported to the cooler.

References
1. Bowling, Barbara. 2000. Berry Grower's Companion. Timber Press Inc. Portland, Oregon.
2. Pritts, M. and Handley, D. 1998. Harvesting, Handling, and Transporting Fresh Fruit. Chapter 12 in: Strawberry Production Guide for the Northwest, Midwest, and Eastern Canada. Northeast Regional Agricultural Engineering Service Publication #88, Ithaca, NY.
3. Pritts, M. and Handley, D. 1989. Harvesting, Handling, and Transporting Fresh Market Bramble Fruit. Chapter 13 in: Bramble Production Guide. Northeast Regional Agricultural Engineering Service Publication #35, Ithaca, NY.

FIRE BLIGHT IN RASPBERRIES

By Kent Evans, USU Extension Plant Pathologist

This year has been one of the more severe years for fire blight in rosaceous plants in Utah. Apple growers in Utah county and elsewhere can attest to that. Since there is plenty of inoculum around, there has been an unusually high occurrence of fire blight in raspberries as well. The pathogen that causes the disease is the bacterium called *Erwinia amylovora*. The disease cycle of this bacterium has not been studied in cane berries but is assumed to be somewhat similar to the disease cycle of apples and pears with symptoms appearing somewhat similar to those that occur on infected apple and pear. Infected canes appear blackened with shepherds-crook symptoms being the most common observation of symptoms. Symptoms on flowers appear as dead and discolored flowers. Fire blighted fruit appears as a dried mummified black and/or brown berries. Although the frequency of this disease seems high, cane berries have a remarkable buffering ability to offset the effects of this disease. Fire blight in cane berry production is fairly uncommon and losses are rarely of an economic concern. Although there are no recommended chemical controls for fire blight in cane berries, growers should prune out and remove blackened dead canes in the off season to remove any potential reservoir of inoculum for the next season. Diseased canes that are removed should be burned and/or disposed of in a landfill.

LIST YOUR OPERATION ON THE WEB

Utahfruit.com is a website sponsored by the Utah Apple, Tart Cherry and Sweet Cherry Marketing Boards. The purpose of this website is to let people know where they can purchase locally grown, Utah produce. This is a service that is available to any grower or anyone who is selling Utah agricultural products. We hope to get the word out about this website and let the public know that fruit from Utah is fresher and tastes better than fruit that can be found at the grocery store. We hope this website assists those who are looking for a fruit stand or farmers market that is located close to their home. We are anxious to add berry growers to this website. If you are interested, please visit the utahfruit.com website and view some of the growers already listed. Look at the information that they include, and send your information to elisependleton@gmail.com. If you have questions about the website, you may contact Elise Pendleton via email or at 801-691-3114. You may also contact Chad Rowley at chadr13@comcast.net with any questions.

SOIL TESTING/NUTRIENT MANAGEMENT

By Grant Cardon, USU Soils Specialist

Introduction

The saying that “knowledge is power” is no more valid than in managing soil fertility. Good decisions begin with a strong base of information—any other way is simply trial and error. Trial and error, even a healthy base of experience working with a particular soil and crop, may get you by in any given year, but many conditions resulting in long-term productivity or crop longevity problems can be avoided with regular soil monitoring and adjustment of fertility management practices.

Soil fertility testing is recommended no less frequently than every other year in perennial crops like berries. The results allow one to monitor changes in soil fertility level, pH, organic matter content and other important soil conditions that affect not only annual berry production, but also root system health, winter survival and springtime recovery of the plants, and soil physical conditions (aeration, compaction, etc.).

The USU Analytical Laboratory (USUAL) offers a wide range of testing services designed to address the routine and not-so-routine needs for information. A complete list of services for plant, soil and irrigation water testing, along with on-line forms for submitting samples, can be obtained at the following web address: www.usual.usu.edu

Soil Sampling

One of the most important aspects of soil testing is proper soil sampling. The basic concept behind a good soil sample is to form an adequate "physical" average representing the area being tested. One could sample in a multitude of locations, send in each individual sample, and request a "numerical" average of all the tests. This however, is both time consuming and prohibitively expensive. To avoid the expense and exhaustion, proper sample *compositing* is a must.

Compositing soil samples is a process by which one samples in multiple, representative locations within the cropped area, mixes the samples together thoroughly, and then sends in a representative sub-sample for testing. Done properly, sample compositing results in a *physical* average of the soil conditions within the cropped area using a single soil sample. A well-composited soil sample can adequately represent up to 25 acres. There are a few tips, however, on making sure that the composite sample is representative of the area in question.

