

Title: **Increasing High Tunnel Strawberry Productivity in the Late Fall and Early Winter with Day Neutral Strawberries and the New Florida Short Day Cv. Radiance**

Progress Report

Grant Code: Research SRSFC Project # 2011-07

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Objectives:

- 1) The main research objective of this project is to investigate the late fall and winter season fruiting potential of four promising day-neutral strawberry cultivars (Albion, San Andreas, Monterrey, and NCL-303), as well as a new short day cultivar from Florida (Radiance), at the Piedmont Research Station (PRS) in Salisbury. Greatest emphasis will be placed on identifying a cultivar that can begin fruiting in mid-October (45 days post-transplant), and then achieve at least 1/3rd lb marketable fruit production by December 31 (120 days post-transplant).
- 2) To provide conditioned plugs of the same test material that we will be evaluating in 2011-2012 at PRS to high tunnel cooperators in Arkansas (Garcia and Vincent, U of A), Georgia (Bob Mathews, Baxley), South Carolina (Bob Hall, York), Tennessee (Annette Lynn Wszelaki, UT), and North Carolina (Patterson Farms, China Grove)

Methodology:

First Research Objective: The first research objective of investigating late fall and winter season fruiting potential of 4 day-neutrals (Albion, San Andreas, Monterrey, NCL-303) and the new short day cultivar Radiance, was not undertaken as described in the project proposal submitted in late October 2010. We learned that Radiance is extremely susceptible to crown rot caused by *Phytophthora cactorum* (Lebert & Cohn) J. Schrot. We started to see evidence of this problem with crown rot in a 2009-2010 high tunnel at PRS (see Figure 1).

A second problem we encountered with Radiance relates to the Florida Strawberry Growers Association and the \$1,000 fee that the FGSA is charging out-state researchers like ourselves to propagate this cultivar. Also, after seeing the poor performance of Radiance in our high tunnel at PRS as well at Patterson Farms (China Grove, NC), we felt it best to simply abandon any further attempts to use Radiance in our work.



Fig. 1. Radiance exhibited high susceptibility to crown rot in high tunnel trials in 2009-2010 at PRS. In this particular plot (706A) and treatment #15 (Radiance plugs from Quebec, Canada), the average yield per plant was only 1.0 lb/plant, which was a disappointing outcome for the 2009-2010 season.

Important Research Changes Made in Fall 2011:

In the fall of 2011, we did proceed ahead with high tunnel strawberry trials at PRS. After several years of researching production methods to increase fall and early winter fruit production in the Piedmont of NC, it has been determined that the current cultivars and nursery conditioning practices are inadequate for producing economically viable production patterns in the Piedmont of NC given the increased costs of production associated with tunnels. Our current focus for tunnel production is enhancing the earliness of spring fruiting therefore removing the emphasis on fall and winter fruiting.

Results (Objective 1)

In the fall of 2010, a trial was established in a 26’x 100’ high tunnel at the Piedmont Research Station in Salisbury, NC. Genotypes evaluated were selections from the 2010 seedling fields which originated from a diverse collection of open pollinated and hybrid families. A single 10 plant plot of 72 selections were planted on 2 October 2010. The tunnel was left uncovered during the winter and row covers (1.5 oz/yd²) were applied on December 10, 2010 for cold weather protection. Plastic was applied to the tunnel the first week of January, 2011 and temperatures were passively managed to sustain a target daytime temperature of 75 degrees F. The top 12 performing selections are shown in table 2. Harvest began on 18 March and continued to 3 May. This method advanced the harvest 3 to 4 weeks earlier compared to outdoor production. These results indicate that early spring forcing can be an economically positive production system that compliments open field production with minimal overlap of fruit production.



Table 2. High tunnel performance of NCSU advanced selections (harvest began 3/18 and ended 5/3).

Selection	Marketable yield (lb/a)	Average	
		Berry Weight (g)	Brix
NCST 10.73	34,584	23.9	6.9
NCS 10.99	25,000	20.9	7.2
NCS 10.82	24,822	23.6	9.3
NCST 10.70	24,424	18.1	7.9
NCS 10.93	22,671	24.0	nd
NCS 10.30	22,361	18.8	7.7
NCH 10.41	22,143	22.4	6.2
NCS 10.83	21,977	20.2	7.3
NCST 10.03	21,713	23.4	7.1
NCS 10.38	20,766	25.6	8.8
NCS 10.32	20,663	26.4	8.3
NCS 10.109	20,089	23.5	8.1

In contrast, our previous work with tunnels using Florida genotypes has yielded approximately 15% of the harvest occurring during the fall and early winter months which was followed by the remaining yield overlapping significantly with the field season. The lack of early spring fruiting has occurred in our trials due to winter snows requiring the removal of the tunnel plastic to protect the structure. Plants were in an active flowering state during the adverse weather and subsequently experienced plant damage due to the physiological state of the protected plants. Furthermore, in our trials, it has been economically unfeasible to produce sustainable fruit production in the fall and early winter to offset the increased management inputs required for this production system.

2011-2012 Season: We are continuing with this approach and have planted a replicated trial at PRS with 17 advanced NCSU 2010 selections and an un-replicated evaluation of 34 selections from the 2011 seedling populations. Management practices will follow the methods outlined for the 2010-11 season to assess the repeatability of the early harvest pattern. In addition to the research station tests, we are also continuing to collaborate with Patterson Farm in China Grove, NC. Fresh dug plants from western NC of

Strawberry Festival and Camarosa were planted in an uncovered Haygrove (series 4 and super solo style) tunnels. Tunnels will be managed similar to the PRS site where plastic will be applied in early January to force early spring fruit. This test will allow us to evaluate the performance of tunnel type and cultivar which will contribute to our future production recommendations.

