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NCSU Strawberry Yield Trials 2015-16

Gina Fernandez and Rocco Schiavone North Carolina State University

Replicated trials were conducted at the Central Crops Research Station (CCRS) in Clayton NC and at the Piedmont Research Station (PRS) in Salisbury NC. In both locations, we tested 20 genotypes (numbered selections and named cultivars), including three advanced selections from our breeding program and several cultivars from the UC Davis, U Florida and Lassen Canyon programs. These include: NCS 10-038, NCS 10-156, NCL 04-17, Chandler, Camarosa, Sweet Charlie, Camino Real, Portola, Merced, Monterey, Albion, San Andreas, Radiance, Sensation, Winter Dawn, Winter Star, Sweet Ann, Ruby June, Scarlet, and Lucia.

We harvested fruit from 20 plant plots replicated 3 times at each location. Total yield (all the berries), marketable yield (berries greater than 10 g and free of noticeable defects), and berry size (based on 25 random marketable berries) was collected over an approximate 6 week period. Data is also presented as a % of marketable yield, and % of Chandler yield. Table 1 is yield from PRS, Table 2 is yield from CCRS, Table 3 and 4 compares yield from genotypes we had both in 2014-5 and 2015-6 at PRS and CCRS over the past 2 years. Tukey MSD at the bottom of the columns indicates the number that statistically distinguishes yield of one cultivar from the other. Figures 1 and 2 are close-up shots of NCS 10-038 and NCS 10-156, the two promising NCSU selections.



Figure 1: NCS 10-038.



Figure 2: NCS 10-156.

There is a lot of information in these tables. Here are some highlights:

- In both locations, NCS 10-038 had the highest total and marketable yield, although statistically (that Tukey MSD number) does not indicate that yields are statistically higher than most of the highest yielding genotypes.
- Berry size of NCS 10-038 is comparable ٠ or slightly smaller than Chandler.
- At PRS, 10 genotypes had marketable yields as high or higher than Chandler (Table 1), while at CRS, 4 genotypes had yields as high or higher than Chandler (Table 2).
- NCS 10-156, had yields higher and lower than Chandler. Berry size was either slightly larger or smaller than Chandler, but statistically there was not a difference.

Table 1. PRS 2015-16 Total yield, marketable yield	, percent marketable yield and average
berry weight.	

Genotype	Total Yield (g/plant)	Total Yield (Ibs/A)	Marketable Yield (g/plant)	Marketable Yield (Ibs/A)	Percentage Marketable Yield (% of total)	Marketable Percent of Chandler	Average berry weight (g)
NC10-038	931	35749	771	29605	82.8%	153%	16.4
Monteray	756	29025	696	26695	92.0%	138%	25.4
Camino Real	767	29436	692	26553	90.2%	137%	23.0
Portola	760	29185	659	25283	86.6%	130%	23.3
NC10-156	697	26757	586	22484	84.0%	116%	18.9
Sensation	671	25746	558	21427	83.2%	111%	23.6
Camarosa	637	24431	550	21107	86.4%	109%	21.7
San Andreas	592	22718	520	19971	87.9%	103%	23.9
Winter Star	615	23602	507	19441	82.4%	100%	19.3
Chandler	665	25505	505	19389	76.0%	100%	16.9
Sweet Ann	544	20862	496	19018	91.2%	98%	33.7
Albion	503	19316	468	17963	93.0%	93%	24.2
Winter Dawn	570	21880	463	17784	81.3%	92%	17.8
Scarlet	523	20071	439	16858	84.0%	87%	31.9
Ruby June	485	18608	429	16462	88.5%	85%	24.4
Merced	457	17526	414	15898	90.7%	82%	26.1
Sweet Charlie	488	18712	406	15592	83.3%	80%	17.3
Lucia	383	14710	344	13220	89.9%	68%	25.1
Radiance	394	15103	315	12079	80.0%	62%	20.0
NCL04-17	353	13553	205	7854	58.0%	41%	11.5
	t	ukey msd 975	2 tu	ukey msd 1004	46		tukey msd 5.64

