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# Small Fruit News

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In this issue

## Special Reports

*Propagation:*

*A "Clear and Present Danger" to the Blueberry Industry in Georgia*

## Bramble Chores

*Fall 2008*

## Strawberry Growers Checklist

*Fall*

## Special Reports:

### **Propagation: A "Clear and Present Danger" to the Blueberry Industry in Georgia**

*Phillip Brannen  
the University of Georgia*

Andy Grove was instrumental in the rise and power of Intel Corporation. He has a famous quote which can easily apply to the south Georgia blueberry industry at this point in time. "Success breeds complacency. Complacency breeds failure. Only the paranoid survive." Most of us have heard about the old glass-half-empty and glass-half-full saying, and yes, we tend to categorize people based on this old saying. Typically, none of us want to fall in the "half-empty" category. I try to avoid either side of this spectrum and deal in reality; being a realist can be of great value, especially as it relates to real dangers. In other words, a healthy dose of paranoia can serve us well from time to time.

We had a meeting on propagation issues back in late March of this year, and we discussed many aspects of the blueberry propagation industry as related to spread of diseases such as viruses and bacterial diseases, but fungal diseases can also be spread through propagation. There are at least nine known viruses of blueberries, and several of these could present major problems to our industry if they become widespread. Though we have observed the blueberry shoestring virus, strawberry latent ringspot virus, and blueberry red ringspot virus previously in Georgia, they have always been more curiosities, as they have been limited to only one or two bushes without major spread. In a 2001 survey for viruses in Georgia and North Carolina, no viruses were found in 55 and 38 suspect samples from

Georgia and North Carolina, respectively; suspect samples were generally attributed to herbicide injury from glyphosate or other issues, but again, no viruses were identified.

Things have obviously changed in a seven-year period. Blueberry red ringspot virus (BRRV) is now being observed in multiple locations throughout the region. As far as we know, this virus is only spread through propagation (see <http://www.smallfruits.org/Newsletter/Vol8-Issue2.pdf> for an article on BRRV by Bill Cline). We also still need to determine whether bacterial leaf scorch of blueberry is a propagated disease (see <http://pubs.caes.uga.edu/caespubs/pubcd/C922/C922.htm> for an article on bacterial leaf scorch), but it is now prevalent in multiple counties. We have recently observed a new potential viral disease in multiple locations, and it appears to be causing major damage or plant stunting (Figures 1-3). Let me emphasize that there has not yet been a confirmed diagnosis of a viral cause, but the symptoms are viral in nature, and herbicides have been largely ruled out. Samples have been sent for diagnosis by virologists, and it will be some time before we have an answer as to the cause. Without regard, all of these situations lead us to think of the danger that propagation can play in the spread of diseases, and none of us want to bring in or spread new diseases.

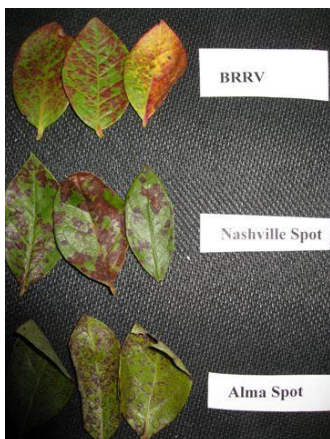
From the meeting in March, I learned several things that personally frighten me. First, most if not all propagators are "skimming" for their cuttings; this means that plants are not "butchered" for cuttings, and producers only take a few cuttings from each plant, allowing for good fruit production on these plants as well. Second, workers may take cuttings from thousands of plants, and they are not necessarily looking for diseases or even concerned about the general health of the plants. This means that if a

disease is found in a field even in a few plants, it is very likely that some of the cuttings will come from these infected plants, and these will then spread the disease to additional fields. Over time, disease levels will likely ramp up to epidemic proportions, especially if insect vectors can also increase spread. Realistically, if we want our industry to remain healthy, we have to change the way we do business relative propagation!

We will have to continue this discussion, but we really need to consider new propagation practices. The following are immediate suggestions for safer propagation:

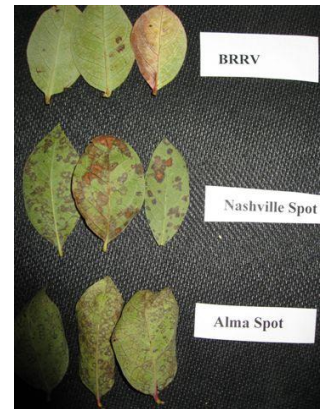
1. Inspect any plants from which cuttings will be taken, and if any disease symptoms are observed (viral or otherwise) on these or other nearby plants, do not use them.
2. Consider using fewer bushes for cuttings, while taking more cuttings from each bush. This will require that the bushes be dedicated to use for cuttings, and yield may be reduced in a year in which cuttings are taken. However, it is much easier to personally inspect a hundred bushes than several thousand.

