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Special Reports:

Possibility of a Research and Promotion Program for Blackberries?

Debby Wechsler, Executive Secretary
North American Raspberry and Blackberry Association

In October, a Working Group of growers, marketers, and other leaders in the industry, pulled together by the North American Raspberry & Blackberry Association (NARBA) developed a draft proposal for a federal Research and Promotion program (R&P) for blackberries. The SRSFC was a sponsor of this meeting. Leadership of this process has been provided by NARBA, based in Pittsboro, NC; chair of the Working Group is NC blackberry grower Ervin Lineberger. This factsheet explains about R&P programs and describes the current draft proposal. The proposal will be discussed on Friday, January 7, 2011 at the Southeast Regional Fruit & Vegetable Conference in Savannah, where NARBA is having its annual meeting (Jan 5-7, 2011). This proposal is also being presented at other grower meetings around the country to get comments and input from blackberry stakeholders. For more information about the R&P proposal or the NARBA conference, contact Debby Wechsler, info@raspberryblackberry.com or visit www.raspberryblackberry.com.



PROPOSED: A USDA Research & Promotion Program for Blackberries

What are Research & Promotion Programs?

Research and Promotion programs are national programs created by a fruit or vegetable industry to support research and promotion to benefit that commodity. Authorized by federal legislation, these programs are designed to strengthen the position of the industry in the marketplace and to maintain and expand domestic and foreign markets. The programs are entirely funded by industry assessments. An industry council, representative of the commodity, is set up to manage the program under the supervision of the USDA. Council members are nominated by the industry and appointed officially by the Secretary of Agriculture.

What can a Research & Promotion Program do for blackberries?

An R & P program provides the means to allow all blackberry growers and other stakeholders to cooperate in promoting their commodity and advancing the blackberry industry. It assesses both domestic and imported berries to support these efforts. This strategy, utilized by many other agricultural crops, has resulted in increased consumption levels which in turn have yielded an increase in returns realized by growers. The creation of a national program under the USDA provides an opportunity to:

1. Address new and changing opportunities to collectively build strong markets
2. Formalize and strengthen working

relationships across the industry

3. Fund much-needed research in areas helpful in developing the blackberry industry
4. Require companies importing blackberries into the U.S. to pay their fair share of the cost of building blackberry markets through mandatory assessments collected by U.S. Customs. Imports currently make up more than 75% of fresh-market blackberries sold in the U.S.

The R & P program can choose to invest funds in many ways:

- **Research:** production, packaging, handling, market, nutrition
- **Information programs:** consumer, industry, trade, food safety
- **Promotion:** nutrition messaging, advertising, media relations, sales development, etc. to a variety of audiences

What is the process for creating a Research & Promotion Program?

A Working Group to create a proposal for this R & P has been created, with initial staff support provided by the North American Raspberry & Blackberry Association (NARBA). Participating in this group are growers, marketers, importers, and grower organizations. This group has created a draft proposal – key features are summarized on the other side – and is asking growers and other stakeholders for review and input. If the Working Group finds that the industry is sufficiently supportive of a proposal, it will then be presented to USDA, which will administer a referendum of producers and importers. USDA suggests a minimum of 12 – 18 months once the proposal is submitted for formal review before a program is declared effective and the Board is seated.

Who votes in the referendum?

Each eligible domestic producer of blackberries and eligible importer of blackberries is entitled to cast one ballot in the referendum. (Foreign producers do not vote.) The Working Group has proposed that the referendum must be approved both by at least 51% of producers and importers, representing at least 65% of production. Final determination of the establishment of the Council will be made by the U.S. Secretary of Agriculture.

What are the Key Features of the Draft Proposal?

- **Only fresh-market blackberries** are included in

the proposal at this time.

- **“Eligible producers”** are the domestic growers who would vote in the referendum and be assessed by this program. The proposal sets this threshold as growers who produce and sell at least 30,000 lbs./year of fresh-market blackberries.
- **“Eligible importers”** are any persons or entities importing any quantity of fresh-market blackberries into the U.S. There is no minimum threshold.
- **The proposed Council** is composed of 13 members, each serving 3-year terms:
 - 5 grower members, one from each of the five leading fresh blackberry producing states
 - 2 additional grower members, one Eastern and one Western
 - 1 at-large member, who could be a grower, researcher, consumer representative, or other
 - 3 blackberry importers
 - 2 foreign producers
- **Assessment Rate:** The proposed assessment rate is \$.01/lb (a penny per pound). It is estimated that at current production levels, this would raise between \$1.25 million and 1.5 million annually.

