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Annual Utah Berry Growers Winter Meeting, the Biggest Yet

The Davis Convention Center in Layton was the site of the 7th annual Utah Berry Growers Association winter meeting on February 23rd. This year's meeting was held in conjunction with the Diversified Agriculture Conference, which provided for a number of concurrent sessions covering a wide range of topics particular-

Berry Program

ly relevant to small-acreage farmers.

The UBGA session was held in the afternoon and featured seven presenters, with one speaker from California, and the others all from Utah State University and USU Extension.

Recent advances - The featured speaker was Ellen Thompson, Research Director for Pacific Berry Breeding in California. Prior to joining Pacific Berry Breeding, Ellen conducted extensive research on blackberry management and is considered an authority on primocane blackberries. Ellen's presentation overviewed some of the most recent developments in raspberry and blackberry production. Talk topics included managing post-harvest disorders of raspberry and blackberry, some of the newest raspberry and blackberry cultivars on the market, and innovations in plant management systems. She has written an article that is included in this newsletter.



Fertilizers - Dr. Teryl Roper from the Plants, Soils and Climate (PSC) Department at Utah State University talked about how to manage fertility and optimize fertilizer inputs in berry crops. Dr. Roper is particularly well suited to discuss this topic. Prior to coming to USU to take an administrative position as the PSC Department Head, he was the Extension Fruit Specialist at the University of Wisconsin - Madison. During his time in Wisconsin, there was a push for commercial growers to improve their nutrient management due to concerns with "non-point-source" pollution resulting from nutrient run off from commercial farms. Dr. Roper worked with the tree fruit and berry crop producers to meet these stricter guidelines for fertilizer use. The recommendations he gave for Utah growers will be particularly helpful, and are detailed in an article in this newsletter.

Value-added - Dr. Karin Allen, USU Extension Specialist for Food Quality and Entrepreneurship was the next featured speaker. Dr. Allen is in the USU Department of Nutrition, Dietetics and Food Science. Her Extension program focuses on assisting small businesses and entrepreneurs with production and processing of value-added food products. She does this through overseeing the on-campus Food Innovation Laboratory and Incubator Kitchen programs, and also assists with labeling requirements to meet State and/or Federal regulations. Dr. Allen's presentation outlined the various regulations and requirements for developing, marketing and labeling a value-added product, and USU Extension resources that could assist in this process.





<u>Weed management -</u> USU Extension Weed Specialist Dr. Ralph Whitesides also presented. Since many of the herbicides available for use in berry crops are residual herbicides with preemergence activity, Dr. Whitesides focused a portion of his talk on the mechanism by which these materials work on the soil surface. As the soil surface is disturbed through cultivation, the effectiveness of these materials is greatly reduced, allowing weed seed germination. Dr. Whitesides also emphasized some of the risks associated with systemic herbicides, presenting a dramatic example from the landscape industry.

<u>Available resources</u> – Marion Murray, Coordinator for USU's Integrated Pest Management program gave a brief overview of new online resources available for berry growers. Marion is very involved in developing fact sheets on insect and disease management and posts these on the Utah Pests website

(http://utahpests.usu.edu/ipm). She also discussed national and regional web resources on pest management. Her resource list is included in this newsletter.



New raspberry cultivars – Two speakers presented information on raspberry cultivars. USU Extension Fruit Specialist Dr. Brent Black presented a summary of a five-year raspberry cultivar trial at the USU Kaysville Research Farm, which included 16 summer-bearing and 10 fall-bearing cultivars. Yields were evaluated over three growing seasons and varied dramatically from year to year. Among the fall-bearing types, the most consistently high yielding cultivars were those that fruited the earliest. The early fall bearing types with consistent yields were Polka, Joan J, Summit and Polana. Among the summer-bearing types, consistent high yields were correlated with resistance to winter injury. The cultivars that showed the best winter survival and consistently high yields were: Royalty, Cascade Bounty, Reveille and Cowichan. The cultivars Coho, Lauren and Tulameen were the most susceptible to cold injury and consequently were very inconsistent producers.