At some point, we may have the option of having more propagation conducted via tissue culture, and this would certainly help to clean up the industry, but for now, we have to make do with what we have. If you are propagating plants, you are critical to this industry's health. Remember Andy Grove's advice that "only the paranoid survive."



**Figure 1.** View of the top of a blueberry leaf infected with blueberry red ringspot virus (BRRV) and leaves from two locations infected with another presumptive virus. The BRRV produces faint to pronounced red rings, whereas rings from the new presumptive virus are dark and often surround a green center.

**Figure 2.** View from the bottom of a blueberry leaf infected with blueberry red ringspot virus (BRRV) and leaves from two locations infected with a presumptive virus. The BRRV rings only appear on the top of the leaf, whereas the new presumptive virus rings appear on both sides of the leaf, are much more pronounced, and are darker.



**Figure 3.** Field shot of minor damage from a new presumptive virus (photo provided by Eddie McGriff, Coffee County Extension Service in Douglas, GA).

## NC Raspberry Breeding Program Releases 'Nantahala' Red Raspberry

Jim Ballington and Gina Fernandez  
NC State University

'Nantahala', is a new primocane fruiting red raspberry (*R. idaeus* L.) released by North Carolina State University. This is the first red raspberry to be released from the bramble breeding program in over 50 years. The primary characteristics that distinguish 'Nantahala' from other red raspberry cultivars are its late harvest season and larger berry size than other industry standards. 'Nantahala' also has a highly attractive red color and slightly conical shape and delectable flavor. In the Cherokee language, 'Nantahala' means land of the midday sun.

'Nantahala' ripens later than most primocane fruiting cultivars. Harvest typically commences the first week of September in Laurel Springs, NC (elevation 2850 ft) and the third week of August in Mills River (formerly Fletcher) NC (elevation 2066 ft). Harvest continues 2-3 weeks until a hard frost occurs. 'Nantahala' is recommended for the mountain regions of North Carolina and adjacent states. The late harvest will enable growers in that region to harvest high quality fruit later into the fall than in the past. Studies are currently underway to assess performance and season of ripening of 'Nantahala' in high tunnels at high elevations.

Replicated yield trials were conducted at the Upper Mountain Research Station in Laurel Springs and at the Mountain Horticultural Crops Research Station in Fletcher, NC. The total yield of 'Nantahala' was 3621 g/20 ft plot and 1434 g/20 ft plot in Laurel Springs and Fletcher, NC respectively, which is lower than other cultivars (Table 1). However, 'Nantahala's' berry (3.5 g) is larger than both Heritage and Caroline, two of the present industry standards.

Sensory Evaluations conducted by a trained panel at the NCSU Department of Food Science in the fall of 2006. Three standard cultivars (Caroline, Heritage and a store bought "California" variety) and 'Nantahala' were evaluated in blind tests. Panelists scored all cultivars for overall acceptability, red color, shape, flavor, firmness, juiciness, seediness, and fuzziness. 'Nantahala's' flavor, texture and seediness were as good as or better than the three other cultivars in the panel. Appearance (color and shape), of 'Nantahala' was rated superior to all of the other cultivars.

The cross was made in Raleigh by Dr. James R. Ballington in 1994. The female parent of 'Nantahala' is NC 245 and the male parent is 'Rosanna'. Seedlings from the cross were planted in Reidsville NC, and NC 451 was selected in 1998. It was then propagated from crown divisions and root cuttings and established at the Mountain Hort Crops Research Station at Mills River, NC, in 2000 and Laurel Springs, NC in 2002.

Names of propagators producing certified 'Nantahala' plants will be supplied upon request. North Carolina State University does not have plants for sale. United States plant patent protection is being sought for 'Nantahala'.

**Table 1.** Yield and fruit weight of raspberries harvested from Laurel Springs, and Mills River, NC.

	Mills River		Laurel Springs	
	Yield estimate <sup>z</sup> (g/plot)	Fruit wt (g)	Yield estimate (g/plot)	Fruit Wt (g)
Nantahala	1434 b <sup>y</sup>	3.5 a	3621 b	3.5 a
Caroline	4173 a	3.2 a	8027 a	2.5 b
Heritage	NA <sup>x</sup>	NA	5092 ab	2.9 ab

<sup>z</sup>Yield estimates were calculated using: Yield/plot = yield/cane of 3 canes/plot \* no. canes/plot. 1 plot = approximately 3 ft x 20 ft.