Table 2. CCRS 2015-16 Total yield, marketable yield , percent marketable yield and average berry weight

Genotype	Total Yield (g/plant)	Total Yield (Ibs/A)	Marketable Yield (g/plant)	Marketable Yield (Ibs/A)	Percentage Marketable Yield (% of total)	Marketable Percent of Chandler	Average berry weight (g)
NC10-038	785	30131	712	27309	90.6%	132%	17.5
Camino Real	668	25619	615	23603	92.1%	114%	21.5
Camarosa	668	25619	607	23290	90.9%	113%	18.2
Chandler	669	25690	539	20698	80.6%	100%	19.8
Portola	649	24909	520	19942	80.1%	96%	19.8
NC10-156	558	21400	485	18603	86.9%	90%	14.6
Sweet Ann	602	23104	457	17549	76.0%	85%	22.4
Ruby June	497	19085	443	17011	89.1%	82%	20.6
Merced	473	18163	421	16160	89.0%	78%	19.6
Sensation	456	17517	410	15725	89.8%	76%	18.8
Monteray	487	18707	388	14886	79.6%	72%	20.1
Winter Star	468	17964	379	14547	81.0%	70%	16.9
Sweet Charlie	337	12941	306	11725	90.6%	57%	14.2
Scarlet	490	18797	304	11680	62.1%	56%	23.9
Lucia	390	14982	291	11155	74.5%	54%	17.4
Albion	360	13811	290	11149	80.7%	54%	20.2
San Andreas	374	14342	269	10317	71.9%	50%	18.3
Radiance	220	8461	196	7520	88.9%	36%	16.8
Winter Dawn	227	8710	182	7002	80.4%	34%	12.7
NCL04-17	253	9709	174	6675	68.8%	32%	7.6
	t	ukev msd 914	7 t	ukey msd 771	2		tukey msd 3 85

Table 3. PRS 2015 and 2016 Total yield, marketable yield , percent marketable yield and average berry weight.												
Genotype	2015 Total Yield (g/plant)	2016 Total Yield (g/plant)	2 year average Total Yield	2015 Marketabl e Yield (g/plant)	2016 Marketabl e Yield (g/plant)	2 year average Marketabl e Yield	2015 Marketabl e Percent of Chandler	2016 Marketabl e Percent of Chandler	2 year Marketabl e Percent of Chandler	2015 Average berry weight (g)	2016 Average berry weight (g)	2 year average Berry Wt
NC10-038	751	931	841	646	771	709	119%	153%	136%	22.5	16.4	19.5
Camino Real	519	767	643	459	692	575	84%	137%	111%	24.7	23.0	23.8
NC10-156	418	697	558	346	586	466	64%	116%	90%	18.9	18.9	18.9
Camarosa	268	637	452	207	550	379	38%	109%	74%	20.4	21.7	21.0
San Andreas	588	592	590	479	520	499	88%	103%	96%	23.0	23.9	23.4
Chandler	733	665	699	543	505	524	100%	100%	100%	18.0	16.9	17.4
Sweet Ann	396	544	470	329	496	412	61%	98%	79%	37.7	33.7	35.7
Albion	312	503	408	266	468	367	49%	93%	71%	25.8	24.2	25.0
Merced	503	457	480	393	414	404	72%	82%	77%	22.2	26.1	24.1
Courses Chevelie	200	400	200	224	400	215	410/	0.00%	C10/	14.0	17.0	10.1