Davis County Horticulture Extension Agent Britney Hunter presented results from her consumer preference survey of raspberry cultivars. During the 2011 season, Britney took fruit samples from the Kaysville cultivar trial to the farmers market at the Utah Botanical Center and surveyed market attendees for their preferences. In her surveys, the summer raspberry cultivars from the Pacific Northwest consistently scored the highest. These included Saanich, Canby, Cascade Dawn and Cowichan. Among fall-bearing types, survey participants preferred Anne, Polka, Joan J and Heritage. A more complete summary of their presentations will soon be available as a USU Extension fact sheet on the UBGA web page (fruit.usu.edu)



Other Diversified Ag Conference Sessions



The conference featured four concurrent sessions over two days, with the UBGA meeting being just one half-day session. Concurrent sessions covered topics ranging from Marketing, Management and Business Plans to Urban Farming and Ag Tourism. I have included a few highlights of particular interest to berry growers.

One of the Thursday morning tracks focused exclusively on high tunnels. USU graduate student Tiffany Maughan presented results from her research to determine the optimum cultivar, plant type and planting date for optimizing spring strawberry production in high tunnels. Although bare-root dormant strawberry plants are significantly cheaper than plug plants, she found that the labor savings and increased productivity more than compensated for plug plant prices. Tiffany is now evaluating the use of low covers and heat additions and will present her findings at a future meeting.

As part of one of the Marketing and Management sessions, UBGA member David Cornaby presented on strategies to market both fresh fruit and companion products including their jam making kits and drink mixes.

In the "New Business" session, high tunnel raspberry grower Stan Carpenter of Preston Berry Farms in Preston Idaho, outlined the development of their business, including finding markets for their off-season berries.

In the Urban Farming track, berry grower Thayne Tagge talked about their efforts to farm small acreage plots in an urban environment, and to provide employment opportunities to disadvantaged youth.

Many of the berry growers in attendance appreciated the range of topics available at the conference, so we will be exploring the possibility of holding future UBGA meetings in conjunction with the Diversified Ag conference.

Caneberries: Novel Production Techniques and New Varieties

Ellen Thompson, MS
Research Director
Pacific Berry Breeding, LLC

As Utah berry growers know well, there are many challenges associated with caneberry production in the Intermountain West. To overcome the greatest production challenges, creative methods should be explored. This article will highlight several of the most common problems affecting caneberry production, and the creative techniques I've observed to mitigate, and even overcome them.

Color Reversion in Blackberries is a problem that affects the smallest grower to the largest entity. This disorder manifests itself after cooling, and causes individual drupelets to turn from black to red. Sometimes up to 50% of the berry may revert, leaving you with unripelooking fruit. Blackberries are supposed to be black, after all. Color reversion is different that sunburn, where blackberries turn a brownish hue after a heat event. In some cultivars, individual drupelets may also turn white after a heat event, often referred to as 'white drupelet disorder'. Reversion is also different from red berry mite (Acalitis essigi) damage, where ripening drupelets remain bright red and never turn black. While genetics play the greatest role in determining whether color reversion will affect your blackberries, work done by postharvest physiologist Dr. Penelope Perkins-Veazie has shown that many factors influence the disorder: 1) Early season blackberries tend to have a higher incidence of color reversion, 2) blackberries that are harvested at the shiny-black stage tend to have more color reversion that berries harvested at the dullblack, or fully-ripe stage, and 3) berries that are held at

45 – 50 °F tend to have less reversion than berries cooled to ~34 °F right after harvest. In Mexico, the largest producer of fresh market blackberries in the world, fruit temperature is checked upon arrival at the cooler. If berry temperature exceeds 72 °F, it is immediately rejected. Dr. Perkins-Veazie's work has also shown that one can almost always induce color reversion in blackberry by submitting fruit to forced air cooling at or below 30 °F. The take home message is this: use blackberry cultivars that exhibit a low incidence of this disorder. Cultivars such as: 'Arapaho', 'Natchez', 'Ouachita', 'Navaho' and 'Prime-Ark 45®' tend to have low instances of color reversion. Cultivars that have high instances of color reversion include: 'Apache', and older cultivars like 'Choctaw' and 'Shawnee'. Be cognizant of berry temperature prior to cooling, and consider staging a pre-cooling area (45 – 50 °F) to gradually reduce fruit temperature. Finally, check your cooler and/or refrigerated truck for hot and cold spots.