What can I do to help the process?

First, participate in the ongoing discussion about the program’s creation and authority. Ask questions and share your thoughts. Attend grower meetings.

Next, when the program is published in the Federal Register, make sure to submit comments and encourage other growers to submit theirs as well. Drafts of comment letters which can be personalized or bullet points that can be included in your own letter will be made available.

Finally, be prepared to vote once the referendum is announced. Find out whatever you need to know about this proposal so you are comfortable it is moving in the right direction.

How can I find out more?

Visit www.raspberryblackberry.com/

[blackberryRandP](#). The site includes a contact information for project staff and Working Group members, a draft of the R & P proposal, and additional information.



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**Fumigant Regulations-Safety
Information for Handlers**

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EPA has activated the website with safety information for handlers involved with soil fumigant applications. The site contains a 1 page (2-sided) general piece from EPA that meets the minimum requirements of the new risk mitigation measures. English and Spanish versions are available. Also available is a more detailed brochure from Dow focused on 1,3-D/chloropicrin combination products. The sites can be accessed with either of the links below:

<http://www.epa.gov/fumiganttraining>

http://www.epa.gov/pesticides/reregistration/soil_fumigants/soil-fum-handlers.html

In addition, EPA has activated the 'Soil Fumigant Toolbox' at the following link:

http://www.epa.gov/pesticides/reregistration/soil_fumigants/

This is a great site that contains links to FMP templates, labels, fact sheets, training presentations and other outreach materials.

**The Great Glyphosate Debate....
Too Much of a Good Thing?**

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One could safely make the statement that glyphosate is the most widely used herbicide in vineyards without concern for being inaccurate. In the Southeast I would say nearly all commercial vineyards using conventional pest management practices apply glyphosate at least once during the year. In fact numerous commercial operations use 2 or more glyphosate applications per year and this practice is not unique to grape producers. Producers of fruits, nursery crops, and agronomic crops place considerable dependence on glyphosate for weed control in their respective cropping systems. Glyphosate use in all crops has been driven by its effectiveness and more recently increased affordability with various generic glyphosate products entering the market place. The development of glyphosate technology has played a huge role in the expansion of glyphosate use in soybean, corn, and cotton plantings. Many critics argue growers of agronomic crops have become too dependent on glyphosate which has led to the development of glyphosate resistant weeds.

In the past several years there has been discussion about the over use of glyphosate in perennial crops like fruit and field grown nursery trees reducing vigor and health of these crops. In Michigan and Ohio cankers on tree trunks have been associated with multiple glyphosate applications. Preliminary research from New York has suggested that internal browning of apples in cold storage may be related to multiple glyphosate applications as well. There is no question that sub-lethal levels of glyphosate and glyphosate metabolites that adversely affect metabolic activities associated with perennial plant growth occurs where glyphosate is applied as a directed spray underneath perennial crops. However apples are not grapes and what occurs in one may have nothing to do with the other but this debate does raise the question "could glyphosate adversely affect the health of grape vines?" By no means am I advocating we stop using glyphosate, it is an excellent herbicide that is essential for good weed management,

however I do believe we should limit its application to once and no more than twice per year to protect its vitality for years to come.

In west coast production regions growers use a single application of glyphosate tank mixed with one other herbicide for their vineyard weed management program. Circumstances in the Southeast are considerably more challenging and make weed control a more challenging endeavor. Unlike drier, more arid production regions, the Southeast gets considerably more rainfall throughout the spring and summer when competitive weeds thrive. This creates a scenario that in some years require postemergence herbicide applications every three to four weeks when a preemergence herbicide is not used. The bold reality is a good weed management program for Southeast vineyards should include preemergence herbicides as a cornerstone. Preemergence herbicide use allows the allocation of management and labor resources to other aspects of grape production, alleviating the need to make multiple, timely postemergence herbicide applications during the summer. Glyphosate use can be reserved for controlling winter annual weeds like chickweed, horseweed (non-glyphosate resistant biotypes), Carolina geranium, mustard species, henbit, and prickly lettuce in the spring. Should a postemergence herbicide need to be used during the summer Rely 280 and paraquat are excellent, effective non-selective postemergence herbicides that will meet this need. Furthermore glyphosate should never be used in vineyards after June because of increased crop sensitivity in late summer and the potential for crop injury the following spring.

