



Second Year (2016) Strawberry Plasti-culture Variety Performance Trial

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Funding and support for this project was provided by the North American Strawberry Growers Association, Rutgers University, Maryland State Horticulture Society, University of Maryland Extension and the Maryland Agricultural Experiment Station.

Objective:

Observe, evaluate, and report the yield performance of the second year of fruit production (carry-over bed) of eleven named varieties and five advanced selections from the Rutgers University breeding program.

Methods and materials:

This plot was established in the Fall of 2014 using standard annual plasti-culture procedures. Plot set-up and complete 2015 harvest data can be found in the 2016 annual strawberry twilight meeting proceedings which can be found on the WyeREC website at this address.

<http://agresearch.umd.edu/sites/default/files/docs/locations/wye/2016%20Strawberry%20Twilight%20Booklet.pdf>

Data presented here for the 2016 season includes; Plot yield (10 plants), culled fruit weight, fruit number, and fruit size by harvest date (averages only, not statistically analyzed). Statistically analyzed data includes 2016 total per plant marketable yield, fruit number, culled fruit weight, average fruit size and flower mortality after the April freeze.

Varieties evaluated:

Flavorfest, Scarlet, Camarosa, Chandler, Benicia, Allstar, AC Wendy, San Andreus, Jewel, Albion and Chandler planted in Fall 2015. The five Rutgers University selections labeled R2, R4, R5, R7 and R9 are ID's that I assigned to these selections. If you talk to Rutgers personnel about this material, they will have no idea what these numbers refer to. Proprietary restrictions prevent me from listing the breeding numbers for these selections. If you have interest in these selections I can provide you with the breeding number for discussions with Rutgers personnel. Please contact me.

Radiance was not included in 2016. Radiance was found to be infected with crown Anthracnose during the 2015 harvest season and was removed from the field. We decided to plant Chandler plugs in the same hole as the Radiance plants in the Fall 2015. In the data tables, you will see Chandler(15) and Chandler(14) listed. Chandler(15) plugs were planted in 2015 and Chandler(14) plugs were planted in Fall 2014 and are the 2nd year plants. Chandler(15) is not included in the two-year harvest total (Table 7), nor will you see Radiance in that table.

Plant renovation procedures used:

After harvest in 2015, leaves were clipped off with a motorized string trimmer leaving the crown intact. Loose plant debris was removed from the plastic using a leaf blower. Minimal irrigation was used until September 1st when we did the crown thinning. Plants were thinned to 3 crowns per plant by breaking off branch crowns by hand. After crown thinning the plot was sprayed with fungicides for prevention of leaf diseases. Plots were fertigated beginning on September 1st with MAP + Urea for 20N-30P-0K plant food. Second fertigation was on September 18th with Urea + Solubor for 20N+0P+0K+ 2B. The final Fall fertigation was on October 2nd with Potassium nitrate for 13N-0P-33K.

All runners (and there were a lot!) were removed on December 7, 2015 as a sanitation procedure.

Spring 2016 fertilization:

Spring 2016 fertigation consisted of Calcium nitrate applied March 25 for 15N-0P-0K-34Ca. The 2nd fertigation was on April 15th with potassium nitrate for 15N-0P-50K and the final fertigation was on April 27 with Calcium nitrate for 15N-0P-0K-34Ca.

Floating row cover (FRC) management:

A challenging Winter for temperature management in strawberry plasti-culture using FRC's. With a mild Fall/early Winter, we did not deploy our 1.2oz FRC for over-wintering until January 4, 2016. An unusually warm February necessitated FRC removal on March 1st and was redeployed on March 18th, 19th and 20th. However, a low temperature of 22f on March 2 was cold enough, and even with buds tight, at the top of the crowns, the first couple of flowers of the earliest blooming varieties were black-eyed when they opened a couple of weeks later. With more strawberry flowering beginning on some varieties more frequent FRC deployment was needed. FRC was deployed on March 29th, April 4th, 5th and 6th. April 8th through April 10th, April 12th, 13th and 14th. Because bloom was in progress and daytime temperatures were warm, we decided to remove and redeploy the FRC's daily as opposed to leaving the FRC on for multiple days when that was practical. Leaving FRC's on during bloom for multiple days is a

risky endeavor. Flowers are difficult to pollinate, higher humidity under the FRC's increase the likelihood of increased diseases. However each time the decision is made to deploy or remove FRC's, it cost money and serious decisions have to be made about FRC management and its impact on the crop.