Darkening in Raspberries is another problem that affects small and large growers alike. At harvest raspberries are generally bright red, but tend to darken within a few hours of picking/cooling. This is caused by a physiochemical change in pigmentation by ethylene (C_2H_2) production. The biggest concern with dark-colored raspberries is that berries appear less fresh. Further, physiologically ripe berries are prone to increased leakiness and decay. Again, genetics play the largest role in pigment development and, unfortunately, there aren't a lot of raspberry varieties with non-darkening flesh

available. What to do? Another study done by postharvest physiologist, Dr. Perkins-Veazie, showed that red raspberries, when harvested unripe (i.e. yellow/pink stage), stayed brighter in color after 6 days in cold storage than fruits that were harvested at the ripe stage (full color, bright red). In addition, Perkins-Veazie showed that fruits harvested at the unripe stage were less leaky and less soft than berries harvested at the ripe stage. Further, berries harvested at the yellow/pink stage developed full color, soluble solid content, acidity and flavor after 2-3 days. The only downside to harvesting unripe berries was a depression in fruit weight, reduced by 4 to 20%, depending on cultivar and level of ripeness at harvest. On the subject of ethylene again, the majority of the gaseous plant hormone is produced in the fruit calyx, the portion which remains on the plant. This can be considered advantageous when harvesting unripe berries, as ethylene generation from the calyx will allow for easier picking of yellow/pink berries.

UV Damage / Winter Injury are serious problems that affect both raspberries and blackberries. UV damage, or sunburn, renders fruit unmarketable by causing bronzing (in blackberries) or white drupelets to develop (in both raspberries and blackberries). High-tunnel production, and more specifically the plastics that cover them, can greatly help mitigate UV damage. There are many specialty plastics on the market today that have been engineered to reflect infrared light (reducing tunnel temperature) and diffuse ultraviolet wavelengths. With a tunnel structure in place, I have observed some growers covering theirs with shade cloth (20 – 30% opacity, with plastic removed) in advance of a forecasted heat event.

Winter injury is simply devastating. The best defense is to protect tender fruit buds from the elements. But how? Tunnels with the sides and ends enclosed, albeit expensive, are one option. An enclosed tunnel can protect bud tissue from desiccating winds and modify the temperature by a few degrees. Another option is the Rotating Cross Arm (RCA) trellis, developed by Trellis Growing Systems, LLC in conjunction with Dr. Fumi Takeda, plant physiologist with the USDA-ARS. The RCA trellis was specifically developed for trailing and semi-erect blackberries, but it has been proven to work well with erect types too (in floricane-fruiting varieties). The biggest difference with the RCA system is that rows are generally oriented east-west, and the in-row plant spacing is increased to 4 ft. In Year 1, primocanes (the

strongest 3-4 canes, all others are removed) are trained horizontally along a wire approx. 12-14 in. above the ground. The horizontally-trained canes are tipped (2-4 in. is removed from the growing tip) after reaching 4 ft. in length, which forces lateral bud growth. The lateral branches are allowed to grow vertically, with upper wires in place to support them. Prior to winter in Year 1, the cross arm supporting the vertical branches are rotated toward the ground and covered with plant protection fabric (Figure 1).



Figure 1: In early winter, when canes are still flexible, the RCA trellis is rotated toward the ground. Plant protection fabric (not shown) is secured over each row. Photo courtesy F. Takeda.

The following spring, in Year 2, the RCA trellis is rotated into "bud break position" (Figure 2).

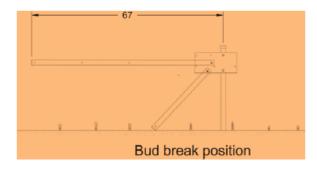


Figure 2. Bud break position on the RCA trellis. The long arm is lifted approx. 1 ft. from the early winter position shown in Figure 1.

Graphic courtesy <u>www.trellisgrowingsystems.com</u>.