If you are interested in learning more about preemergence herbicide options and suggested herbicide programs using preemergence herbicides visit www.smallfruits.org and click on the IPM/Production guide icon. If you have further questions contact me via email at wayne_mitchem@ncsu.edu.



Chateau + Rely followed by Rely in August

Two new virus diseases in *Rubus*: Blackberry yellow vein and raspberry crumbly fruit

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Blackberry yellow vein disease

Blackberry production area has increased dramatically in the Southeast in recent years with the release of new cultivars suitable for the region and due to elevated customer demand for high quality fruit, which has led to high prices enjoyed by the growers. As in almost all cases where a crop is introduced or expands to new areas problems follow. In this case the problem is blackberry yellow vein disease (BYVD), a disease previously thought to be caused by *Tobacco ringspot virus* (TRSV).

For many years TRSV was considered a major problem in the southeastern United States because of the severe symptoms it causes, which affect blackberry yield and longevity of plantings. Because of work done at the University of Arkansas by Dr. Rose Gergerich we now know that TRSV is symptomless or gives mild symptoms in most modern cultivars. This prompted us to look to other agents that may be involved in the symptoms that are observed in virtually all major producing areas in the Southeast and Midsouth. BYVD symptoms include vein banding and chlorotic blotches and results in the general decline of plants and reduced production (Fig. 1). Before the onset of

the disease it was not unusual that a blackberry field would be productive for 20 or more years whereas today 5-7 year rotations are the norm.



Figure 1. Symptoms normally associated with Blackberry yellow vein disease including vein banding and leaf mottling.

BYVD is caused by viruses. What is unique with BYVD is the fact that there are more than 15 viruses associated with the disease. None of these viruses are known to cause symptoms by themselves in most cultivars. The problems start when two or more viruses accumulate in plants, leading to synergism and disease. Symptoms are not associated with any given virus combination and different combinations can cause identical symptoms making BYVD one of the most complex diseases of small fruit crops. For example in Arkansas, *Blackberry yellow vein associated virus* (BYVaV) and *Blackberry chlorotic ringspot virus* (BCRV) are the viruses more frequently found in BYVD plants whereas in North and South Carolina the combination of BYVaV with TRSV is more prominent.

Most of the viruses found in BYVD plants are new to science and there is limited knowledge on their epidemiology including potential vectors. Judging from similar viruses already studied we can speculate that the vectors of the viruses can be whiteflies, eriophyid mites, hoppers, thrips and aphids. The fact that there are at least five different putative types of vectors able to transmit viruses associated with the disease makes control a difficult undertaking. It becomes evident that no one measure can be used to minimize the impact of all viruses involved in the complex. On the other hand there needs to be at least two viruses for disease symptoms to be expressed. This means control for all viruses may not be necessary in production fields. It is important to determine which viruses are present in the region before planting so that a management strategy can be devised accordingly.

As with the control of any virus disease of *Rubus* as well as other crops, the first and most important measure is to start with planting stocks that have tested free of all viruses known to infect the particular crop. Since single infections tend to be symptomless in blackberry, there is a risk of introducing a new virus onto a farm or into a region if only visual inspection for symptoms is used. In nursery production, pre- and post-planting vector control, isolation from hosts (domesticated or native) infected with any of the component viruses, and the use of clean plant material is critical. In production fields, preplant soil testing for *X. americanum* (vector of TRSV) should be carried out and followed up with control measures if the nematode is present. Knowing which of these viruses are not present in the area and thus, controlled by isolation from inoculum sources, or conversely, identification of which viruses in the complex are present in the area in plants that exhibit BYVD symptoms will be the basis of developing a localized control strategy. As more information on vectors is developed, knowing what is nearby that can potentially move into a field will be the basis for developing a vector monitoring and control program. If the BYVD component viruses nearby are known, then control measures can be directed at the vectors of those viruses rather than at controlling viruses that are not present. For example, if a virus does not occur in a region, then controlling its' vector would not benefit a BYVD management strategy for the field. Once the nearby component viruses of BYVD are known, then control measures should

target the vector(s) of these specific viruses with priority given to the vectors that are easiest to manage and that transmit critical virus(es) for BYVD development.

