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Rebecca Brown

brownreb@uri.edu, *brownreb@uri.edu*

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2021 URI Swiss Chard Variety Trial

Rebecca Nelson Brown and Rabmatallah (Fari) Gbeshm brownreb@uri.edu

In 2021 the URI Vegetable Program trialed 19 varieties of Swiss chard in two seasons. The primary objective of the trial was to identify varieties with good yields, high uniformity, and tolerance to leafspot diseases, particularly *Cercospora* leafspot. The Spring trial was transplanted, with seeds started in plug trays in the greenhouse the first week of March and transplants put into the field on April 21. Seedlings were thinned to three per plug beginning when the first true leaves emerged. Spacing in the field was 15 inches between rows and 4 inches between plants in the row. Each 8 foot plot contained 3 rows; the center 5 feet of the center row

<i>Entry</i>	<i>Petiole Color</i>	<i>Blade Color</i>	<i>Leaf Texture</i>	<i>Blade:Petiole Ratio</i>	<i>Source</i>
<i>Fire Fresh</i>	Purple	dark green	semi-savoy	0.9	Sakata
<i>Ion</i>	Fuchsia	mixed green	smooth	1.0	Pop Vriend
<i>Silverado*</i>	White	dark green	savoy	1.4	Sakata
<i>Fordhook Giant*</i>	White	mixed green	variable	1.0	various
<i>Charsano</i>	White	mixed green	semi-savoy	1.0	Rijk Zwaan
<i>Northern Lights</i>	Rainbow	mixed	variable	0.9	Harris
<i>Aurora</i>	Rainbow	mixed	variable	1.0	Osborne
<i>Orange Fantasia</i>	Yellow	bright green	variable	0.8	various
<i>Bali</i>	Red	mixed	semi-savoy	1.0	Bejo
<i>Peppermint</i>	Fuchsia/ white striped	olive green	savoy	1.3	various
<i>Flamingo*</i>	Fuchsia	bright green	smooth	0.9	various
<i>Eldorado</i>	Gold	bright green	variable	1.0	Sakata
<i>Celebration</i>	Rainbow	mixed	variable	1.0	Sakata
<i>Intense</i>	Red	olive green	semi-savoy	1.1	various
<i>Red Rhubarb*</i>	Red	mixed	variable	1.0	Fedco
<i>Bright Lights</i>	Rainbow	mixed	semi-savoy	0.8	Johnny's
<i>Orange Ribbed*</i>	Yellow	bright green	semi-savoy	0.9	Johnny's
<i>Charbell</i>	Fuchsia/ salmon striped	olive green	semi-savoy	0.9	Rijk Zwaan
<i>Rhubarb Supreme*</i>	Mixed reds	mixed	semi-savoy	0.9	Johnny's

Table 1. Chard entries in the 2021 trial. Asterisks indicate varieties for which organic seed is available; others are available untreated. 'Source' is the seed company responsible for variety maintenance; most varieties are sold by multiple vendors. Varieties with "various" listed are open-pollinated. 'Orange Ribbed' was included inly in the Spring planting and was not commercially available in 2021 or 2022.

[Type here]

was harvested for yield data on June 12. The Fall trial was direct-seeded by hand into the field on July 20. Spacing was 15 inches between rows and 2-3 inches between seeds in the row. Plants were thinned to 4 inch spacing. Each 10 foot plot contained 3 rows and the center 8 feet of the center row were harvested for yield data in late September. Trial management followed recommendations in the New England Vegetable