With the lateral branches in the horizontal "bud break position", inflorescences grow vertically toward the sun. When the developing berries are 80% ripe, the trellis is rotated roughly 110° into the "growing and harvesting position" (Figure 3). Here, the berries will finish ripen-

ing on the north side of the row, protected from the sun. According to Dr. Takeda, north-facing berry temperatures may be reduced by up to 10 °F (which may reduce the incidence of color reversion). With the berries out of the sun, UV damage becomes a minor issue. Finally, with all of the berries on one side of the trellis, Dr. Takeda has documented a 33% increase in harvest efficiency. Year 2 primocanes are trained horizontally as they emerge. Floricanes are pruned out immediately after harvest. There are currently over 100 acres of blackberries using the RCA trellis system in USDA hardiness zone 5 upper Midwest, where cold hardiness in blackberries has long been an issue. It's difficult to say whether the RCA trellis system would be suitable to zone 5 Intermountain West, but it may be worth a try. As part of an ongoing study, Dr. Takeda is seeking additional locations to trial the RCA trellis system. If interested, you may contact him at: Fumi.Takeda@ars. usda. gov. For more information and pricing, please visit www.trellisgrowingsystems.com.



Figure 3. The RCA trellis system in the "growing and harvesting position". All berries are rotated to the north side, and continue ripening in the shade.

Photo courtesy F. Takeda.

Problem Soil is an increasing challenge to all involved in agriculture. The best method I've observed in the caneberry industry to deal with problem soil is to avoid

it altogether. This is accomplished by establishing individual plants into 3-5 gal. pots containing coco fiber or peat-based media. Commercially, potted caneberries are grown under high tunnels or in greenhouses using high-density spacing. Weed mat or gravel may be placed below the pots to help control weeds. The ability to control everything from the rhizosphere to the ambient temperature (particularly in a greenhouse setting) creates an advantageous growing situation. In an arid climate like Utah, it may be better to use Styrofoam pots or planters to reduce moisture loss from the root zone. The greatest disadvantage to this growing method is 1) high establishment cost, 2) having a protected area to store your potted plants during the winter where they will receive adequate chilling, and 3) controlling vigor and managing primocanes optimally (3 primocanes/pot is ideal). Potted caneberry plants can typically be maintained over 2-3 growing seasons, but then need to be divided or replanted with new media. With a protected storage area for your dormant plants, pots may be placed in the tunnel or greenhouse every two weeks for a continuous harvest all season. This growing method, where floricanes are forced to fruit when you desire, is similar to "long-cane production" used in Europe.

Newer Blackberry Varieties

'Natchez'

| Avg. Yield | 9,000 lb/a | |
|----------------|---------------|-----------------|
| High Yield | 25,000 lb/a | |
| Season | Early to mid | June 5 – July 1 |
| Soluble Solids | 8.4% | Sweeter in |
| Soluble Solius | 0.470 | hot climates |
| Porryyyt | 726 | Elongated |
| Berry wt. | 7.3 g | shape |
| Pros | Early, firm, | Heavy crop |
| PTUS | thornless | potential |
| | Slow to de- | |
| | velop | |
| | primocanes – | Moderate |
| Cons | important to | |
| | prune | color rever- |
| | floricanes | sion |
| | immediately | |
| | after harvest | |

'Natchez' is a floricane variety released from the Univ. of Arkansas and is available from the following nurseries: North American Plants (TC plugs), NorCal Nursery (TC plugs), Lassen Canyon Nursery (TC plugs, cane with root).

'Ouachita'

| Avg. Yield | 16,000 lb/a | |
|----------------|----------------|-----------------|
| High Yield | 18,000 lb/a | |
| Season | Mid | June 12 – |
| Season | IVIIU | July 15 |
| Soluble Solids | 10.2% | Sweet, low |
| Soluble Solius | 10.270 | acid |
| Berry wt. | 6.4 g | Round shape |
| | Thornless, | Mild color |
| Pros | consistent | reversion |
| | flavor/sugar | Teversion |
| | Susceptible to | Can be tart in |
| Cons | powdery mil- | cool climates |
| | dew | cool ciiillates |

'Ouachita' is a floricane variety released from the Univ. of Arkansas and is available from the following nurseries: North American Plants (TC plugs), NorCal Nursery (TC plugs), Lassen Canyon Nursery (TC plugs, cane with root).

