Title: Trialing advanced strawberry selections in the Southern Region
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Research proposal

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Objective: To evaluate advanced selections of strawberries from the NC State University strawberry breeding program at research stations and on-farm locations throughout the SEUS, Part 2: Trueness-to-type testing, large scale propagation and potential cultivar release.

Justification and Description
For the past 20 years, two cultivars have been the backbone of the southeastern US strawberry production acreage. ‘Chandler’ released by the University of California in 1982, is adapted to the wide range of climates and soils across the southeast region. ‘Chandler’ has consistently high yields, excellent flavor and is a favorite of pick-your-own customers. ‘Camarosa’ was released by UC in 1992. It was at first rejected by the industry because of its firmness, however, overtime ‘Camarosa’ has grown in popularity, and has begun to replace ‘Chandler’ acreage in specific regions of the SE. ‘Camarosa’ is grown for its exceptional fruit firmness, excellent post-harvest life and large, deep red fruit. A third cultivar, ‘Sweet Charlie’, a variety from the University of
Florida is the cultivar that is most often planted when growers want to establish fruit in early market windows, as it ripens 5-7 days before ‘Chandler’. However the yield of ‘Sweet Charlie’ is low in comparison, and the flavor is either really liked or just tolerated by growers and customers.

The strawberry breeding program at NC State University has undergone recent transitions (2008 and 2014), with changes in leadership. However, with cooperation between the leaders, the program has continued to move forward. We have developed a number of advanced lines of strawberry that are adapted to the climate of the Southeastern US. In 2014, 18 advanced lines were evaluated at 3 locations in NC. Data collected in 2014 and previous years, has indicated that of these 18 advanced lines, 2 are candidates for the next step in evaluation, trialing at locations outside of our research station system. NCS 10-156 is an early genotype that has uniform fruit with excellent flavor, rich red color that has consistently good yields. It is a potential ‘Sweet Charlie’ replacement. It is a bit soft, comparable or better than ‘Sweet Charlie’ or ‘Chandler’. The other promising selection is NCS 10-038. It is a potential ‘Chandler’ replacement with high yields, firmer fruit and its more uniform production across the season than ‘Chandler’.

In the summer of 2014, we sent the two elite selections (NCS10-056 and NCS 10-038) to the Micropropagation and Repository Unit (MPRU) at NC State University. The MPRU produces, maintains and supplies specific pathogen-tested plant material of berry crops including strawberry. The program uses thermal therapy to eliminate viruses from plants and assesses plants for known viruses using laboratory tests and biological indexing. The MPRU is part of the National Clean Plant Network for Berries (NCPN-B) (http://www.ncpnberries.org).

Clean material from the MPRU was available during the winter of 2015-16 to increase plant numbers out of tissue culture under clean conditions at the MPRU greenhouses. These plants will be used for trueness-to-type observations and for increase for medium scale propagation at a nursery. NCSU is testing the MPRU material in side-by-side trials at 2 locations for trueness-to-type verification. Plants will be observed for potential off type traits, and yield data will be collected on both types of plants. Approximately 400 MPRU propagated plugs will be sent to a commercial nursery (Norton Creek Farms/Nate Moss, Cashiers NC) for commercial propagation in early 2016 to increase plant numbers. Small numbers of these plants will be sold to growers in NC, SC, VA and other states in the region.

**Timeline:**
Fall 2015. Plants propagated in the field under clean as possible conditions were sent to VA, SC and NC growers and collaborators.
Winter 2016. MPRU propagates 400 plants in their facility. Send to nursery in Feb.
Spring 2016. Nursery will propagate plants, the target ratio is 50:1, and so 20,000 plants could be generated. Plants
Summer 2016. Team discusses results from 2015-16 on-farm trials and prepares data for release information.
Fall 2016. Release of at least one of the NCSU selections, if data and feedback from cooperators is positive. Plants or tips sold to growers in SC, NC, VA and other states in the southern region.
Conclusions

Micropropagation
In the spring of 2015, we received 20-30 mother plants of each genotype that had gone through meristem culture, tissue culture increase and had been tested for 15 viruses by the NCSU Micropropagation and Research Unit (MPRU) (Table 1). Clean plants were established in pots. Potted clean plants were established in an isolated greenhouse at the Sandhills Research Station (SRS) in Jackson Springs, NC for runner production. Runners were collected in early September, tips were set into plug trays and propagated at the Piedmont Research Station. Over 200 plug plants were produced from the original mother plants.

Trueness-to-type testing
Replicated plots at the Central Crops Research Station in Clayton NC had 20 genotypes including NCS10-156 and NCS 10-038 that were from field grown plants. In addition, plants that had undergone micropropagation were set in adjacent unreplicated 10-20 plots for observation. Both plots were monitored through the growing season. There were no differences in appearance and estimated yield between the field produced and the MPRU plants.

Large Scale Propagation
In the spring of 2016, X MPRU mother plants were delivered to Norton Creek Farms, Cashiers, NC. Plants were set in the field for bareroot propagation. Over 1500 plants were harvested.

Grower distribution for 2016-17 season (9 on farm locations in 3 states) 50-350 plants of NSC10-156 and NCS 10-038 were planted at the following locations in late summer/fall 2016.
6 NC growers: Cottle Farms (Duplin Co), Lewis farm and nursery (Pender Co), Patterson Farm (Rowan Co), TC Smith Produce (Pitt Co), and Bernies Berries (Guilford Co).
SC grower: Strawberry Hill Chesnee, SC

Potential for release
Yield and qualitative data for the two selections, NCS 10-156 and NCS 10-038 are very promising (see separate report). Feedback from growers in 2016 was very good (also in separate report). Further feedback on larger scale plantings in 2017 will determine if we will formally release these 2 selections. We will continue to propagate them Norton Creek Farm and plants will be ready for wider distribution in fall of 2017.

Funds from the SRSFC for the past 2 years have been essential in covering costs of travel, propagation and part time labor. It would have been very difficult to impossible to scale these selections up without this funding and grower organization funding (NCSA and NASGA), as there were no operating funds available when the program underwent transition in leadership 2014.

References:
Table 1. Virus Testing Results for NCSU Strawberry Selections
NCL 04-17, NCS 10-038, NCS 10-156, NCL 09-11, NCS 10-032, NCST 10-777

**List of Pathogens**
Apple Mosaic Virus
Arabis Mosaic Virus
Beet Pseudo-Yellows Virus
Fragaria Chiloensis Latent Virus
Strawberry Crinkle Virus
Strawberry Chlorotic Fleck Virus
Strawberry Latent Ringspot Virus
Strawberry Mild Yellow Edge Virus
Strawberry Mottle Virus
Strawberry Necrotic Shock Virus
Strawberry Pallidosis Virus
Strawberry Vein Banding Virus
Tomato Ring Spot Virus
Tomato Black Ring Virus
Tomato Ring Spot Virus
Phytoplasma

TC derived plants of six NCSU selections tested negative for all pathogens listed above.