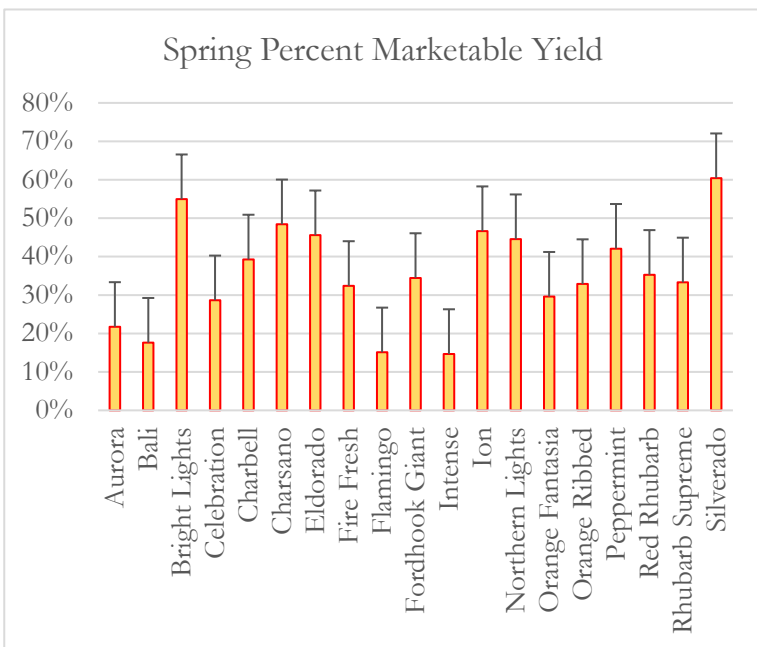


Figure 1. Marketable yields expressed as a percentage of total yields. Chard was harvested as whole plants then prepared for bunch sales by removing over-mature, damaged, or immature leaves. Error bars indicate the standard error for comparison.

Management Guide; weeds were controlled with cultivation. Both trials were randomized complete block designs with three replications.

Data on petiole color, blade color, leaf texture and blade to petiole length ratio were collected from three marketable leaves per plot at the spring harvest. “Mixed green” indicates varying shades of green, while ‘mixed’ includes burgundy and bronze shades.

Yield

For the Spring planting there were no statistically significant differences in total yield between varieties. This means that random differences in yield due to field location and harvester technique were greater than the differences between varieties. Yields

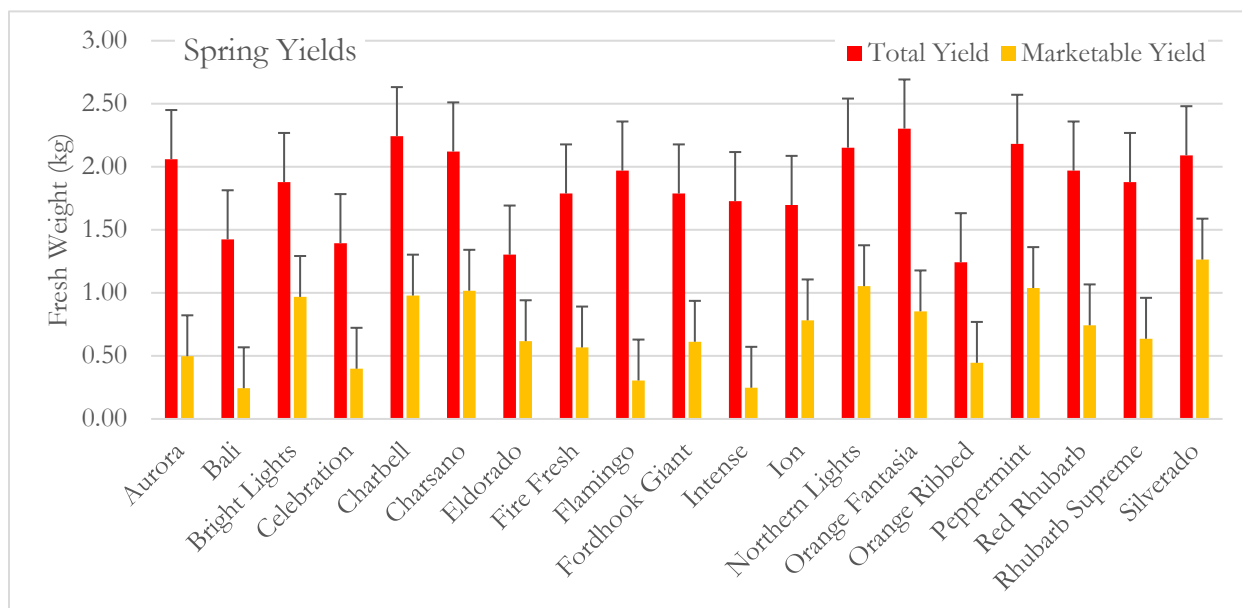


Figure 2. Total and total marketable yields in the spring planting. Yields are kilograms from 5 feet of row. Error bars indicate the standard error for the comparison of means. P-values were 0.21 for total yield and 0.08 for marketable yield.

[Type here]

from 5 feet of row ranged from 1.24 kg for ‘Orange Ribbed’ to 2.3 kg for ‘Orange Fantasia’ with an average of 1.85 kg. Differences in total marketable yield were moderately significant, with a 92% chance of being due to varietal differences rather than to chance.