<sup>y</sup> Means in a column followed by different letters are significantly different at the  $p \leq 0.05$  level, Fishers LSD.

<sup>x</sup>NA, data not available (cultivar not included in Mills River trial).



**Figure 1.** 'Nantahala' red raspberry

## Preplant Disease Alert for the 2008-2009 Strawberry Season

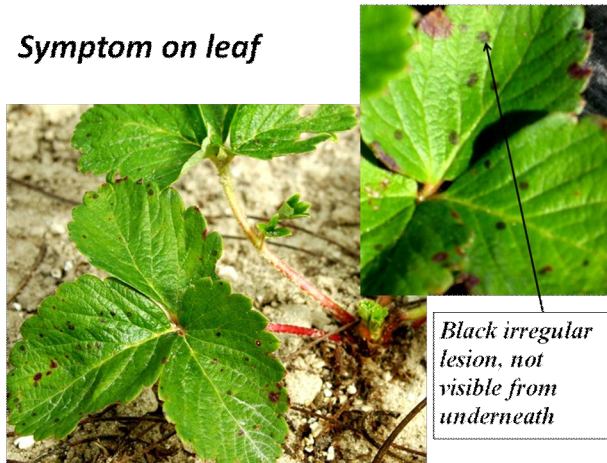
By Mahfuzur Rahman and Frank Louws, NCSU  
Dept. of Plant Pathology

Strawberry growers in North Carolina and the Southeast have experienced a year of *Colletotrichum gloeosporioides* ("Glo") horror with some growers losing as much as 90% of the crop. Many factors such as prevalence of a more aggressive strain of *Colletotrichum gloeosporioides* and a hot dry summer and fall may have aggravated the situation. Pathogenicity trials of isolates collected from fields with greater loss have revealed higher aggressiveness under greenhouse conditions. Ideally, growers who lost 60-90% of the plants and experienced plant collapse a couple of weeks after planting should have noticed some kind of black irregular lesions on the leaves as in Fig. 1 at the time of planting or during plug production. These lesions are different from common leaf spots caused by *Mycosphaerella*



*fragariae*, phomopsis blight or scorch, caused by *Diplocarpon earlianum*, where the lesion is visible from the underside of the leaf. The Glo leaf spots are only visible from the upper surface of the leaf.

### Symptom on leaf



**Figure 1.** Black lesion on the upper surface of leaf caused by Glo at higher severity. Presence of Glo doesn't always end up in producing symptoms. At lower level of quiescent infection in the leaf may not show any symptoms at all

Although there are alternate wild sources of inoculum (e.g. wild grapes) for the fruiting field, commonly *Colletotrichum* pathogens are introduced to the production system via infested plants. Hence, the best way to prevent disease problems is to make sure that the planting stock is not infected.

- Ask your plant supplier about any incidence of Glo symptoms in the nursery or plug production facility.
- Check the plants for any symptoms as in Fig. 1 on the leaves prior to planting. In case of any confusion, send to the Plant Disease & Insect Clinic at NCSU or your state clinic for confirmation.

- If there is no other option than using plants with known minor infestation, fungicide dip the fresh-dug plants with Switch @ 5-8 oz/100 gal water or dip plants in Abound @ 5-8 fl. oz/100 gal water. Dip plants for 2-5 minutes and plant as soon as possible after dipping. Follow all label directions carefully. If possible, minimize irrigation from overhead sprinklers. Our research results indicated that significant reduction of plant mortality and increase in yield can be

obtained by dipping infested plants in Switch before planting.

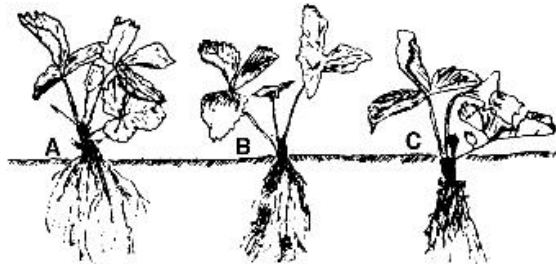
- Make sure soil salt concentration is in the acceptable range. Last season (2007-2008) many growers suffered extensive plant mortality due to high salt concentrations. The foliar symptoms (Fig. 2) were very similar to Glo crown rot symptom except crowns were clean.