The FRC was mostly successful in limiting blossom damage due to sub-freezing temperatures with the exception of the freeze on April 5th and 6th. We recorded a low of 21f air temperatures at canopy level. Under the FRC the temperature was 28f enough to cause blossom damage. Open Flowers were counted 2 days after this freeze event (Table 8). Open flowers ranged from 0 to 10 per plant and most all opened flowers were damaged.

Harvest:

Harvest in 2016 began on May 4th, eight days earlier than in 2015. Plots were harvested 2x's/week. Fruit was sorted for marketable size (< 10 gram berry size were not marketable) and free from deformities. All fruit were counted and average fruit size was determined. Final harvest was on June 10th. I included seasonal average harvest information (Tables 4, 5, 6 and 8) and by harvest date (Table 1), which gives a better picture of how the harvest was spread out during the 30 day harvest period and how fruit size varies from beginning to end. I know that many growers will carry-over plasti-culture plantings for multiple years, so I combined the total marketable yields for 2015 and 2016 in Table 7.

Other challenges:

If the cold April temperatures were not enough, the May rains sealed this season as one of the most difficult in recent memories. During the first sixteen days of May, fourteen days had precipitation. I believe the reason I did not have a botrytis fruit rot problem was because good sanitation and a diligent spray program. Late Winter field clean-up is an activity we always do. Removal of dead flowers and dead leaves removes potential sources of fungal inoculum. If disease pressure is low, this sanitation activity may not be needed and regular fungicide applications may be enough. But how do you know if a season will be a low disease pressure season? A diligent spray program which includes timely sprays and knowing what fungicides will be effective. I always apply a spray for botrytis crown rot before or right at 1st bloom. This spray has to be applied before too much canopy has developed to ensure spray deposition down into the crown. Begin other fungicide sprays at 10% bloom and then at full bloom. If rainfall is abundant more sprays will be needed. It's not uncommon to have blooms occur as fruit is nearing harvest. During bloom if FRC's will be needed and you anticipate the need to leave the FRC's on for multiple days because of forecasted rain, wind or more damaging temperatures, apply fungicides before FRC deployment.

Recently, some Universities have been offering fungicide resistance testing in order to determine if the fungal pathogens on your farm are insensitive to various fungicide classes. It's well worth the cost of this test so you know the correct fungicides to apply. Fungicides aren't cheap!

Highlights and lowlights:

Flavorfest, continues to be a high yielder for our location. It was the last to flower in 2016 and it may have been part of the reason the 2016 yield was 1.5 lbs. per plant (no freeze damaged flowers). It's overall seasonal fruit size was not the largest numerically, but statistically it was not different than the larger fruited varieties. It also had the larger sized fruit during the early and mid-season (Table 1).

Albion, a day-neutral, cannot be counted on to produce much as a Spring-bearer only. Its real value still seems to be in extending the Spring-harvest season. However at the end of our harvest season (June 10th), Albion was not showing any flowers. Higher nitrogen fertility is mentioned by others to be key to continued production. We did not keep the plots for Summer production of the day-neutrals.

Scarlet, the recent release from Rutgers University, had impressed me in the previous 3 years for yield and fruit size. It did fair as well as Chandler(14) for yield and better in size this year. Freeze damage to early flowers contributed to lower yields in 2016.

Jewel, had amazing flavors in 2015 with average yields and fruit size. In general most flavors were off in 2016 because of cloudy, rainy weather during May. In 2016 Jewel had a serious skin cracking problem which brought the marketable yields down by over six ounces per plant!

San Andreus, a day-neutral California variety, has not impressed me the several times we have grown it here at Wye. In 2016 there was a high level of fruit Anthracnose.

Benicia, a short-day California variety had good yields in 2015 and 2016. Although I did not note any problems in 2015 with off-coloring of the fruit, in 2016 many had a "blotchy" coloring. I did not cull the fruit because of this, but it may be a concern. Maybe the prolonged cloudy weather in 2016 was the cause.