Raspberry crumbly fruit

The Pacific Northwest (PNW) is a leading producer of red raspberries in the world. In the mid 1980's the cultivar 'Meeker' replaced 'Willamette' due to its high fruit quality, improved yields and efficient machine harvestability. 'Meeker' is particularly susceptible to crumbly fruit, a virus-induced disease that is now widespread in the PNW, especially in northern Washington and British Columbia but also present in other areas raspberries are grown. The disease produces drupelet abortion which causes the fruit to crumble when picked, affecting fruit quality and reducing yield (Fig. 2). The disease was attributed to *Raspberry bushy dwarf virus* (RBDV), a pollen and seed transmitted virus. Studies have shown that entire fields may become infected with RBDV within 3-5 years of planting. Although RBDV has become common in southern Washington and Oregon, crumbly fruit is not as prevalent. The large raspberry aphid (*Amphorophora agathonica*) is found in much higher populations in production areas in the northern WA and B.C. These observations suggested that there may be other virus(es) transmitted by aphids, which act synergistically with RBDV to cause the severe crumbly fruit disease.

A recent virus survey conducted in northern Washington revealed the presence of two recently characterized viruses: *Raspberry leaf mottle virus* (RLMV) and *Raspberry latent virus* (RpLV). RLMV incidence ranged from 4% to 30% in 2 year-old plantings and 50% to 100% in 5 year-old plantings; whereas RpLV incidence ranged from 6% to 40% in 5 year-old plantings. Ongoing experiments using infected 'Meeker' plants under field conditions show that when RBDV occurs in mixed-infections with RLMV, the concentration of RBDV is significantly higher (several hundred fold higher) compared to the RBDV concentration in plants infected with RBDV alone. Furthermore, plants infected with mixed-infections (containing the three viruses) exhibited a 70% reduction in cane growth during the first year of planting compared to plants free of the viruses. The role of each of the three viruses in crumbly fruit disease is being evaluated.

Understanding the biology of the viruses is very important when it comes to controlling the disease. RBDV is transmitted by pollen, thus, bees play an important role in spreading the virus. RLMV and RpLV on the other hand, are transmitted by the

large raspberry aphid. Based on what it's known for other aphid-transmitted viruses which are related to RLMV, aphids will acquire the virus after a few hours (3h-12h) of feeding on an infected plant and viruliferous aphids will carry the virus for up to 24h whereas it takes as few as two hours for the aphid to transmit the virus. For RpLV the time from acquisition to transmission is much longer. The incubation period of viruses related to RpLV has been reported to range from 10 to 24 days. This characteristic in the virus transmission makes RpLV less of a problem in terms of control and may explain the relatively lower incidence in the field. RpLV transmission highlights the importance of validating the 'best guess' at a vector based on sequence data. All other plant viruses in this group are transmitted by leafhoppers, while RpLV is transmitted by aphids.

As noted in the BYVD section, virus management focuses on starting with virus-tested plants and preventing the spread of the virus(es) to uninfected fields. However, since RBDV is transmitted by pollen, insect management cannot be implemented to stop its spread. On the other hand, preliminary results obtained from virus surveys, and with experiments using 'Meeker' with mixed virus infections containing RBDV, RLMV and RpLV, suggest that the severity of crumbly fruit observed in northern WA and B.C. is due to a synergistic effect among these three viruses. Should this be confirmed in the ongoing field experiments, growers could implement a control strategy that targets the easiest component of the virus complex. The two additional viruses (RLMV and RpLV), being transmitted by aphids, would provide an opportunity for reducing the severity of crumbly fruit disease. In terms of control, RpLV may represent the weakest target of the three viruses as it requires a longer period of time before it can be transmitted to a new plant by the aphid. RLMV cannot be acquired by simple probing of the aphids, meaning that the insect has to settle and feed on an infected plant for at least several hours before the virus gets attached to the insect mouth parts. This window may mean that systemic insecticides could be useful in controlling RLMV transmission in the field.