**Figure 2.** Plant mortality due to abiotic causes (high soil salt content)

Assessment of soil salt concentration showed 40 ds/m which was 20 times higher compared to > 2 ds/m for normal salt contents. If high salt concentration occurs, turn on the drip to wash down salt and reassess whether salt levels have returned to a normal range.

Similar plant mortality symptoms were also observed in the field last year due to improper planting depth. For fresh-dug plants it is important to make sure that the mid-point of the crown is level with the soil surface as shown in Fig. 3



(Taken from "Strawberries" with the permission from Ronald C. Smith-NDSU)

**Figure 3.** Proper planting depth for fresh dug bare root plants. (A) Too Shallow (B) Correct (C) Too deep.

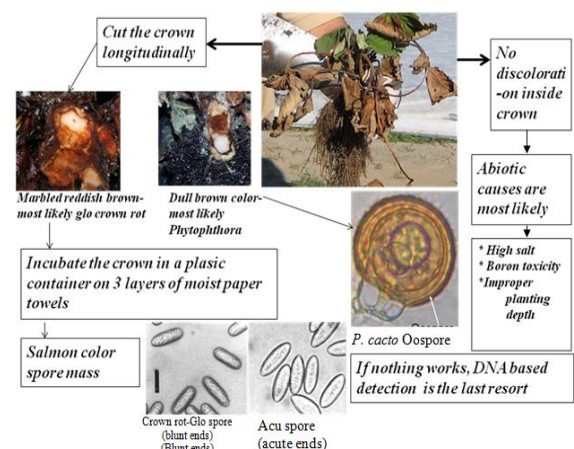
Although we did not see crown rot caused by *Phytophthora cactorum* at a high frequency last year, this might dominate in some fields, putting proper diagnosis in the forefront of deciding management options. By following the flow diagram in Fig. 4, growers, with the help of extension agents, may be able to perform a rapid diagnosis of the plant collapse and take the right corrective measure before disease spreads in the field.

Phytophthora can also be a serious problem in the plug production phase. The pathogen can be introduced on contaminated tips and cause severe losses. Symptoms include poor rooting, tip-over of leaves, and dark black lesions on the foliage or leaf stems. (Fig. 5). Heavy infestations often lead to a decision to discard infected plants (not near any water ways) and seek a clean source of plants. Planting infected plants into the field could result in yearly recurrent problems since the pathogen is able to survive for many years in the soil.

If anthracnose crown rot is detected in the field, random collection of leaf samples from the whole field followed by a paraquat dip protocol (done in the lab) should be able to indicate how widespread the inoculum is in the field. Fall applications of captan + a Qol fungicide (e.g. Abound, Cabrio or Pristine) will be required if infestation is present in the whole field; spot application is worthwhile when infestation is localized. If *Phytophthora* is present, application of Ridomil Gold @ 1.0 pt/treated acre should be effective in keeping the situation under control. It is very unlikely to have crown rot caused by *C. acutatum* without seeing extensive petiole lesions.

Some of the growers who had the *Colletotrichum* crown rot problem last year may have to use the same piece of land for another strawberry crop, due to the unavailability of other land for planting. This raises the obvious concern whether the next crop can be affected by the over-summering inocula of the previous crop. No specific research for NC has been conducted in this regard. However, results from Florida indicated that *C. glo* in the plant debris buried in soil does not survive over summer in strawberry tissues. The time between the end of last season's strawberry crop and the planting of the next season (four to six months) should be sufficient to get zero survival of inocula in plant debris. However, this result needs to be interpreted with caution as the decay of strawberry crowns in soil can be affected by soil properties, soil moisture content, soil temperature, and microbial dynamics. Soil moisture close to 22% or field capacity was found to support faster decay of tissue and inversely correlated with survival of inoculum. Plants in the crown rot-affected fields need to be killed and incorporated into the soil as soon as harvest is done. Pre-planting fumigation also needs to be done with extra care to make sure all the beds receive required amount of fumigants. Overall risk involved with carry-over inoculum is very low if the conditions mentioned above are fulfilled.