Results (Objective 2 – Outreach Component)

We provided another 6,500 Albion plug plants for high tunnel and field plasticulture test trials in NC and South Carolina in 2011. Unfortunately, we could not secure permission from FGSA for propagation of Radiance for outreach trials. The University of California's Office of Technology Transfer did grant Dr. Poling permission to move conditioned plugs of Albion grown at UMRS to these eight (8) off-site locations (the original OTT agreement allowed only testing of Albion at UMRS and PRS):

- 1) 1,000 Albion plugs – were delivered to NC A&T University in Greensboro, NC, in early September for evaluation in a high tunnel owned by the university (under the direction of Keith Baldwin)
- 2) 2,000 Albion plugs - delivered to Mr Bob Hall, Bush-N-Vine Farm, 1690 Filbert Hwy, York, SC, [803-684-4954](tel:803-684-4954), and cell [803-627-2329](tel:803-627-2329), and the purpose will be to evaluate Albion plugs grown at the Upper Mountain Research Station vs. Albion plugs from Cashiers (Wayne Moss) - we have some very interesting data that is showing that Albion grown at UMRS are on a slightly different fruiting cycle than from mountains further south (Cashiers, NC).
- 3) 500 Albion plugs to each of three NC growers in the central piedmont to evaluate what we believe are some important thermo-dormancy issues with this day-neutral, and our goal is to identify and optimum planting date for field production (not high tunnel). We have reason to believe that Albion may have a place along with Chandler and Camarosa in the spring season, and it is my belief that Albion may fruit on a different cycle in May (later) as well as produce into June. These are the names of the 3 cooperators (500 each):
- 4) Kenneth Rudd, Rudd Farms, 4021 Hicone Rd, Greensboro, NC 27405, phone [336-621-1264](tel:336-621-1264), and cell [336-362-5890](tel:336-362-5890) (Kenneth is past president of NC Strawberry Association, and is one of our leading growers in Piedmont NC) (500 Albion plugs)
- 5) James and Bernie Kenan, Bernie's Berries, 6126 Jonquil Drive, Greensboro, NC 27407, phone [336-852-1594](tel:336-852-1594) (Bernis is a current Board Member of NCSA) (500 Albion plugs)
- 6) Michael Beal, President, NCSA, and his farm, Kildee Farm, is located: 936 Kildee Church Rd., Ramseur, NC 27316, phone [919-742-3600](tel:919-742-3600) and cell 919-795-1181 (500 Albion plugs)
- 7) Tracey and Shawn Harding, Southside Farms, 320 Harding Lane, Chocowinity, NC 27817, phone [252-946-9349](tel:252-946-9349) and cell 252-945-1078 (250 Albion plugs). This ENC location will be very interesting re: thermo-dormancy issue, as this area can be quite a bit warmer in the fall. These were delivered by Rod Gurganus, Director, NC Market Ready, NCCES

We are in the process now of collecting feedback from all the test cooperators, and we anticipate making a full report to the SRSFC about this outreach component in 2012.

Conclusions (3)

- Due to the poor performance of Radiance in our high tunnel at PRS as well as at Patterson Farms (China Grove, NC), we feel it best to simply abandon any further attempts to use Radiance in our work
- Our current focus for tunnel production is enhancing the earliness of spring fruiting therefore removing the emphasis on fall and winter fruiting
- Albion is showing promise for high tunnel production in the off-season fruiting, as well as in the spring (see Figure 3). A report in summer 2012 will identify how Albion performed in a high tunnel situation during the fall/winter/spring of 2011-2012.



Figure 3. This photo shows the early fruit production that we achieved at PRS with the day-neutral Albion by moving our transplant date from mid-September to the 1st of September in 2010 (photo taken 10/20/10, Albion plug plant set 9/1/10). The early set Albion plugs do require some runner removal, but this is a normal operation to expect for such an early planting.

Impact Statement

As stated on the SRSFC website, “Small fruit crops are knowledge and technology-intensive enterprises, and all the land grant universities in the southern region have their strengths and weaknesses with regard to expertise and information dissemination with these crops.”

This particular project (Research SRSFC Project # 2011-07) has been designed to advance a new technology for off-season strawberry production across our region, and it

takes advantage of the infrastructure that NC State University already has in place for High Tunnel research at the Piedmont Research Station (PRS) in Salisbury, NC, as well as new plug propagation facilities located at the Upper Mountain Research Station in Laurel Springs that were developed with funding from the Tobacco Trust Fund. The plug facility is used for producing conditioned strawberry plugs that can be shared with other researchers (e.g. Dr. Keith Baldwin, NC A&T), as well as growers in NC and SC. The SRSFC has provided critically needed funding for us to continue with these collaborative, multi-state research and outreach efforts. A report will be submitted in the summer of 2012 on the direct industry the impacts of this project.

Citation(s) for any publications arising from the project

- **Preliminary Report on Albion Strawberry in Piedmont, NC**
E. Barclay Poling Professor Emeritus & Small Fruit Specialist,
<http://www.smallfruits.org/Newsletter/Vol11-Issue3.pdf>