Images: Top left, leaf mottling on red raspberry infected with RLMV and RpLV, top right, crumbly fruit in 'Meeker' red raspberry, lower left, crumbly fruit in 'Marion' blackberry infected with RBDV and Blackberry calico.

**Red Cell, Red Drupelet, Color Reversion:
What's happening to those packaged
blackberries?**

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It's a problem that is becoming more critical as commercial production increases. You have a beautiful, fully black pack of blackberries going into precooling and truck loading. A day later, black fruits start sporting areas of bright red, sometimes a few spots, sometimes 30% of the fruit. This disorder manifests itself only after storage, and is different from heat damage, where the fruit can turn a brownish red if picked in the hot afternoon then not promptly cooled (see attached photos), or from freeze injury, when more than 70% of the berry turns bright red after exposure to air too cold (<30 F) or close to a chilling unit, especially in a transport vehicle.

A blackberry is actually made up of many fruitlets, each with an individual seed. These fruitlets are called drupes or drupelets, and the reddening is on the drupelets themselves. When blackberries were

a pretty new item on the shelf, consumers and store managers were happy just to have fruit that weren't moldy. Now, though, as competition increases, more and more costly repacking to eliminate these red berries is being done by growers and shippers.

We first noticed this phenomenon back in 1992 at the USDA in Lane, OK when screening blackberry germplasm for suitable postharvest life. At the time, we were more concerned with mold, leak, and soft berries, and assumed the red drupelets might be from leaky spots. Over the next few years, we noticed this color reversion was appearing much more on some varieties than on others. For instance, 'Shawnee' and 'Choctaw' might have as much as 30% of berries affected while 'Navaho' and 'Arapaho' rarely had over 5%. So, we started a series of experiments to look into this problem with thorny and thornless selections from the University of Arkansas. The first hypothesis was that the red drupelet would occur more often in thorny than thornless selections. Some 5 years and 50 selections later, it appeared there is no relation-thornless selections can also get this disorder. The harvest period (early, mid, late season), relative fruit maturity, relationship of leaky and/or soft berries, and storage temperatures were also considered. The results from these studies: germplasm was the main player, early fruit were more likely to show red drupelet, shiny black would have a higher percentage red drupelet than dull black fruit, and holding fruit at 41 to 50 F would slightly reduce incidence of red drupelet compared to fruit stored at 35 F. The number of leaky or soft berries was not correlated with incidence of red drupelet. Berries collected for this work were grown in Oklahoma and Arkansas, and occasionally rainfall occurred during the harvest period.

The next step was to go from trying to associate gross differences with more targeted differences. We determined the amount of total anthocyanin among varieties, thinking that those with more red drupelet might have less total pigment. This turned out not to be true; in fact, some varieties such as Arapaho that have almost no red drupelet tended to have less anthocyanin than those with a high incidence, like Shawnee. In another study, the acidity of the individual drupelets (pH) was measured using micro electrodes. Red drupelet was induced by exposing berries to very cold temperatures (25

F) for 15 minutes in Shawnee and Navaho berries, and the pH measured on individual black and red drupelets. The pH of the red drupelets was about 3.04 while black drupelets were 3.41. Anthocyanin, the major pigment of blackberries, will show visible color shifts with changing pH. The classic example used is that of red cabbage juice, where a red color is made at acid pH (<7) and a blue color at basic pH (>7). Problem is, no one has determined what the pigment of blackberry fruit will do in a narrow range of pH shifts (between 3 and 3.5, for instance). Another possibility was that the two specific pigments making up total anthocyanin could be increasing or decreasing, causing a color change. We dissected the red drupelets from the black. Dr. Luke Howard at the University of Arkansas found that the pigments were the same in the red and black drupelets (cyanidin-3-glucoside), but the red had only half as much pigment as the black.