Table 4. CCRS 2015 and 2016 Total yield, marketable yield, percent marketable yield and average berry weight.												
Genotype	2015 Total Yield (g/plant)	2016 Total Yield (g/plant)	2 year average Total Yield	2015 Marketabl e Yield (g/plant)	2016 Marketabl e Yield (g/plant)	2 year average Marketabl e Yield	2015 Marketabl e Percent of Chandler	2016 Marketabl e Percent of Chandler	2 year Marketabl e Percent of Chandler	2015 Average berry weight (g)	2016 Average berry weight (g)	2 year average Berry Wt
NC10-038	656	785	720	617	712	664	98%	132%	115%	24.3	17.5	20.9
Camino Real	547	668	607	505	615	560	80%	114%	97%	25.6	21.5	23.5
Camarosa	212	668	440	132	607	369	21%	113%	67%	19.8	18.2	19.0
Chandler	733	669	701	632	539	586	100%	100%	100%	20.8	19.8	20.3
NC10-156	547	558	552	495	485	490	78%	90%	84%	20.7	14.6	17.7
Sweet Ann	709	602	656	614	457	536	97%	85%	91%	35.7	22.4	29.1
Merced	710	473	592	648	421	535	103%	78%	90%	27.3	19.6	23.4
Sweet Charlie	244	337	291	219	306	262	35%	57%	46%	17.3	14.2	15.7
Albion	277	360	318	254	290	272	40%	54%	47%	27.6	20.2	23.9
San Andreas	645	374	509	583	269	426	92%	50%	71%	25.2	18.3	21.7

- Camino Real and Monterey had the highest yield of all the UC Davis cultivars.
- Sensation had the highest yield of all the Florida cultivars.

- Sweet Ann, from Lassen Canyon had the largest berry size of all the genotypes in these trials.
- NCL 04-17 had low yields and small fruit.
 We are looking at its potential as an ornamental/home garden cultivar.
- Table 3 and 4 show how yield data can vary from year to year in the same location.

We have additional data on season of ripening, fruit quality (shape, appearance, texture, flavor, firmness etc.) as well as fruit chemistry. Here are some highlights:

- NCS 10-038 maintains its yield through most of the season
- NCS 10-156 is consistently rated with the highest flavor ratings
- Ruby June also scored high in our flavor ratings
- San Andreas was the firmest berry

We will present more of this data, including grower comments on the NC selections at the Southeast Regional Fruit and Vegetable Expo in Savannah GA, Saturday Jan 7, 1:30-2:00 pm.

Grower feedback from 2015-16 season NC growers:

- "NCS 10-156": comparable to Sweet Charlie early on
- "NCS 10-038": has potential for ENC, good vigor, good canopy cover in heat
- Need more feedback in 2017!

Powell Smith (Clemson Univ)

• NCS 10-156: "Most people think that the shape, taste, and aroma are superior to 'Camarosa' this year. It appears to be a really good strawberry".

Andy Rollins (NCSU)

 NCS 10-156: "Very typical strawberry shape, no 'flat' berries, excellent aroma with a bright red color, flavor with some tartness"

'Opportunity' and 'Enchantment' Wine Grapes for the Mid-South

John R. Clark and Renee Threlfall University of Arkansas



Photo: Clusters of 'Opportunity' white wine grape.

'Opportunity' and 'Enchantment' wine grapes are new cultivars developed by the University of Arkansas System Division of Agriculture, the first wine grapes from the program. Both cultivars have shown good adaptation and consistent productivity in Arkansas. Enological evaluations have shown that these cultivars produced quality wines from fruit grown in Arkansas. 'Opportunity' is a white wine grape, while 'Enchantment' is red. It is envisioned that these cultivars will be best utilized by Mid-South wine-grape growers and wine makers and will expand options for wine grape production in the region.

Origin

'Opportunity' is a result of a cross of 'Cayuga × Ark. 1754 made in 1987 by James N. Moore. This white cultivar combines the female parent 'Cayuga' with a selection from two *V. vinifera* cultivars Semillon and Rkatsiteli. The original plant was selected in 1991 and tested as selection Ark. 2245. 'Enchantment' resulted from a cross of Ark. 1628 × Ark. 1481 made in 1990 also by Moore. It was selected in 1993 and tested as Ark. 2467. The female parent Ark 1628 resulted from a cross of two *V. vinifera* cultivars, Petit Syrah and Alicante Bouschet . The male parent resulted from a cross of the *V. vinifera*-derived 'Bouschet Petit' and 'Salvador'. Breeding and testing evaluations were conducted at the University of Arkansas Fruit Research Station (FRS), Clarksville. The grapes were grown on a bilateral cordon trellis system. Wine evaluations were led by Dr. Justin Morris and associates in the Department of Food Science, Fayetteville.