'Prime-Ark® 45'

| IIIIC-AIR 73 | | |
|-----------------|-----------------|----------------------|
| Avg. Yield | 14,000 lb/a | |
| High Yield | 17,000 lb/a | |
| Season | Very late | Sept. 5 – Nov. 15 |
| Calulata Calida | 11 10/ | |
| Soluble Solids | 11.1% | Low acid |
| Berry wt. | 9.6 g | Elongated |
| Derry Wt. | | shape |
| | First commer- | Potential to |
| | cial | extend the |
| Pros | primocane- | season, mild |
| | fruiting black- | color rever- |
| | berry | sion |
| | Thorny, too | Hard to man- |
| Cons | late for many | age high vigor |
| | climates | age mgm vigor |

'Prime-Ark® 45' is a primocane-fruiting variety released from the Univ. of Arkansas and is available from the following nurseries: North American Plants (TC plugs), NorCal Nursery (TC plugs), Lassen Canyon Nursery (TC plugs).

'ORUS 2711-1'

| Avg. Yield | ? | |
|----------------|---|---|
| High Yield | ? | |
| Season | Mid to late | 1 week before Navaho |
| Soluble Solids | ? | |
| Berry wt. | ? | |
| Pros | Productive, firm, medium size berries, semi-erect habit | May have western blackberry flavor |
| Cons | Little data | Hardiness? |

'ORUS 2711-1' is an advanced selection from the USDA-ARS-HCRL in Corvallis, OR. It is an interspecific hybrid, genetically 75% eastern blackberry and 25% western trailing blackberry. Trial quantities are available from NorCal Nursery.

'ORUS 2635-1'

| = = | | |
|----------------|--|---|
| Avg. Yield | ? | |
| High Yield | ? | |
| Season | Mid | |
| Soluble Solids | ? | |
| Berry wt. | ? | |
| Pros | High yields, suited for fresh market | A trailing blackberry with a very erect habit |
| Cons | Thorny, little data | Hardiness? |

'ORUS 2635-1' is an advanced selection from the USDA-ARS-HCRL in Corvallis, OR. It is an interspecific hybrid between eastern and western blackberries. Trial quantities are available from NorCal Nursery.

Newer Raspberry Varieties

'Joan Irene'

| Avg. Yield | 6,500 lb/a | |
|----------------|----------------|----------------|
| High Yield | ? | |
| | | Aug. 25 – |
| Season | Late | Oct. 1 (for |
| | | primocanes) |
| Soluble Solids | 8.4% | Mildly sweet |
| Berry wt. | 4.5 g | |
| Dros | Thornless, | Potential for |
| Pros | high vigor | high yields |
| | Uneven fruit | |
| Cons | ripening, ber- | Susceptible to |
| | ries turn dark | Phytophthora |
| | after cooling | |

^{&#}x27;Joan Irene' is a primocane-fruiting variety that was bred in England. Plants are available from Nourse Farms.

'Brice'

| Avg. Yield | ? | |
|----------------|--------------|----------------|
| High Yield | ? | |
| Season | Early | July 15 (for |
| Season | Early | primocanes) |
| Soluble Solids | 8.6% | Bland |
| Berry wt. | 4.3 g | |
| | | Potential for |
| | Thornless, | high yields, |
| Pros | high vigor, | precocious, |
| | early | uniform |
| | | bloom |
| | Berries turn | Susceptible to |
| Cons | dark after | powdery mil- |
| | cooling | dew |

^{&#}x27;Brice' is a primocane-fruiting variety that was bred in England. Plants are available from Nourse Farms.