So, the pigments stay the same, but are they leaking away? Is the red being caused by vacuole disruption (anthocyanin is contained here), and contact of the pigment crystals with acid? Is the leak caused by a weak point of attachment of drupelets to the cortex (receptacle), or by some sort of insect damage or pathogen? My technician often observed that the classic red drupelets appeared swollen compared to normal drupelets. Sometimes one can see these swollen drupelets on berries going into storage. The problem is, they don't necessarily turn red. So, generally the red drupelets are going to be swollen, but something else is happening to trigger the reddening. Is it possible that the swollen drupelets are sensitive to chill injury, more than the non-swollen drupelets, and membrane leakage occurs with exposure to low temperatures? Or, are we inadvertently bruising blackberry fruit (with susceptible varieties having a tendency to have more uneven drupelet sizes, and larger drupelets are damaged), and it is later expressed as red drupelet?

How to prevent this disorder from happening? The long term answer is screening of germplasm to see how severe this tendency can be. Several breeders now incorporate this evaluation in their postharvest testing. The best answer (scientifically) is to figure out what the mechanisms might be for this disorder, and even to make sure it is truly a disorder and not an overlooked pathogen or insect problem. Certainly manipulation of temperatures appears to have some effect. This is the one and only case where storing blackberries warmer can help a problem. Of course, breaking the cold chain causes other problems, like accelerated softening

and growth of mold. And, adding another layer to all this, it's still not clear if rainfall, irrigation, and relative heat load affect incidence. Certainly in some production areas, varieties with tendency to color reversion will have more incidence than the same varieties grown in other areas. The best advice we have right now is this: try to use varieties that score low in color reversion; protect the top layer of fruit in a pallet from direct exposure to forced air cooling (use a sheet of cardboard or foam on top); and carefully monitor the cooling inside reefers to avoid cold spots as well as warm spots.

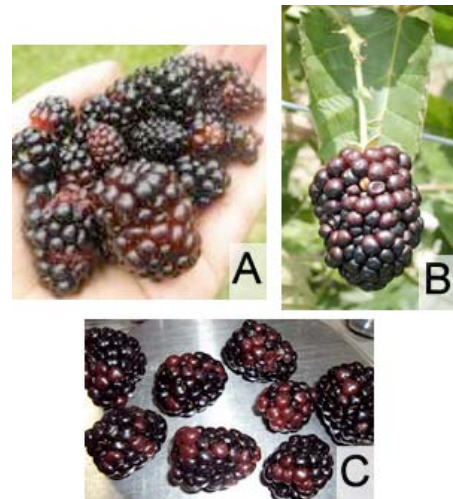


Figure 1. Heat damage (A), rain damage (B), red drupelet on stored blackberry (C)

Blackberry and Raspberry Seasonal Checklist

Gina Fernandez, Small Fruit Specialist
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This checklist was originally developed for blackberry growers in North Carolina. Many of the items apply to raspberry production as well. You may have to adjust your work activities either earlier or later depending on your location. For more detailed information, check the Southern Region Integrated Bramble Management Guide and the Southeast Regional Bramble Production Guide at: <http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>

WINTER

Plant growth and development

✓ Plant is "dormant"

- ✓ Some differentiation is occurring in the flower buds

Pruning and trellising

- ✓ Pruning should occur in late winter. However, in some areas winter ice storms can do tremendous damage to plants and trellis systems. If you produce blackberries in one of these areas, pruning can take place early winter to help avoid severe damage.
- ✓ **Make trellis repairs after plants have defoliated but before pruning and training.**

Erect types

- ✓ Prune out the spent floricanes
- ✓ Tie canes to wires in a fan shape
- ✓ Cut lateral branches back to 8-12"
- ✓ Thin canes to 6-8 canes/ hill (4 ft spacing)

Trailing types

- ✓ prune out spent floricanes
- ✓ tie or weave canes to wire so that they do not overlap
- ✓ prune side laterals to 12-18"
- ✓ thin canes to 6-8 hill (6-8ft spacing)

Primocane fruiting raspberries and blackberries

- ✓ Prune (mow) primocane fruiting types to ground level

Weed control

- ✓ Many summer weed problems can be best managed in the fall and winter using preemergent herbicides. Determine what weeds have been or could be a problem in your area. Check with local extension agent for cultural or chemical means to control these weeds.
- ✓ Establishing new plants into rows of black plastic or landscape cloth can reduce weed problems significantly

