

A Challenging Strawberry Season – Results of the 2021-2022 Advanced Selection and Cultivar Trial at Cottle Farms, Faison NC.

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On June 1, 2022, we concluded our 2021-2022 strawberry advanced selections and cultivar trial at Cottle Farms in Faison, NC. In this trial we evaluated more than 150 advanced selections from the Lassen Canyon Breeding Program and California Berry Cultivars. We also evaluated cultivars from Lassen Canyon, USDA and UC Davis. Unfortunately, despite an 8-week harvest season (beginning April 1st to June 1st), yields were sharply lower this year, compared to the previous season. This was mostly due to a severe *windborne freeze* on the night of March 12-13, 2022. This freeze has impacted not only our research plot, but many other strawberry farmers, as it coincided with a strawberry crop that was in full bloom for many varieties. Shortly after this early freeze, King blossoms of varieties such as Ruby June, Camarosa and several advanced *selections*, such as 122X08, were severely damaged by this single freeze event.



Fig. 1. This photo of the advanced selection, 122X08, was taken in our research plots on March 22nd (about 10 days after the windborne freeze of March 12-13). When we surveyed the damage to our plants on March 22nd, our first inclination was to simply cancel the field day event scheduled for April 26th. However, the field day was re-scheduled for May 10th (see June 2022 newsletter for field day report), and we were ultimately able to harvest this research trial for 8-weeks, from April 1 – June 1, 2022.

On March 22nd our 1/4 acre of strawberry varieties and selections looked more like a battlefield in which the battle to prevent injury to the open blossoms had truly been lost! Our medium weight, 1.25 oz AgroFabric PRO42, did not provide adequate open blossom protection against a 22 °F windborne freeze. And winds gusting over 20 mph in a very open field exposure with row covers might have caused additional damage. But, at least some of the blossoms that had set fruit before March 12th survived the freeze (in Figure 1 you can see several ‘green fruit’ stage berries on March 22nd).

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Table 1. Overall performance of the 7 named varieties in the 2021-2022 trial at Cottle Farms (Faison, NC)^z

Variety	Plant type	Marketable yield (lbs/plant)	Marketable yield (lbs/acre) ^y	Berry size (grams/berry)	Quality evaluations (number)	Ave Brix (sugar)	Ave flavor score
Albion	Cut-off	1.04	15,600	18.6	3	9.8	3.4
Camarosa	Cut-off	1.53	22,950	14.9	3	7.9	2.2
Camino Real	Cut-off	1.33	19,950	16.4	6	7.7	1.7
Fronteras	Cut-off	1.59	23,850	19.7	4	8.3	1.9
Monterey	Cut-off	1.35	20,250	17.5	2	8.5	2.1
Royal Royce	Cut-off	1.84	27,600	17.0	1	8.0	1.3
Ruby June	Cut-off	1.40	21,000	19.9	3	10.3	3.3

^z This trial was transplanted on 10/08/21. The exception to the 10/08/22 planting date was Ruby June – these cut-offs from Lassen Canyon were transplanted on 10/22/21 (personal communication Whit Jones).

^y Yield per acre has been estimated with an assumption of 15,000 plants per acre – the plant density used at Cottle Farms.

As it turned out, virtually all the plants in our approximate ¼ acre research block recovered reasonably well in late March, and by the 1st of April we made our first of twelve harvests. The 2022 harvest season ran from April 1 – June 1, and the data in Table 1 includes information on the 7 named varieties in the trial.

The highest yielding variety? In previous years of research testing at Cottle Farms we have seen exceptional yields for the day-neutral Royal Royce, a relatively new variety from the University of California in Davis (released in 2019). In the 2019-2020 strawberry season, for example, Royal Royce produced 2.8 lbs. per plant (equivalent to 42,000 lbs/acre – assuming 15,000 plants/acre). However, in the spring of 2022, the total marketable yield for Royal Royce was only 1.84 lbs. per plant (Table 1), which was a 34% lower yield than in 2020! At the same time, Royal Royce was our highest yielding variety in 2021-2022. We saw a very similar yield reduction for other varieties as well in the 2021-2022 season. Camarosa, for example, had an average yield of 2.03 lbs/plant (30,450 lbs/acre) in spring 2021 at this location (Table 2), but in 2022 it produced a marketable yield of only 1.53 lbs/acre, or 22,950 lbs/acre (Table 1). It is also important to note that the cut-off varieties in both the 2020-2021 study and 2021-2022 had the exact same planting date of October 8th. The one exception was Ruby June – it was transplanted on 8-Oct in 2020, but in 2021 it was planted on 22-Oct, or two weeks later than the other varieties shown in Table 1.