R 5, an unreleased selection from the Rutgers breeding program out-yielded Scarlet in 2016. It is a little earlier than Scarlet and had a higher Brix level in 2015 than Scarlet. I hope that Rutgers is looking at this selection as their next release.

Table 1. Per Plot Marketable Yield, Fruit Number, Culled Fruit and Fruit Size By Harvest Date

Variety	4-May				9-May				13-May			
	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)
ALBION	0.82	2	0.00	0.55	4.33	11	0.13	0.41	5.09	11	0.89	0.46
BENICA	2.90	5	0.00	0.58	13.15	27	1.92	0.48	24.84	46	1.84	0.55
CHANDLER(15)	3.23	6	1.21	0.56	7.89	13	1.00	0.61	18.79	27	0.71	0.69
SAN ANDREUS	0.00	0	0.00	0.00	5.21	11	0.38	0.50	12.34	24	1.11	0.53
CHANDLER(14)	2.36	6	0.00	0.37	4.16	12	0.75	0.35	14.11	31	1.98	0.46
CAMAROSA	2.69	7	0.00	0.37	5.45	14	0.83	0.38	8.39	18	0.81	0.48
FLAVORFEST	0.00	0	0.00	0.00	0.84	1	0.00	0.84	8.12	10	0.00	0.79
AC WENDY	0.00	0	0.00	0.00	2.00	5	0.13	0.40	10.22	18	0.68	0.57
JEWELL	0.00	0	0.00	0.00	7.40	19	0.00	0.40	1.04	3	0.00	0.41
ALLSTAR	0.00	0	0.00	0.00	0.88	2	0.11	0.39	2.83	7	0.28	0.40
SCARLET	0.00	0	0.00	0.00	4.23	10	0.00	0.45	5.59	13	0.18	0.43
R2	0.49	1	0.00	0.49	2.57	7	0.34	0.40	8.94	21	0.87	0.43
R 7	0.00	0	0.00	0.00	2.37	5	0.15	0.47	3.56	7	0.38	0.53
R4	0.85	2	0.00	0.43	3.24	7	0.00	0.46	3.67	9	1.94	0.43
R 5	0.77	2	0.00	0.51	3.29	4	0.00	0.88	6.49	11	0.24	0.59
R 9	0.00	0	0.00	0.00	1.44	3	0.00	0.43	3.84	9	1.26	0.43

Plot size = 10 plants

Table 1. Per Plot Marketable Yield, Fruit Number, Culled Fruit and Fruit Size By Harvest Date (continued)

Variety	16-May				19-May				24-May			
	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)
ALBION	8.68	19	0.16	0.46	8.67	19	0.71	0.47	20.14	39	0.82	0.52
BENICA	27.12	52	1.27	0.53	30.63	66	1.42	0.46	37.71	76	2.09	0.50
CHANDLER(15)	15.07	28	0.45	0.54	9.82	20	0.50	0.49	18.39	38	0.80	0.49
SAN ANDREUS	22.46	43	0.91	0.52	28.34	58	2.58	0.49	33.34	66	2.05	0.51
CHANDLER(14)	18.89	42	2.10	0.45	16.61	39	1.31	0.43	23.87	59	3.74	0.41
CAMAROSA	13.05	31	1.32	0.43	10.01	25	1.62	0.40	21.02	47	2.13	0.45
FLAVORFEST	17.07	27	1.05	0.63	24.63	40	2.19	0.62	58.90	102	2.75	0.58
AC WENDY	21.45	39	0.36	0.55	20.30	42	0.79	0.48	45.34	87	2.44	0.52
JEWELL	1.97	4	0.46	0.49	4.88	11	0.34	0.47	20.23	42	5.31	0.48
ALLSTAR	6.37	16	0.75	0.40	13.39	31	2.02	0.43	37.16	75	2.60	0.49
SCARLET	7.44	16	0.18	0.46	12.55	26	0.39	0.49	35.12	62	1.38	0.57
R2	15.41	36	0.77	0.43	11.35	28	1.20	0.41	27.81	60	1.47	0.46
R 7	13.60	25	0.60	0.55	16.88	31	1.39	0.54	34.33	62	2.92	0.55
R4	10.29	22	1.99	0.46	14.59	31	1.83	0.47	35.60	71	6.13	0.50
R 5	12.53	23	1.11	0.54	21.81	38	1.15	0.58	38.96	63	2.37	0.62
R 9	10.88	24	0.51	0.45	13.41	33	2.26	0.41	27.14	62	5.37	0.44