Marketable yields ranged from 0.24 kg for ‘Bali’ to 1.26 kg for ‘Silverado’; the average across all varieties was 0.7 kg. Marketable yield excluded any bolted plants, damaged or diseased leaves, or leaves which had not yet fully expanded. Differences in percent marketable yield were highly significant, with a 99% chance of being due to varietal differences. Percentages ranged from 60% for ‘Silverado’ to 15% for ‘Flamingo’ and ‘Intense’, both of which were heavily damaged by *Cercospora* leafspot. ‘Bright Lights’

and ‘Northern Lights’ out-yielded the other rainbow varieties, having higher marketable yield and significantly greater percentage marketable yield. However ‘Bright Lights’ was the first variety in the trial to bolt, with some plants bolting by June 7. ‘Ion’ had the highest percentage marketable yield of the red and pink chard varieties but ‘Charbell’ was just slightly lower and had greater total yield and total marketable yield. ‘Silverado’ had both the highest total marketable yield and the greatest percentage marketable yield of the white-stemmed chard varieties. ‘Eldorado’ had the highest percentage marketable yield of the yellow varieties, but ‘Orange Fantasia’ had higher total and total marketable yields.

Only total yield data were collected for the fall planting. Over-mature leaves were left in the field. There were no bolted plants and cooler weather had greatly reduced incidence of leafspot. Yields ranged from 2.4 kg for ‘Red Rhubarb’ to 10.1 kg for ‘Fordhook Giant’ with an average of 5.8 kg and highly significant differences between varieties. Fall yields were higher than spring yields due to larger plant size, longer plots (8 feet rather than 3 feet) and higher water content as the weather during harvest was cold and wet rather than warm and dry. ‘Charsano’, ‘Northern Lights’, and ‘Fire Fresh’ had yields comparable to ‘Fordhook Giant’. When the color groups are evaluated separately ‘Northern Lights’ had the greatest yield among the rainbow varieties, but ‘Bright Lights’ was not significantly different. Both ‘Aurora’ and ‘Celebration’ yielded significantly less than ‘Northern Lights’. ‘Fire Fresh’ had the highest yields among the red varieties, significantly greater than all others except ‘Ion’ which ranked second. ‘Charbell’ ranked third, but was not statistically different from the varieties below it. Among the white varieties ‘Fordhook Giant’ had the highest yield and ‘Peppermint’ the lowest, with significant differences between the two. Only two yellow varieties were included in the fall planting and they did not differ significantly in yield.

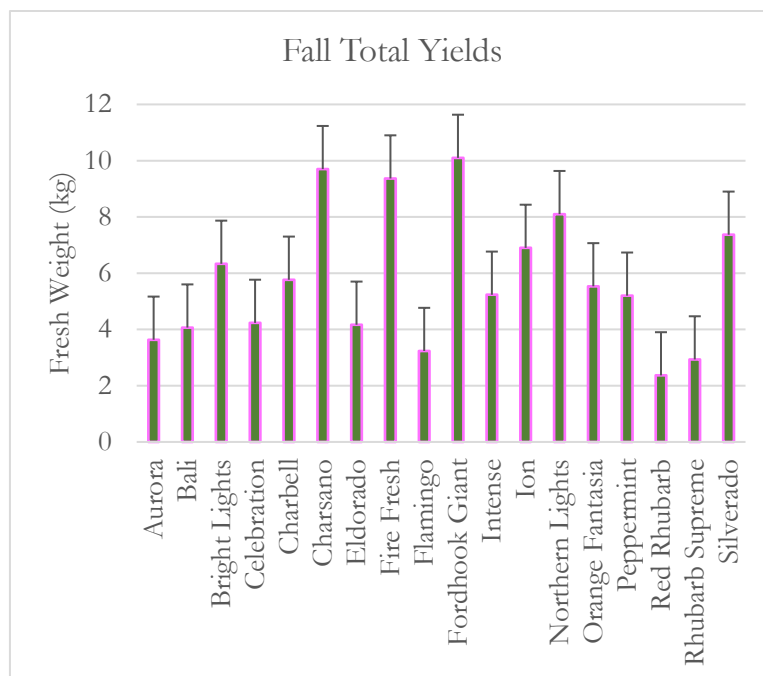


Figure 3. Fall total yields, measured as kg of fresh weight from 8 feet of row. ‘Orange Ribbed’ was not included in the fall planting. Chard was harvested for bunching in the last week of September.