*The Plant Disease & Insect Clinic at NCSU accepts samples both from in-state and out-of-state. For information on fees and on how to submit samples, visit <http://www.cals.ncsu.edu/plantpath/extension/clinic/Submit/submit.htm>.*



**Figure 4.** Rapid diagnosis of the causal agent involved with early plant mortality



**Figure 5:** *Phytophthora* disease pressure during plug production. Top Left- range of symptoms in 10-day old plugs showing no rooting and blackened leaves and leaf stems. Top Right – poor plug stand and range of symptoms including leaf tip-over. Bottom Left – close up of one leaf and petiole that recently became infected and the pathogen has not migrated into the crown or other leaves. Bottom Right – microscopic view of oospores in plug plant tissue. These oospores can survive in field soils for many years such that *Phytophthora* crown rot can become a recurrent problem in infested fields.

### **Some Brief Observations of the Blueberry Industry in Argentina Following a 2008 Trip**

*D. Scott NeSmith, University of Georgia*

Argentina has rapidly become a major global player in the fresh blueberry industry in a short amount of time. In August 2008 I made my second trip to Argentina in the past 3 years. It was surprising to see how quickly this new production area has expanded its blueberries! In 2003, the country had less than 2000 acres underway, and in 2008 they have more than 10,000 acres planted and are still expanding. To date, almost 100% of the fruit is marketed as fresh product, with nearly all being exported to North America and Europe, with smaller amounts to Japan. During the 2007-2008 growing season, lower than expected prices were received for much of the fruit, hence, newer plantings are being considered more cautiously. None the less, many young plantings can be readily observed (Fig. 1).



**Figure 1.** Two-year old field of southern highbush blueberries in Argentina, August 2008.

### **Growing Regions**

There are three main growing regions in Argentina. The area around Tucuman is located in the more northern part of the country, and here they produce the earliest ripening berries. Harvest from this region begins in September. Chilling hours received here are low, but they are successful at producing 400 or less chill hour varieties in this region due to its elevation. I have yet to visit this region, but it is an area of heavy focus due to the early season possibilities. As southern highbush blueberry varieties are developed with lower chilling requirements, production will continue to expand in this area of the country.

The second major growing region is near Concordia which is in the area referred to as the Entre Rios. This region borders Uruguay, and is situated between two great rivers. Soils here are good agricultural soils, and blueberries can be harvested here beginning in late October. Chill hours received in this area easily allow varieties with a 300 to 500 chill-hour requirement to be produced. In early plantings, the varieties O'Neal and Misty were heavily planted in this and other regions. However, cultivars now being grown are largely newer releases such as 'Star', 'Emerald', and 'Jewel' (Fig. 2).





**Figure 2.** A newer field of the varieties Emerald, Jewel, and Star near Concordia.

The third important growing region in Argentina is the area around Buenos Aires. This is a larger area with more diversification in soils and climate than the other regions. Some berries in this area may ripen in mid to late November, but generally the harvest period here would be December through early February. Varieties in this area receive 500 to 800 chill hours per year and more as you go south. Many of the plantings near Buenos Aires are still southern highbush, but some rabbiteye varieties and northern highbush can be found there.

### Challenges

One of the troublesome issues in many parts of Argentina is crop damage from hail storms. Therefore, it is not uncommon to see hail netting structures around many fields (Fig. 3).



**Figure 3.** In Argentina hail netting is common to reduce damage to the blueberry crop.

In the heavier soils around the Buenos Aires region, older plantings can be plagued by poor drainage (Fig. 4). Newer replacement plantings are being more carefully prepared with bedding and improved field drainage systems.



**Figure 4.** Poor drainage in these heavier soils has caused stunting and stand loss in this older field near Buenos Aires.

Since much of the focus in Argentina is trying to achieve early production, frost and freeze events typically cause damage in some of the areas year in and year out. Some growers have overhead sprinkler irrigation for frost protection (Fig. 5, upper photo), while others have to rely on other methods such as orchard heaters (Fig. 5, lower photo).



**Figure 5.** Freeze protection measures include overhead sprinkler irrigation (upper photo) and systems of orchard heaters (lower photo).

There are a number of diseases that challenge growers including root rot organisms and leaf fungi. One disease that has caused problems in some fields but little is known about is crown gall (Fig. 6).