Plot size = 10 plants

Table 1. Per Plot Marketable Yield, Fruit Number, Culled Fruit and Fruit Size By Harvest Date (continued)

Variety	27-May				31-May				2-Jun			
	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)
ALBION	7.77	19	2.27	0.42	11.68	26	0.61	0.45	6.54	12	1.11	0.54
BENICA	17.90	43	7.35	0.42	14.50	34	9.23	0.43	12.64	24	1.95	0.52
CHANDLER(15)	9.95	20	1.88	0.51	8.81	18	0.70	0.49	5.69	12	0.98	0.46
SAN ANDREUS	27.74	70	11.46	0.40	14.88	37	3.94	0.40	11.88	29	4.01	0.41
CHANDLER(14)	9.35	24	3.15	0.39	11.66	28	2.43	0.42	9.05	23	1.30	0.39
CAMAROSA	11.88	30	3.50	0.40	12.46	28	2.04	0.45	7.86	19	1.11	0.42
FLAVORFEST	47.76	111	7.30	0.43	42.78	105	5.89	0.41	24.42	67	5.68	0.36
AC WENDY	27.27	69	6.67	0.40	18.88	54	2.18	0.35	6.79	20	1.34	0.34
JEWELL	27.46	62	14.25	0.45	24.02	61	17.68	0.39	17.50	55	12.84	0.32
ALLSTAR	41.42	92	9.54	0.45	41.15	103	4.81	0.40	16.78	51	5.71	0.33
SCARLET	25.72	55	2.75	0.47	23.81	53	2.23	0.45	13.70	32	2.53	0.42
R2	17.54	48	3.88	0.37	17.68	46	3.26	0.38	9.83	27	2.93	0.37
R 7	25.29	54	3.99	0.47	21.34	46	2.10	0.46	16.99	40	2.44	0.43
R4	33.91	72	7.88	0.47	29.71	56	3.67	0.54	18.18	38	3.80	0.48
R 5	34.07	67	3.72	0.51	28.84	60	1.64	0.48	22.92	53	2.21	0.43
R 9	11.95	27	7.58	0.45	14.52	109	3.01	0.13	8.29	21	1.52	0.39

Plot size = 10 plants

Table 1. Per Plot Marketable Yield, Fruit Number, Culled Fruit and Fruit Size By Harvest Date (continued)

Variety	7-Jun				10-Jun			
	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)	Marketable Yield per plot (oz)	Fruit number per plot	Culled fruit per plot (oz)	Fruit Size (oz)
ALBION	12.70	24	1.08	0.54	5.47	12	1.79	0.46
BENICA	13.63	57	2.29	0.24	2.75	8	1.86	0.37
CHANDLER(15)	6.61	17	0.48	0.39	3.08	7	1.46	0.46
SAN ANDREUS	14.41	38	3.00	0.38	2.78	8	1.95	0.36
CHANDLER(14)	12.92	38	2.06	0.34	2.53	8	1.99	0.34
CAMAROSA	11.77	30	1.78	0.40	2.39	9	0.88	0.28
FLAVORFEST	17.38	54	5.03	0.32	1.67	5	1.39	0.31
AC WENDY	3.06	9	2.54	0.34	0.89	3	0.57	0.30
JEWELL	15.54	59	6.75	0.26	2.35	8	3.14	0.29
ALLSTAR	13.59	43	5.31	0.32	2.17	7	2.75	0.31
SCARLET	6.94	20	1.61	0.34	1.40	4	2.09	0.38
R2	9.81	25	1.88	0.39	1.61	5	1.48	0.36
R 7	17.35	42	3.74	0.42	4.66	12	1.64	0.39
R4	10.06	25	3.29	0.41	1.64	4	1.12	0.41
R 5	20.61	46	3.48	0.45	4.80	12	2.04	0.39
R 9	18.88	41	3.78	0.46	5.51	14	1.86	0.39