'Nantahala'

| Avg. Yield | 12,000 lb/a | |
|----------------|---------------|---------------|
| High Yield | ? | |
| | | Aug. 25 – |
| Season | Very Late | Oct. 1 (for |
| | | primocanes) |
| Soluble Solids | 9.5% | Sweet |
| Berry wt. | 3.0 g | Medium-small |
| | Non- | |
| Pros | darkening | High vigor |
| | color after | High vigor |
| | cooling | |
| | Too late for | _ |
| Cons | Utah (without | Small berries |
| | tunnels) | |

^{&#}x27;Nantahala' is a primocane-fruiting raspberry released from North Carolina State Univ. Plants are available from North American Plants, Nourse Farms and NorCal Nursery.

'Vintage'

| Avg. Yield | 15,000 lb/a | |
|----------------|---------------|----------------|
| High Yield | ? | |
| | | Aug. 15 – |
| Season | Late | Oct. 1 (for |
| | | primocanes) |
| Soluble Solids | 9.0% | Decent flavor |
| Berry wt. | 2.5 g | Small |
| | Non- | |
| Dros | darkening | Potential for |
| Pros | color after | high yields |
| | cooling | |
| | Too late for | Small berries, |
| Cons | Utah (without | low vigor |
| | tunnels) | IOW VISUI |

'Vintage' is a new primocane-fruiting raspberry released from the USDA-ARS-HCRL in Corvallis, OR. Plants are available from North American Plants, NorCal Nursery and Lassen Canyon Nursery.

'Crimson Giant'

| Avg. Yield | 12,000 lb/a | |
|----------------|---------------|---------------|
| High Yield | ? | |
| Season | Vorulato | 30 days after |
| Season | Very Late | 'Heritage' |
| Soluble Solids | 3 | |
| Berry wt. | 5.0 g | Large |
| Pros | Darkens after | Firm, heavy |
| | cooling | crop |
| | Too late for | |
| Cons | Utah (without | |
| | tunnels) | |

'Crimson Giant' is a new primocane-fruiting variety from Cornell Univ. Plants are available from North American Plants.

'Cascade Gold'

| Avg. Yield | 16,500 lb/a | |
|----------------|---|------------------------------------|
| High Yield | ? | |
| Season | Early to mid- season | July 1 – 25 |
| Soluble Solids | ? | Sweet, easy to eat |
| Berry wt. | 5.5 g | Large |
| Pros | Early, golden, firm, easy fruit detach- ment | High yield, RBDV re- sistant |
| Cons | Susceptible to Phytophthora | |

'Cascade Gold' is a floricane variety released from Washington State Univ. Plants are available from NorCal Nursery and Lassen Canyon Nursery.

Soil and Tissue Testing for Berry Crops

Teryl R. Roper
Dept. of Plants, Soils, and Climate
Utah State University

We make decisions about our farms and how we will grow our crops every day. The best decisions we make are those that are informed with experience or data. Experience is an expensive teacher, so if we can make decisions based on data informed by others' experience we are that much better off. We use information to make decisions already. For example, we scout or use degree day models to estimate insect pest populations so we don't apply expensive insecticides unnecessarily. We use data and experience to make decisions about when and how long to irrigate. We can also obtain data that will help us make decisions about applying fertilizer to berry crops.

Our mineral nutrition objective for berry crops is to provide the plants and the soil with sufficient elements so that mineral nutrients are never limiting to plant growth or yield. Berry plants are all perennial and perennial plant parts serve as a reservoir of nutrients. Fertile soils also contain pools of nutrients adsorbed to the surface of soil minerals and organic matter. Thus, the nutrients that support crop growth and development for any year don't all have to come from the soil during that year.

Fertilizer can be applied for any number of reasons. However, the best reasons to make fertilizer applications are to maintain tissue sufficiency, to supplement soils that show low reservoirs of a given nutrient, or because tissue levels are already below, or are approaching, the normal sufficiency range. The best data on which fertility decision can be made are the results of soil and tissue testing; and tissue test results are stronger than soil test data.

Soil Testing

Soil testing is best done well before planting strawberries or raspberries. Using a soil probe or trowel take a sample to a depth of six inches. The samples you take must represent the entire field. Sample randomly across the field. Assemble all of the samples in a clean plastic bucket and mix them thoroughly. Once mixed, place about one cup of the soil into a clean paper or plastic bag. Fill out the information sheet for the lab of your choice, and ship both to the lab.