Insect and disease scouting

Check the Southern Regional Bramble integrated Management Guide for recommendations.
www.smallfruits.org

- ✓ To learn more about the spotted wing drosophila and how it may impact your fruit in 2011, check out Hannah Burrack blog, she has lots of links in addition to her blog posts
- ✓ Scout fields for insect and disease damage and remove those canes

- ✓ Remove wild brambles within 600 ft of your planting during the winter
- ✓ Apply liquid lime sulphur or Bordeaux for disease control before new buds are 1/8"

Planting

- ✓ Growers in warmer regions can plant in December.
- ✓ Take soil tests to determine fertility needs for spring plantings.
- ✓ Prepare list of cultivars for next years new plantings. Find the commercial small fruit nursery list at <http://www.smallfruit.org>

Nutrient management

- ✓ Place nitrogenous fertilizers in row before new canes emerge in spring
 - Raspberries: Apply 500-800 lbs of 10-10-10 per acre in split applications. Apply half in Feb-March and the remainder in April-May. Spread uniformly across the row or side dress with half on each side of row in a 3 ft wide band.
 - Blackberries: In established plantings apply 60 to 80 lb/acre N. Nitrogen can be applied in split or single applications. If using a split application, apply the first portion at bud break and the remainder just after harvest. Ammonium nitrate is the most common form of N used on blackberries.

Water management

- ✓ Make repairs to irrigation system (check pumps, lines, etc)
- ✓ Plants generally do not need supplemental water in winter

Marketing and miscellaneous

- ✓ Order containers for next season
- ✓ Make contacts for selling fruit next season
- ✓ Attend grower meetings:
 - The 2011 North American Raspberry & Blackberry Conference
 - ✓ January 5-7, 2011 in Savannah, Georgia. Register now. Earlybird registration ends December 15! For more information click on link below: [http://www.raspberrylblackberry.com/local.cfm?doc=webdocs%](http://www.raspberrylblackberry.com/local.cfm?doc=webdocs%20)

[2FRaspberryBlackberryConferenc
eInfo.htm](#)

- The North Carolina Commercial Blackberry and Raspberry Growers Association
 - ✓ Feb 22, Mills River, NC. For more information, click on this link:
<http://cipm.ncsu.edu/NCCBRGA/>

Quarterly Strawberry Plasticulture Checklist

Gina Fernandez, Small Fruit Specialist
North Carolina State University

This checklist was originally developed for growers in North Carolina. You will have to adjust your work activities either earlier or later depending on your location. For more detailed information, check the Southern Region Integrated Strawberry Management Guide and the Southeast Regional Strawberry Plasticulture Production Guide at:

<http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>

Winter (Dec-Feb)

- ✓ Check all equipment (replace hoses etc)
- ✓ Get drip and overhead irrigation system hooked up, check your sprayer, replace hoses etc.
- ✓ Keep deer out of the strawberry patch. They can do serious damage to plants and plastic
- ✓ Examine plants for spider mite damage, they can be mistaken for winter damage
- ✓ Get ready for leaf tissue analysis in late February
- ✓ Spray ryegrass in late February/March
- ✓ Order chemicals and fertilizer for spring
- ✓ Scout crops for insects, mite and leaf diseases
- ✓ Scout for weeds, vetch in holes is not killed by winter temperatures
- ✓ Spray row middles with grass herbicide when ryegrass is 10-12 inches tall
- ✓ Purchase digital thermometer
- ✓ Calibrate thermometers in 32F water bath
- ✓ Purchase row covers
- ✓ Monitor weather forecasts closely
- ✓ Check frost alarm to see that it is working properly
- ✓ Get pumps, hoses and pipe ready for frost protection (First date is usually early March in NC)
- ✓ Order picking containers

- ✓ Prepare signs for stands, roadside directions, and on-farm use
- ✓ For companion crops, order seeds and locate/prepare greenhouse facility for growing transplants
- ✓ If selling fruit at wholesale markets, line up buyers now.

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