Plot size = 10 plants

Table 4. 2016 Per Plant Yield (Lbs)

2016 Harvest Marketable Lbs Per Plant		
Variety	Yield (lbs)	
FLAVORFEST	1.53	a
BENICIA	1.21	ab
R 5	1.19	ab
ALLSTAR	1.07	bc
SAN ANDREUS	1.07	bcd
AC WENDY	0.96	bcde
R 7	0.96	bcde
R4	0.99	bcde
CHANDLER(14)	0.77	cdef
SCARLET	0.83	cdef
R2	0.76	cdef
JEWELL	0.73	def
CHANDLER(15)	0.66	ef
CAMAROSA	0.66	ef
R 9	0.71	ef
ALBION	0.57	f

Table 5. 2016 Per Plant Fruit Number

2016 Fruit Number Per Plant		
Variety	Fruit Number	
FLAVORFEST	41.7	a
BENICIA	42.7	ab
ALLSTAR	42.2	ab
SAN ANDREUS	37.7	abc
R 5	36.7	bc
AC WENDY	34.2	bcd
R4	33.2	bcd
R 9	33.7	bcd
CHANDLER(14)	30.2	bcde
JEWEL	30.5	bcde
R2	29.7	bcde
R 7	31.7	bcde
CAMAROSA	25	cde
SCARLET	27	cde
CHANDLER(15)	20	de
ALBION	18.7	e

Table 6. 2016 Average Fruit Size (oz)

2016 Average Fruit Size (oz)		
Variety	oz	
CHANDLER(15)	0.53	a
SCARLET	0.51	a
R 5	0.52	a
ALBION	0.49	ab
R 7	0.48	ab
R4	0.48	ab
BENICIA	0.45	abcd
SAN ANDREUS	0.45	abcd
FLAVORFEST	0.46	abc
AC WENDY	0.44	abcd
CHANDLER(14)	0.40	bcd
CAMAROSA	0.42	bcd
ALLSTAR	0.41	bcd
R2	0.41	bcd
R 9	0.48	cd
JEWEL	0.38	d

Averages with similar letters within each column are not significantly different at the 5% level (Tukey Test)

Table 7. Two Year Marketable Yields (Lbs.)

2015+2016 Harvest Total		
Variety	lbs/plant	
FLAVORFEST	2.71	a
R 5	2.36	ab
BENICIA	2.13	bc
SAN ANDREUS	1.88	bcdef
CAMAROSA	1.83	bcdef
ALLSTAR	1.97	bcdef
SCARLET	2.02	bcdef
R 7	2.07	bcdef
R4	1.95	bcdef
AC WENDY	1.78	cdef
R2	1.67	cdefg
CHANDLER(14)	1.58	defg
JEWEL	1.44	efg
R 9	1.41	fg
ALBION	1.15	g

Table 8. 2016 Bloom Mortality

2016 Bloom Mortality After April Freeze	
Variety	# Dead Blooms
FLAVORFEST	0.25 b
AC WENDY	5.5 ab
JEWEL	4.5 ab
SCARLET	5 ab
ALBION	6.5 a
BENICIA	10 a
CHANDLER(15)	6.25 a
SAN ANDREUS	10 a
CHANDLER(14)	7.5 a
CAMAROSA	8.7 a
ALLSTAR	6.25 a
R2	7.5 a
R 7	7.5 a
R4	7.5 a
R 5	8.75 a
R 9	5 a

Table 9. 2016 Culled Fruit (oz)

2016 Culled Fruit Per Plant		
Variety	oz	
JEWEL	6.03	a
ALLSTAR	3.18	b
R4	3.09	b
BENICIA	2.74	bc
SAN ANDREUS	2.92	bc
FLAVORFEST	2.83	bc
R 9	2.65	bc
CHANDLER(14)	1.99	bcd
CAMAROSA	1.49	bcd
AC WENDY	1.48	bcd
R2	1.72	bcd
R 7	1.79	bcd
R 5	1.66	bcd
SCARLET	1.28	cd
ALBION	0.65	d
CHANDLER(15)	0.76	d

Averages with similar letters within each column are not significantly different at the 5% level (Tukey Test)