Freeze impact on berry size? Not only did this year’s freeze reduce overall marketable yields, but the loss of the early season blooms to the windborne freeze of March 12-13, also reduced average berry size in Camarosa, Camino Real, and Fronteras, but there did not seem to be as much of negative impact on berry size in Ruby June (Table 2)

Table 2. A comparison of two strawberry seasons – 2020-2021 vs. 2021-2022 at Cottle Farms, Faison, NC

Variety (all cut-offs)	Marketable yield 2021 (lbs/plant)	Marketable yield 2022 (lbs/plant)	Berry size 2021 (grams)	Berry size 2022 (grams)	⁰ Brix (sugar) 2021	⁰ Brix (sugar) 2022	Ave flavor score 2021	Ave flavor score 2022
Camarosa	2.03	1.53	17.9	14.9	7.5	7.9	2.3	2.2
Camino Real	2.45	1.33	20.8	16.4	7.0	7.7	2.6	1.7
Fronteras	2.44	1.59	25.3	19.7	5.6	8.3	1.5	1.9
Ruby June	2.00	1.40	20.9	19.9	3.5	3.3	3.5	3.3

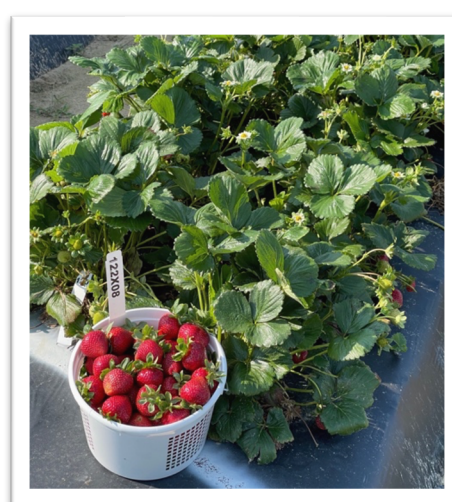
Fruit quality data. Except for Fronteras, Brix levels and flavor scores for each variety in spring 2022 (Table 1) were relatively consistent with Brix and flavor data for the same variety in spring 2021 (Table 2). In spring 2022, Fronteras had an average Brix reading of 8.3 compared to the previous year's Brix level of 5.6 (Table 2). It also had a slight improvement in flavor in spring 2022. Overall, Ruby June had the highest Brix readings and flavor in both seasons, except for Albion in 2022. In spring 2022, Albion berries achieved a slightly higher flavor score of 3.4 compared to a score of 3.3 for Ruby June (Table 1). In our flavor scoring system, a score of 4 indicates excellent flavor, 3 indicates good flavor, 2 indicates fair flavor, and 1 indicates poor flavor.

An improved program in 2021-2022. As was explained at the May 10, 2022, Field Day, our trial work in the 2021-2022 strawberry season was significantly expanded and improved in 2021-2022 because of two very important factors: 1) increased financial assistance from the NC Strawberry Assn., and 2) the continuing assistance we receive from NC State University's Dr. Mark Hoffmann, Research Assistant Emma Volk, as well as Amanda Lewis, Communications Assistant of the Hoffmann group in the Dept. of Horticultural Science. In the 2021-2022 strawberry season we managed to screen 150 new advanced selections (from two different strawberry breeding programs based in California), and well as evaluate 12 *repeat* selections from the Lassen Canyon Strawberry Breeding Program. One of the repeaters in 2021-2022 was 122X08. In 2020-2021, 122X08 produced 2.11 lbs/plant as well as having some of the largest berries of all varieties and selections tested last year (122X08 had average berry size of 29.6 grams in 2021). Unfortunately, 122X08 was one of the advanced selections that seemed to have been very adversely impacted by the 12-13 March windborne freeze (see Figure 1). This season, plants of 122X08 produced only 1.0 lb/plant in our research plots. However, given 122X08's impressive showing in 2020-2021, as well as its good performance in a semi-commercial test at another location on Cottle Farms (this year,) our plans are to continue testing 122X08 in the 2022-2023 season (see Figs 2a and 2b).