Photo: Cluster of 'Enchantment' red wine grape.

'Opportunity'

Average harvest date for 'Opportunity' was 30 Aug. in west-central Arkansas. Juice pH averaged 3.5, titratable acidity averaged 0.5%, and soluble solids averaged 17.3%. Yield of 'Opportunity' averaged 24 lb/vine. Crop ratings averaged 7.7 (1-10 scale, 10= highest yield) a reflection of good crop and consistent cropping observed in most years. Cluster weight averaged 234.3 g. Clusters were rated very full with berries attached very tightly. Berries averaged 2.7 g. Fruit cracking was not observed for 'Opportunity' following summer rains near harvest.

Rating for vigor averaged 7.2 (on a 10-point scale), reflecting medium-high, but not excessive, vigor. Health of the vines was consistently rated good also, averaging 7.4.

Observations each year included examination of the vines for presence of diseases. It should be noted that the vines were sprayed with a commercial fungicide program up until late June to early July each year. Some rotting of berries was observed in many years particularly near harvest. This is likely due to the extended period from the last fungicide spray applied until harvest, plus the tight cluster architecture that contributes to bunch rot. Careful control of rot nearing harvest will need to be undertaken to ensure disease-free fruit of 'Opportunity'. In over 20 years of observation, powdery mildew was seen on leaves in two years, and even in the very severe powdery mildew year of 2015, only slight leaf infection was noted. Downy mildew was not observed on the vines, even in the severe infection year of 2013 when this disease was very common in the research vineyard on other genotypes. Neither, black rot nor anthracnose were noted on the vines, but these earlier-season diseases were likely controlled by fungicide applications and no resistance is implied for these. It is hoped that the minimal observation of common diseases reflect the potential to manage disease pressures with average or possibly slightly reduced applications of fungicides.

The adaptation of 'Opportunity' to the climate at FRS was found to be very good, and reflective of its potential for reliable production in the Mid-South. Winter injury was not observed during its testing, reflecting good hardiness for this location.

Juice and wine quality of 'Opportunity' was consistently good for wine production as reflected by composition. For wine production, the soluble solids of this juice occasionally needed to be adjusted, but the pH and titratable acidity were ideal. The yield at crush was 15 lb of grapes for one gallon of juice, similar to other white wine grapes in Arkansas. Fermentation should be done at 60°F to retain fruity characteristics of the wine.

The wine evaluation panels with the Arkansas grape and winery industry indicated a positive

impression of 'Opportunity' wine. Comments included "great potential, with spice like 'Semillon', and bouquet of the cultivar Cayuga". 'Opportunity' wine has a fruit-forward aroma with good body and green apple flavor. The acidity can be marked with this wine, but can be balanced with adjustment of residual sugar prior to bottling.

'Enchantment'

Average harvest date for 'Enchantment' was 22 Aug. Juice pH averaged 3.4, titratable acidity averaged 0.8%, and soluble solids averaged 18.9%. Average yield of 22 lb/vine was recorded for 'Enchantment'. Crop rating averaged 7.7, reflecting good cropping consistency and potential. Berry weight averaged 1.5 g while clusters averaged 178.3 g. Clusters are compact, but not as excessively tight as compared to 'Opportunity'. Fruit cracking following summer rains near harvest was not observed for 'Enchantment'. 'Enchantment' is unique as it is a teinturier grape, meaning that thehttps://en.wikipedia.org/wiki/Wine_term grape's flesh and juice are red due to anthocyanin pigments accumulating within the pulp of the grape berry. Typically, anthocyanin pigments are in the outer skin tissue of the grape berry and the dark color of red wines come from anthocyanins extracted from the crushed skins during fermentation.