**Figure 6.** A blueberry plant in Argentina with crown gall symptoms.

### Outlook for the Future

All in all, the future outlook for blueberries in Argentina appears to be good. Labor is plentiful and affordable to do any number of tasks. I have even observed workers removing older leaves from plants by hand to reduce potential disease pressure (Fig. 7). It appears many of the older plantings that included less vigorous and productive varieties such as Georgiagem and O'Neal will have to be renovated with newer varieties that are higher yielding and more suitable to the various regions. Blueberry nurseries for plant supply are becoming less common, but larger nurseries such as MR Berry (Fig. 8) are providing high quality plants of the newest patented varieties from the U.S. Fruit supply from Argentina will be on the increase in the next few years, so likely prices there will continue to adjust accordingly (i.e., will be lower). Growers will need to seek ways to become more cost effective in production to maintain a desirable profit level. So, I foresee this not-so-long-ago "infant industry" going through a struggling "adolescence phase" in the next few years. However, there is little doubt that Argentina will continue to be prominent in blueberry production for years to come.



**Figure 7.** Field laborers remove old leaves by hand to prevent infection of newly emerging leaves with diseases such as rust.



**Figure 8.** A blueberry nursery growing facility of MR Berry in Argentina.

### Bramble Chores

Bramble (Caneberry) Growers Checklist  
Gina Fernandez, Small Fruit Specialist  
North Carolina State University

FALL 2008

#### *Plant growth and development*

- ✓ Primocanes continue to growth but slow down.
- ✓ Flower buds start to form.
- ✓ Primocane leaves senesce late fall.

#### *Pruning and trellising*

- ✓ Spent floricanes should be removed asap
- ✓ Optimal time to prune is after the coldest part of the season is over. However, pruning can start in late fall if plantings are large (late winter for smaller plantings).
- ✓ Start trellis repairs after plants have defoliated



### *Weed management*

- ✓ 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 your states agricultural chemical manual and local extension agent for the best labeled chemicals to control these weeds. Also see <http://www.smallfruits.org/SmallFruitsRegGuide/Guides/2007/BrambleSprayGuideNewTrialVersion112607.pdf>

### *Insect and disease scouting*

- ✓ Continue scouting for insects and diseases.
- ✓ Remove damaged canes as soon as possible.
- ✓ Check the Southern Regional Bramble integrated Management Guide for recommendations <http://www.smallfruits.org/SmallFruitsRegGuide/Guides/2007/BrambleSprayGuideNewTrialVersion112607.pdf>

### *Planting*

- ✓ Growers in warmer areas (e.g. part of central southeastern NC) can plant in December. (Preparations for fall/winter planting should have already been made).
- ✓ Prepare list of cultivars for next years new plantings.

### *Fertilizer*

- ✓ Take soil tests to determine fertility needs for spring plantings. (We are currently reviewing our fertility needs in NC, stay tuned for more information in 2009).

### *Marketing and miscellaneous*

- ✓ Order containers for next season.
- ✓ Make contacts for selling fruit next season.
- ✓ Plan on attending bramble (caneberry) sessions at either the SOUTHEAST REGIONAL FRUIT AND VEGETABLE GROWERS CONFERENCE in Savannah GA January 8-10, 2009 (<http://www.gfvga.org/conferences/2007FVWC/ConferenceMain.htm>) or the North American Raspberry and Blackberry Growers Association

meeting in Michigan Dec. 8-9, 2008.  
([www.raspberryblackberry.com](http://www.raspberryblackberry.com))

## **Strawberry Growers Checklist**

Gina Fernandez

North Carolina State University

- ✓ Fumigate in early Sept in NC, and put down plastic.
- ✓ Know your plant back times for fumigant used.
- ✓ Plant ryegrass in aisles (1 bu/acre) before you punch holes in plastic
- ✓ Set up overhead irrigation system. Check pups, pipes and nozzles.
- ✓ Plant in mid-to-late September for high elevation and western NC, early-to-mid October for the piedmont regions, and late October for the Coastal Plain.
- ✓ Use overhead irrigation as needed for plugs or fresh dug plants. Fresh dug need water from 9-5 for 7-12 days, plug plants need water five hours the first day, three hours the second day and two hours the third day More may be needed if weather is hot and sunny.
- ✓ Check for dead plants and reset asap.
- ✓ Watch for pests: insects and diseases, and deer.
- ✓ Fall irrigate if soil is dry.
- ✓ Hand weed emerging winter weeds.
- ✓ Consider placing row covers on plants the first 10 days of Nov. for additional flower development this fall and higher yields next spring (optional).
- ✓ Inspect plants late fall and winter for crown development, you should see 2-3 crowns by December in a normal year.
- ✓ Protect plants and plastic from deer, set up deer fence before ryegrass germinates.
- ✓ Make plans to attend the Southeast Strawberry Expo., November 6-8, 2008. For more information see: <http://www.ncstrawberry.org/>

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**Editor and Contributor ..... Tom Monaco**

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