(2a)



(2b)



Figs. 2a. & 2b. The advanced selection, 122X08, turned in an impressive performance relative to the UC variety Fronteras in a semi-commercial test block at Cottle Farms this season. In Figure 2a you can see the row of 122X08 plants on the left side of the photograph. To the right of the 122X08 row is a row of Fronteras (field day participants are standing on both sides of the Fronteras row). In Figure 2b you can see the large and very attractive berries 122X08 that were picked on May 16th from this same semi-commercial planting at Cottle Farms.

Looking ahead to the 2023 season. In addition to including some of the more popular industry varieties in our 2022-2023 trial at Cottle Farms, including Albion, Camarosa, Camino Real, Fronteras, Merced (if available) and Ruby June, we will also be evaluating several advanced selections from the Lassen Canyon Nursery Breeding Program that did well this past season. As we explained in our June article for this newsletter (*Highlights of the 2022 Strawberry Variety and Advanced Selection Showcase at Cottle Farms on May 10, 2022*), flavor is very important for local marketing, and for that reason, we give greater emphasis to selecting advanced selections with desirable flavor characteristics in this program. Based on the data shown in Table 3, our plan is to continue testing of 062z34 next year. This selection compared quite favorably this season with Ruby June for marketable yield, berry size, Brix and *flavor*. We will also continue testing 222z34, which had a lower flavor score of 2.7 than Ruby June (3.3), but its higher yield of 1.60 lbs/plant (compared to 1.40 lbs/plant for Ruby June), and its very impressive berry size of 31.2 g vs. 19.9 grams for Ruby June, will justify further testing of 222z34 in 2022-2023. It is unlikely we will continue with 177z14 due to its lower yield of only 1.20 lbs/plant relative to Ruby June, but we will be requesting plants of both 064z16 and 073x41, because of their superior

marketable yields to Ruby June, as well as having reasonable flavor scores. What is particularly interesting about 064z16 is that its yield of 1.80 lbs/plant is only slightly lower than Royal Royce, which was the top yielder in our trial this year. This selection (064z16) also has a flavor rating of 2.6 which compares very favorably with Royal Royce as well as most all of the other industry varieties except Albion and Ruby June (Table 1).

Table 3. The top Lassen Canyon Strawberry Breeding Program Selections in 2021-2022, Cottle Farms

Rank by Flavor	Variety or Advanced Sel.	Yield per plant (lbs)	Berry size (gms)	Quality Evaluations		
				No. entries	Ave. Brix	Ave Flavor
1	Ruby June LCN	1.40	19.9	3	10.3	3.3
2	062z34	1.50	23.0	4	9.3	3.1
3	177z14	1.22	19.6	3	11.5	2.9
4	222z34	1.60	31.2	5	8.2	2.7
5	073x41	1.73	22.1	5	7.3	2.6
6	064z16	1.80	21.5	2	9.3	2.6

Conclusion. A severe windborne freeze caused extensive open blossom damage to our ¼ acre strawberry variety and advanced selection trial at Cottle Farms (Faison, NC), on March 12-13, 2022. As we learned in 2022, row cover protection alone did not provide adequate blossom protection against a windborne freeze in our very exposed field location. We will not likely be using late winter row covers to advance our crop's ripening date next spring unless irrigation is available to us for sprinkling on top of the row covers. This year's crop recovered well enough from the March freeze event so that we were able to host a public field day on May 10th, and we ended up with an 8-week harvest season that ran from April 1st – June 1st. Despite the freeze in March that destroyed so many early blossoms, it was still possible to gain some valuable information on the relative performance of different varieties and selections on a *relative basis*. Although Ruby June continues to gain greater popularity in the South Atlantic Coast Region because of its generally good productivity and flavor, we are committed to testing newer varieties and selections from both public and private breeding programs. We are already making plans to incorporate in our trail at Cottle Farms in 2022-2023, several new selections from the Lassen Canyon Strawberry Breeding Program (including 122X08, 062z34, 222z34, 064z16 and 073x41), that compared very favorably with Ruby June in terms of productivity and berry size this past season.