Rating for vigor averaged 6.7, indicating moderate vigor. Health of the vines was consistently rated good also, averaging 7.1. Observations each year included examination of the vines for presence of diseases, with fungicide applications as described prior. Some rotting of berries was observed in some years particularly near harvest (pathogen not identified). This again is likely due to the extended period since the last fungicide spray was applied (as mentioned earlier) prior to harvest. Occasional berry shriveling was noted near harvest, particularly in the hottest summers of evaluation, indicating some heat stress on the fruit. In 18 years of observation, powdery mildew was seen on leaves in two years, and on fruit in the severe powdery mildew year of 2015.

Downy mildew was observed one year with a slight infection on leaves. As stated for 'Opportunity', neither black rot nor anthracnose were noted on the vines. It is also hoped that with 'Enchantment' that the minimal observation of common diseases reflects the potential to manage disease pressures with average or possibly slightly reduced applications of fungicides.

The adaptation of 'Enchantment' to the climate at FRS was also found to be good, and reflective of its potential for reliable production in the Mid-South. Winter injury was not common during its testing, reflecting good hardiness for this location.

Juice and wine quality of 'Enchantment' was consistently good as reflected by various measurements of composition. The composition of the juice is generally ideal for wine production, but the pH and titratable acidity need to be monitored during fermentation, especially during malolactic fermentations. The yield at crushing was 11 lb of grapes for one gallon of juice, which is typically more than 'Cynthiana' wine grapes in Arkansas. Fermentation should be done at 60°F to retain characteristics of the wine. Fermentation on the skins can substantially impact the wine, but generally 2-5 days on the skins will maximize the positive attributes of this wine.

The wine evaluation panels with the Arkansas grape and winery industry indicated a positive impression of 'Enchantment' wine. The deep, dark red color of the wine was noted, along with a "cherry-like" aroma. The wine is similar to 'Petit Syrah' in color and mouthfeel. The only negative concern was the slight vegetative aroma of the non-aged wine. Because of the deep color, this wine could also be used for blending. There are not many red grape cultivars that produce well in this region, so 'Enchantment' can be a positive addition to the Mid-South grape and wine industry due to the versatility ranging from blush to dry, with the potential for oak addition.

Availability

Limited vines are available in the winter of 2016-17 from the sources below. Additional propagators should be added in the coming year.

Post Vineyards 8530 Fair Haven Road Altus, AR 72821 (479) 264-4999 Thomas B. Post tpost76@gmail.com

Double A Vineyards Inc. 10277 Christy Rd Fredonia NY 14063 716-672-8493 www.doubleavineyards.com Dennis Rak dennis.rak@doubleavineyards.com

Training Opportunity for Beginning Blackberry Farmers in the Mid-South



Horticulture extension specialists at the University of Arkansas, Dr. Jackie Lee and Dr. Amanda McWhirt, will be conducting a Blackberry School in Arkansas throughout 2017. The Blackberry

School will consist of four classes timed to match the four seasons of the year. Each class will cover different material and will focus on the activities and best-management practices that should be conducted in commercial blackberries during that season. The course is meant for beginning *commercial* blackberry growers or growers interested in starting to produce blackberries in the Mid-South. Dates for 2017 Blackberry School:

Winter	Feb 9th
Spring	April 18th
Summer	June 13th
Fall	Sept. (TBD)

Each class will be held from 1:00-4:00pm at the University of Arkansas Fruit Research Station in Clarksville, AR. Each class period will be split between classroom talks and outdoor hands-on activities. Guest speakers throughout the course will draw on the expertise of other University of Arkansas faculty, including Drs. John Clark, Don Johnson, Elena Garcia, and Renee Threllfall. The cost is \$40 for all four classes and will include printed course materials for each class, and snacks.

Link to online registration: <u>https://forms.uaex.edu/registrations/hort/hort.asp</u> *Deadline for Registration: Jan 20th, 2017*

More info and a flyer are available here: https://www.facebook.com/UAEXfruitandveggie/

Questions?