To make sure that the composite soil sample adequately reflects the conditions within the cropped area, these key guidelines should be followed:

- ***Make sure that soil is taken from the proper soil depth***. For strawberries, the most active root zone is only about the top foot of soil. Samples should be taken down to that depth and should include material from the surface to one foot. For caneberries, the effective root zone is much deeper and extends to about two feet below the soil surface. Some effort should be made to sample at least down to one foot, and to about 15 to 18 inches if possible. Focusing on surface materials for caneberries will not properly reflect the soil conditions experienced by the plant. In all cases, use a sampling tool that is least invasive of the root zone (causes the least amount of disruption to the roots and crowns of the plants). Sampling probes can generally be checked out from your local USU Extension office.
- ***Choose an adequate number of sample locations in a zigzag, random pattern***. The number of separate soil samples included in each composite sample should be no less than 5-10 for small areas (less than ¼ acre), 10-15 for mid-sized areas (up to 5 acres), and 20-30 for large areas (up to 25 acres). No composite sample should be made to represent more than 25 acres. A zigzag, random pattern covering the whole cropped area should be used when selecting a sample location (see Figure 1). Try to avoid introducing any bias to the composite sample by inadvertently sampling from a systematic location (all within the inter-row area, all within one corner of the field or planting, etc.)
- ***Make sure that the sampling equipment is cleaned between samples***. Some effort should be made to reduce the potential for cross-contamination between soil samples that can result from soil being left in or on the sampling equipment. Brush or scrape off any soil residue between sampling locations. There is generally no need to wash the equipment between sample locations unless the soil is wet and sticky and adheres so much to the equipment that simple brushing and scraping do not adequately remove the residue.
- ***Make sure that a uniform volume of soil is taken from each sample location***. To form a physical average, each contributing sub-sample should be of the same volume. If it is not, improper influence of individual sub-samples on the eventual composite sample will result. This is most easily done using a tube-type sample probe (see Figure 2) or by trimming samples taken with a shovel or spade (see Figure 3).
- ***Avoid anomalous areas within the cropped area***. Low spots, areas of different soil texture, or other anomalies in the condition of small areas within the crop should not be included in the composite sample. If these areas are not avoided they can unduly influence the composite sample. If these areas are large enough that they warrant separate management, then sample these separately as an area of their own, and submit a composite sample representative of the anomaly.

Interpreting Soil Test Results

Berries vary in the soil physical and chemical conditions that they require for proper growth, production and maintenance. To properly utilize soil testing information, a good understanding of soil test level interpretation for each berry type is important to have. Some basic information is included here for reference and will be covered in more detail in upcoming newsletters.

<u>Strawberry</u>
Strawberries grow over a wide range of soil pH, but a pH of 6.8 to 7.2 is optimum for growth and root health.

Annual application and management of Nitrogen is required for all crops. Therefore, nitrogen testing is not generally included in the routine soil analysis package at most soil testing laboratories, including the USUAL. Annual N need for strawberry varies with variety. California varieties (like Pajaro, Chandler and Camarosa) have high N demand, others (like the Florida variety, Sweet

Charlie) use as little as 50% of the N used by the California varieties. A good recommendation for varieties grown in Utah and Idaho is given below for new plantings and established, fruiting plantings

New Plantings
Nitrogen—From 35 to 50 pounds N per acre should be applied at or soon after planting to encourage development of large vigorous plants and early formation, rooting, and development of runner plants. An additional 30 to 40 pounds N per acre should be applied between August 15 and September 1 to aid in flower bud formation for the next year's crop.

Phosphorus—Phosphorus is important in establishing strawberry plants. A starter solution made with 1 gallon of 52 percent phosphoric acid added to 100 gallons of water helps give the plants early vigor. Apply at a rate of 1 cupful of this acid solution per plant at setting, regardless of soil P test value. Soils testing less than 3.0 ppm P in a soil sample taken from the top 12 inches should receive 100 pounds P_2O_5 per acre before planting.
Established/Fruiting Plantings
Nitrogen—Nitrogen should be applied at rates between 35 and 50 pounds per acre between mid-August and early September. Nitrogen fertilizer should not be applied in the spring during a fruiting year as it will often cause excessive foliage, soft berries, and increased fruit rot. If the plants show a need for N in the spring, no more than 15 pounds per acre should be applied.

Phosphorus—Strawberries will respond to applications of P if soil test levels are low. The soil test is based on extractable P present in a soil sample from the upper 12 inches of the soil profile. Table 1 shows the rates of P_2O_5 to apply for different soil test levels and berry varieties. On soils derived from volcanic ash parent material, the P should be applied in a band application. P should only be applied to soils in the fall.

Potassium—Strawberries require adequate levels of soil K for maximum yields. The soil test for K is based on extractable K in a soil sample from the upper 12 inches of the soil profile. Table 2 shows the rates of K_2O to be applied for different soil test levels. When K is

<u>Caneberries</u>
Most caneberry species grow best in a pH of 6.5-7.5. Such soils should be 2-4 feet deep, well drained, and relatively free of salt. Most caneberries have little tolerance for soils high in either calcium or sodium salts.

Nutrient soil test level interpretations for caneberry are given below. Again there are differences between new plantings and established, fruiting plantings. For reference, the information below is for red raspberry. More specific information for other bramble, or caneberry crops will be given in future newsletter articles.

New Plantings
Nitrogen—An application of 50 to 60 pounds N peracre should be made to soils shortly after setting the plants. At establishment, the N may be applied to the soil surface, banded alone, or banded with the P fertilizer material. Rainfall or irrigation is needed to move the applied N fertilizer into the root zone.