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Emergence

Days to emergence were recorded for the spring planting, which was seeded into plug trays in the greenhouse. Percent emergence was visually estimated. ‘Eldorado’ was notable for extremely strong and rapid emergence, reaching 95% 4 days after seeding (DAS) and exceeding 100% at 5 DAS. ‘Silverado’, ‘Fire Fresh’ and ‘Orange Fantasia’ also had

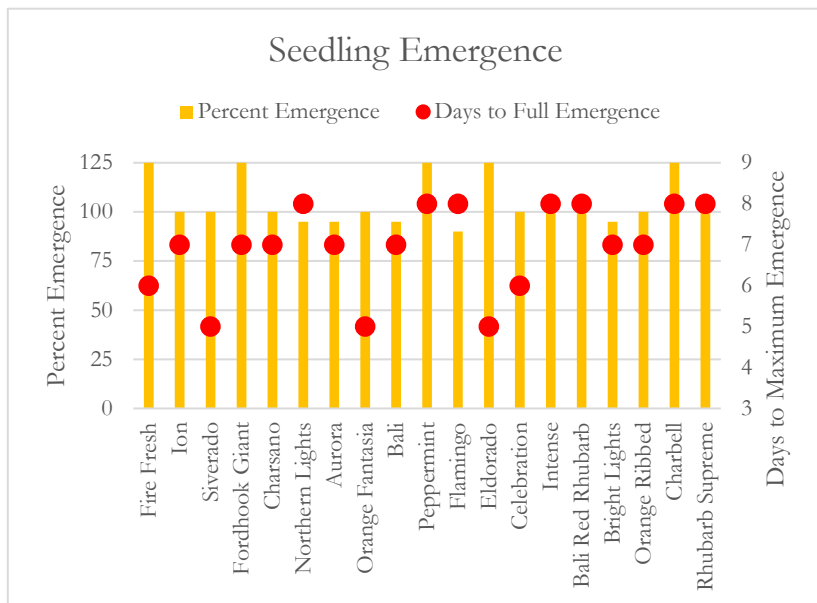


Figure 5. Emergence data for chard varieties in the greenhouse. Emergence was visually estimated daily from 4 to 9 days after seeding.

Entry	Percent Stand
Aurora	72
Bali	53
Bright Lights	80
Celebration	70
Charbell	95
Charsano	100
Eldorado	78
Fire Fresh	78
Flamingo	73
Fordhook Giant	63
Intense	77
Ion	70
Northern Lights	93
Orange Fantasia	85
Peppermint	97
Red Rhubarb	53
Rhubarb Supreme	42
Silverado	100

Table 2. Percent stand establishment for entries in the direct-seeded fall planting. Data are the means of three replications; a difference of 30% or more is statistically significant.

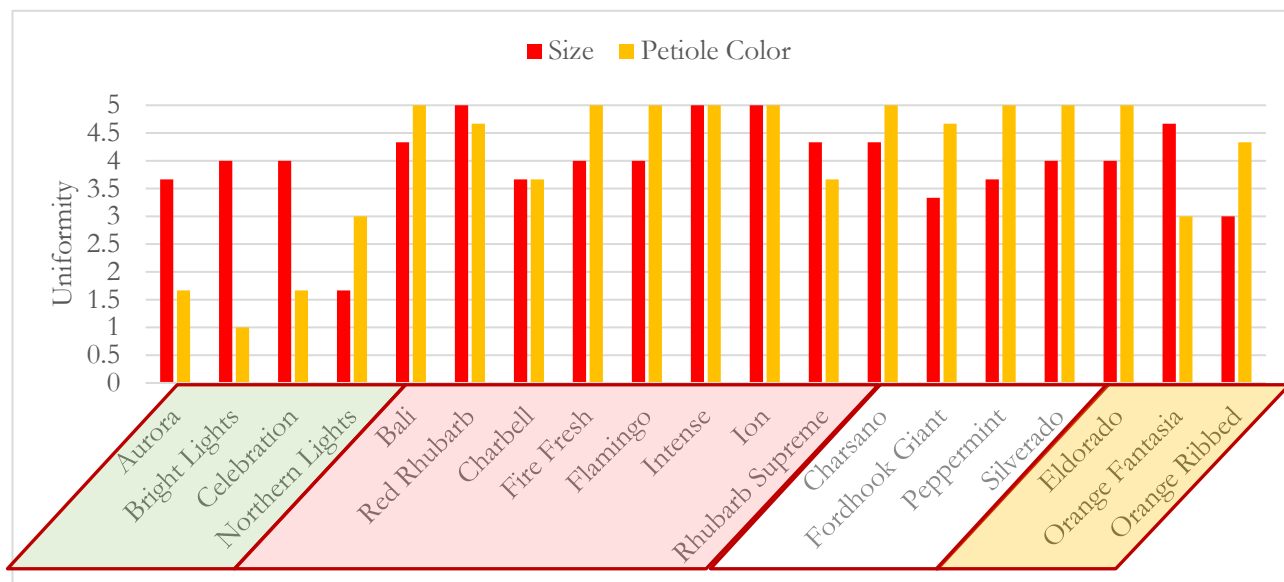


Figure 4. Uniformity scores for the spring planting. Uniformity was rated on a scale from 1 = highly variable to 5 = completely uniform. Data are means across three replications; a difference of 0.7 is significant for petiole color and difference of 1.5 is significant for size. Background colors group varieties by type, with the green background indicating rainbow types.