Contact: Amanda McWhirt (amcwhirt@uaex.edu, 501-671-2229)

Creating a gentler, more profitable way to harvest blueberries

Scott Elliott National Institute of Food and Agriculture

Previously published in Fruit Grower News, January 2016

Although automation in agriculture is often synonymous with efficiency, that has not been the case with harvesting and processing berries. That is about to change.

Automated berry processing systems often damage the fruit, which results in lower profitability for growers and marketers. To counter this, a University of Georgia (UGA)-led research team is developing an advanced sensor system to help harvest and process fresh-market highbush blueberries at high-speed and with low yield loss.

The second-generation berry impact recording device (BIRD) is one part of a multi-faceted effort being funded by the U.S. Department of Agriculture's National Institute of Food and Agriculture (NIFA). In addition to BIRD, researchers are using the nearly \$2.4 million Specialty Crop Research Initiative grant to develop high throughput phenotyping technology and a semi-mechanical harvest-aid system. They will also investigate microbial contamination points along the harvest and postharvest process.

"Blueberries will invariably interact with various machine parts or contacting surfaces that create bruises and reduce fruit quality," said Dr. Changying "Charlie" Li, associate professor at the University of Georgia's College of Engineering. "The BIRD sensor will help farmers deliver higher quality fresh market fruit with less bruises during harvesting, help marketers reduce bruising during postharvest handling and transportation, and allow consumers to buy higher quality fresh market blueberries at lower prices due to higher harvest efficiency and pack out rate."

BIRD is a wireless data logging sensor that is similar to a blueberry in shape, size, weight, and surface physical properties. BIRD is placed into the handling process where the sensor is subjected to the same mechanical stress as a real blueberry. Along the way, BIRD quantitatively measures and records all the mechanical impacts it encounters. Impact data are saved in a memory chip.

The team of 14 researchers from 10 institutions includes expertise in engineering, plant science, microbiology, economics, and social science. "We believe it's necessary to take a holistic approach to address the critical and challenging issues facing the blueberry industry," Li said.

Although the team is focusing on the \$1 billionper-year blueberry industry in the United States, they know that BIRD technology is not limited to that crop. "It is the first of its kind to study small fruits," Li said. "It can not only be used to study blueberries, but also be used for other small fruits such as cranberries, cherries, and olives. It has drawn great interest from the industry not only in the United States, but also from South America and Australia."

Li's research partners are located at Michigan State University, University of Florida, Penn State University, Washington State University, North Carolina State University, Oregon State University, Mississippi State University, University of California at Berkeley, and the USDA Agricultural Research Service's Appalachian Fruit Research Station in Kearneysville, West Virginia.

Take Advantage of the Clemson Fungicide Resistance Profiling Service

Guido Schnabel Clemson University



Make sure you know what fungicides may work best for you for gray mold control this coming season. The Schnabel lab at Clemson University in conjunction with the Southern Region Small Fruit Consortium (www.smallfruits.org) again offers a service that provides growers with optimized spray recommendations. The test covers multiple chemical classes and growers from Consortium member states (GA, NC, SC, TN, VA, AR) may send samples for testing free of charge to the Clemson lab. Instructions on how to collect and where to send samples can be found at <u>www.peachdoc.com</u> (go to 'EXTENSION' and 'Fungicide Resistance Profiling' on bottom of page).

The assay typically takes a week to conduct (depending on the quality of the samples submitted) and we try our best to get a report to you without delay. What you are getting: -confirmation that we received your samples on day one

-assay results with fungicide resistance management and disease management recommendations

-color coded sheet listing active ingredients, trade names, FRAC codes and more -most recent gray mold and anthracnose disease management guidelines authored by Chuck Johnson, Frank Louws, and yours truly

Gray mold samples from all small fruits are welcome. For more information contact Dr. Guido Schnabel; <u>schnabe@clemson.edu;</u> cell 864-643-7131.

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