Phosphorus—Phosphorus is critical in the establishment of raspberry plants. Shortly after planting, phosphorus should be applied in bands on each side of the row, 4 to 7 inches from the plants and 3 to 6 inches deep. At least 2 inches of soil must separate the fertilizer from the plant roots. Soils testing less than 4.0 ppm P should receive 90 pounds P_2O_5 per acre. On soil derived from volcanic ash, the P rate should be increased by about 25 percent.

Established, Fruiting Plantings
Nitrogen—Annual application of 50 to 65 pounds of N per acre are recommended for red raspberry production. The N should be applied to the soil surface along the row or banded with P in the spring (late March or early April). If cane growth is inadequate and internodal length less than 4 inches, more N can be used (65 to 75 pounds per acre). Remember that a 4-inch internodal length (distance between buds 2 to 3 feet above the soil surface) is desirable. Nitrogen is the most important factor controlling internodal length.

Phosphorus—Red raspberries will respond to applications of P if soil test values are low. The soil test is based on extractable P present in a soil sample taken from the upper 12 inches of the soil profile. Table 1 shows the rates of P to apply for different soil test levels for each berry variety. The P should be applied in a band on each side of the row about 1 foot from the edge of the crown and, if possible, 3 to 4 inches deep. Apply P in the spring.

Potassium—Red raspberries require adequate levels of soil K for maximum yields. Potassium fertilizer should be applied to soils in the spring. Table 2 shows the rates of K_2O to be applied for different soil test levels and each berry variety. Potassium fertilizers (potassium chloride or potassium sulfate) may be broadcast between the rows or banded with P and N fertilizers.

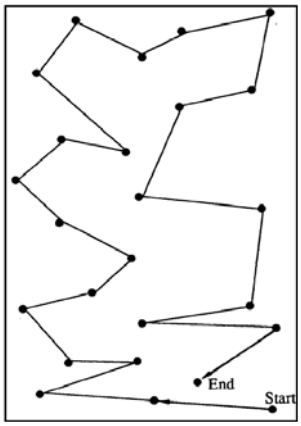


Figure 1. Zigzag, random soil sample pattern

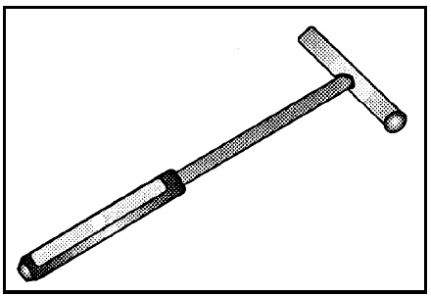


Figure 2. Tube-type soil sample probe

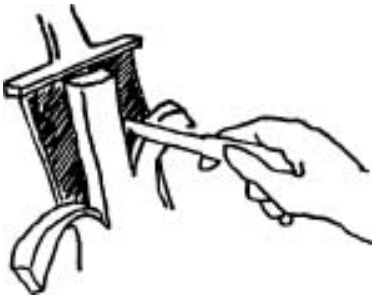


Figure 3. Trimming a shovel sample for a consistent volume of soil

Table 1. Phosphorus fertilizer rates for blueberries, raspberries, and strawberries based on soil tests.

Soil test P (ppm) (0 to 12 inches)[1]			Application rate (lb/acre)[2]		
			Blue-berries	Rasp-berries	Straw-berries
NaOAc	Bray I	$NaHCO_3$	---------- P_2O_5 ----------		
0 to 1	0 to 10	0 to 4	100	135	90
1 to 2	10 to 20	4 to 8	80	100	70
2 to 3	20 to 30	9 to 11	60	80	50
3 to 4	30 to 40	12 to 14	30	70	25
4 to 5	40 to 50	15 to 17	10	50	0
5 to 10	50 to 100	18 to 25	0	40	0
over 10	over 100	over 25	0	0	0

[1] Soil test P can be determined by three different procedures: sodium acetate (NaOAc), Bray I method, or by sodium bicarbonate ($NaHCO_3$). Sodium bicarbonate should not be used on soils with pH values less than 6.2. Use the column indicated by your soil test report.

[2] P x 2.29 = P_2O_5, or P_2O_5 x 0.44 = P.

Table 2. Potassium fertilizer rates for blueberries, raspberries, and strawberries based on soil tests.

Soil tests for K[1] (0- to 12-inch)	Application rates (lb/acre)[2]		
	Blue-berries	Rasp-berries	Straw-berries
(ppm)	---------- K_2O ----------		
0 to 50	80	90	80
50 to 75	50	60	50
75 to 100	30	40	30
more than 100	0	0	0

[1] Soil extractant is sodium acetate.

[2] K x 1.20 = K_2O or K_2O x 0.83 = K.

PLANTS, SOILS, & BIOMETEROLOGY
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We hope you find the information in this newsletter useful. If you have comments regarding information in this newsletter, or would like to see in future newsletters, please contact:

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