[Type here]

good seedling vigor, reaching 100% emergence at 5 DAS, but all had noticeably less emergence than ‘El Dorado’ at 4 DAS. Final emergence was 90% or better for all varieties, but some took as many as 8 days to reach full emergence. Stand percentage was estimated on a single date for the fall planting. Averaged across replications stands ranged from 42% for ‘Rhubarb Supreme’ to 100% for ‘Charsano’ and ‘Silverado’.

Uniformity

Entries in the spring planting were rated for uniformity using a subjective 1 to 5 scale where 1 was non-uniform and 5 was highly uniform. Uniformity of petiole color was rated separately from uniformity of leaf size and texture. Higher scores are preferred except for petiole color ratings of rainbow chard varieties, where lack of uniformity is desired. ‘Northern Lights’, ‘Fordhook Giant’ and ‘Orange Ribbed’ had significant lack of uniformity for leaf size and texture. ‘Fordhook Giant’ and ‘Orange Ribbed’ had considerable variation in plant size, while in ‘Northern Lights’ lack of uniformity was caused by differences in leaf textures and bolting in addition to plant size differences. ‘Aurora’ and ‘Peppermint’ also had variations in leaf size, while ‘Charbell’ had uniform leaf size but variations in plant height. ‘Northern Lights’ was the first variety to bolt, but by the end of June ‘Ion’, ‘Orange Fantasia’, ‘Orange Ribbed’, ‘Aurora’, ‘Charsano’ and ‘Celebration’ were also bolting.

‘Bright Lights’ had the best mix of colors of the rainbow chard varieties. ‘Celebration’ and ‘Aurora’ were slightly less variable, with lots of red and yellow but few of the oranges and pinks found in ‘Bright Lights’. ‘Northern Lights’ was unacceptable as a rainbow chard, being mostly large white or green plants with a few small yellow or red ones. All of the white varieties had excellent color uniformity. Color uniformity was generally excellent among the red chard varieties. The exceptions were ‘Rhubarb Supreme’ and ‘Charbell’. ‘Rhubarb Supreme’ is supposed to be a uniform bright red, but some plants were white or pale pink. In contrast, ‘Charbell’ is not strictly a red chard. Rather, the wide petioles are streaked with varying shades of crimson, orange and salmon. ‘Eldorado’ had the best color uniformity of the yellow chard varieties, with none of the white or pale plants which occurred in ‘Orange Ribbed’ and ‘Orange Fantasia’.

Overall Conclusions

‘Bright Lights’ is clearly the best of the rainbow chards, with better quality than ‘Northern Lights’ and better yields than ‘Aurora’ and ‘Celebration’.

‘Eldorado’ outperformed both ‘Orange Fantasia’ and ‘Orange Ribbed’ in terms of color uniformity, resistance to bolting, and leaf blade size but it had total lower yields. Extremely rapid emergence in the greenhouse suggests it would be a good choice for microgreens. All of the white chard varieties are strong performers, including ‘Peppermint’. However, ‘Silverado’ and ‘Charsano’ are better than the older ‘Fordhook Giant’. Much recent effort has focused on the red chards, and we identified some strong performers. ‘Ion’



Figure 6. Chard trial on May 7.

[Type here]

and ‘Fire Fresh’ were both developed for use as baby greens, but they out-yielded the classic varieties when harvested for bunching. ‘Ion’ has smooth leaves and good resistance to *Cercospora* leafspot, both of which help it to stay clean even in wet weather. ‘Fire Fresh’ has better seedling vigor, slightly higher yields, better resistance to bolting, and more purple color in the petioles. *Cercospora* resistance is similar to ‘Ion’ but the semi-savoy leaves can trap moisture increasing *Alternaria* leafspot. ‘Charbell’ is a bunching chard with wide petioles and large leaves. It was easily the prettiest entry in the trial. It had excellent emergence in both the field and the greenhouse. Total yields were high in the spring but lower than ‘Fire Fresh’ in the fall as the large size and more horizontal angle of ‘Charbell’ leaves makes them more susceptible to damage from wind and rain. ‘Charbell’ also is not resistant to *Cercospora*.

Acknowledgements

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