In a week or two you will receive a report back from the lab. The data you receive will depend on the test you chose to have done. A basic soil test costs \$14.00 at the USU Analytical Labs, and will provide data on pH, salinity, texture and an estimate of plant available phosphorus and potassium. Having this data pre-plant will allow you to add and incorporate P and K pre-plant. This is especially important for phosphorus because it moves very slowly in soils without some sort of tillage. In Utah pH it is usually not possible to adjust soil pH, but it can inform you of soil conditions.

Tissue Testing

Tissue testing should be an annual practice. Tissue testing provides a snapshot of the current mineral nutrition status of plants. Proper tissue testing depends on following three principles:

- Sample the correct plant part (the diagnostic tissue)
- 2. Collect the sample at the correct stage of development or time of year
- Collect the samples at random through the block or field

Each plant has its own diagnostic plant part. By sampling a uniform tissue producers' samples can be compared to university research. Sampling other tissues does not allow comparisons to be made to university standards. For strawberries the preferred plant part is a young, but fully expanded trifoliate leaf plus the petiole. For raspberries it is a fully expanded leaf between the fifth and twelfth nodes from the cane tip. Counting from the tip, go down at least five leaves and less than twelve and remove one full leaf.

The time of sampling is typically when nutrient concentrations in the diagnostic tissue are stable. This allows a broader window for sampling. Sampling at a different time does not allow comparison to university standards. June bearing strawberries are tissue sampled at renovation. Day neutral strawberries are sampled mid season as one cropping is complete. Summer bearing (floricanes) raspberries are sampled after harvest, usually in late July to early August. Fall bearing (primocane) raspberries are sampled before the primocane crop begins to mature.

An acre of crop can have millions of leaves. The leaves that are collected need to represent the leaves in a given planting. Random collection of the leaves across a planting helps ensure that the collection is representative of the total leaf population. Don't collect diseased, damaged, or dirty leaves. Collect 20-25 samples from each block or planting.

Once collected, you can allow the leaves to air dry overnight. Place them in paper bags or envelopes. Don't put them in plastic bags. Upon arrival at the lab they plant tissue will be dried and ground prior to analysis. Fill out the information sheet for each set of samples and include the sheet along with the samples when you ship them to the lab of your choice. A basic tissue test at the USU Analytical Labs is \$35.00.

Within 10 days to 2 weeks you'll get a report back from the lab. The report will provide information on the concentration of mineral nutrients in your tissue. An interpretation will also be provided indicating that the concentration is deficient, low, sufficient, high, or excessive. The report will not tell you how much fertilizer to apply, if any. The goal of fertilizer application is to keep the tissue concentration of each element in the sufficient range.

Once you have the data, you can consider your past fertilizer practices, the concentration in your crop, the vigor of your plants, and crop load to determine what and how much fertilizer to apply. When tissue are sampled annually for a number of years you can see trends over time in the data. Data provided from tissue testing can help you avoid mineral deficiencies before they occur and it will help you avoid applying fertilizer that is not needed.

When used together, soil and tissue testing are powerful tools. Basing your fertilizer decisions at least in part on the results can help you reduce costs and to be efficient in fertilizer application.

USU High Tunnel Field Day featured fruits, vegetables and cut flowers

By Tiffany Maughan, USU graduate student



Local high tunnel production is capturing the attention of many growers as a form of season extension. The High Tunnel Field Day held on March 19th at Utah State University's Greenville Research Farm was attended by 50 commercial growers from Utah, Idaho and Wyoming. Presentations and tours provided information on vegetable, fruit, and even cut flower production in high tunnels. A new resource available, http://tunnel.usu.edu, was introduced as a one stop shop for research results and publications on high tunnels.

Several vegetable cropping systems that perform well in a high tunnel were highlighted, including spinach, bush bean, tomato and pepper. Dr. Dan Drost, extension vegetable specialist, presented his research findings

on these crops. In particular, he discussed production plans that utilize the valuable tunnel space almost all year round. He also presented economic data about these high tunnel vegetables, with most of this information now available on tunnel.usu.edu.

Spinach was in full production as graduate student, Taunya Ernst, gave growers a tour of her research on winter production. Growers were able to view, as well as learn about advantages of various secondary crop covers. There was also a demonstration of the potential difference buried heating cables can make on crop yield. Spinach can be grown as either a late fall or early spring crop, extending the usefulness of the high tunnel.



Dr. Brent Black, extension fruit specialist, presented information and research findings on strawberry, raspberry, and blackberry high tunnel production. He introduced two new high tunnel designs for growing brambles. The tunnels have only been in use for about 6

months and are being evaluated for effectiveness. Blackberries and raspberry trials are being researched in the high tunnels and the different varieties were discussed. More information will be coming soon about these new designs on the tunnel website.

Strawberries were presented to the growers as a high value crop that does very well in high tunnels. Strawberry research at Utah State has been ongoing for 5 years and Tiffany Maughan, a graduate student, explained the potential of strawberry high tunnel systems. In Logan, where strawberry production normally starts at the end of May, the high tunnel strawberries were already ripening almost 2 months early! Growers were

able to sample the ripe berries produced in the high tunnels. Similar to the spinach, growers saw the effect of secondary covers (low-tunnels) on further extending the season.

Cut flower production research is still rather new at Utah State and Dr. Larry Rupp, extension specialist, presented information on this new research. Peony and annual sunflower production are being evaluated in this new high tunnel system. This is the first year of the research and so no results were available, but the peonies (planted fall 2011) had

emerged in the high tunnels, approximately 4 weeks sooner than the outdoor peonies. There is great potential for this new high tunnel crop, particularly if the high value Mother's Day market can be targeted.

Beyond these exciting findings about crops being researched, general high tunnel information was given at this conference. Presenters stressed the need for a well-built tunnel that can withstand wind and other adverse conditions. The high tunnels at the Greenville Research Farm in Logan, Utah have withstood winds of up to 60 mph with little to no damage. However, high tunnels need to be properly managed and maintained in order to keep them in good condition. Tips such as internal snow supports, methods of ventilation, and irrigation using drip tape were presented.



At the end of the day, participants were surveyed on their current practices and interests. Most of the group expressed interest in having an annual high tunnel field day. Dates for future field days will be posted on the website http://tunnel.usu.edu.

Online Pest Management and Weather Resources

Look to http://ipm.usu.edu for information on pests and pest management. The site offers a subscription to a periodic newsletter (search back issues by keyword), and photo galleries, fact sheets, and more specific to fruits. http://utahpests.usu.edu/ipm/

Get detailed and current insect, disease, and weed pesticide recommendations from the online Pacific Northwest Management Handbooks, which can be accessed from http://pnwpest.org/

Missing a pesticide label? If you apply pesticides, it is important to read all labels for application information and safety. Search for pdfs of ag product labels at http://cdms.net/.

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Search registered pesticides by crop, pest, product name, or active ingredient, from one of these databases (to find them online, type the title into Google):

- IR-4 Biopesticide and Organic Database (http://ir4.rutgers.edu/biopesticides/labeldatabase/index.cfm)
- ATTRA Ecological Pest Management Database (https://attra.ncat.org/attra-pub/biorationals/)
- Utah Pesticide Information Retrieval System (http://state.ceris.purdue.edu/doc/ut/stateut.html)

The Utah Climate Center, at http://climate.usu.edu, has a variety of online plant management tools.

- Searchable weather data (http://climate.usurf.usu.edu/products/data.php)
- Site-specific growing degree day calculator ("GDD") (http://climate.usurf.usu.edu/traps.php)
- Utah freeze dates (http://climate.usurf.usu.edu/reports/freezeDates.php)
- A text or email frost alert system, accessed via a user login (please email marion.murray@usu.edu if you are interested in receiving frost alerts for your area)

These and other sites can be accessed from the USU extension fruit website (http://fruit.usu.edu).



MARK YOUR CALENDAR

Kaysville Research Farm Field Day

August 16, 2012, 1:00 pm to 5:00 pm

Concurrent tracks on Berry Crops, Vegetables and Tree Fruit

USU Kaysville Research Farm 725 South Sego Lily Drive Kaysville, Utah

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