Strawberry Physiology and Horticultural Research Updates

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2023–24 season trials

Nitrogen rate

Planting date

Transplant digging date (chill hours)

Treatments

Cultivar

- Brilliance
- Medallion
- Pearl ’109’
- Pearl ‘66’

Trial 1

Early season (6 wk)

Early-season N rate	Daily N application rate (lb/acre/d)					Total N (lb/acre)
	Oct	Nov	Dec	Jan	Feb	
0 lb/acre/d	Sprinkler	0.0	1.0		1.0	84
0.5 lb/acre/d		0.5	1.0		1.0	105
1 lb/acre/d		1.0	1.0		1.0	126
2 lb/acre/d		2.0	1.0		1.0	168
3 lb/acre/d		3.0	1.0		1.0	210

Trial 2

Mid-season (6 wk)

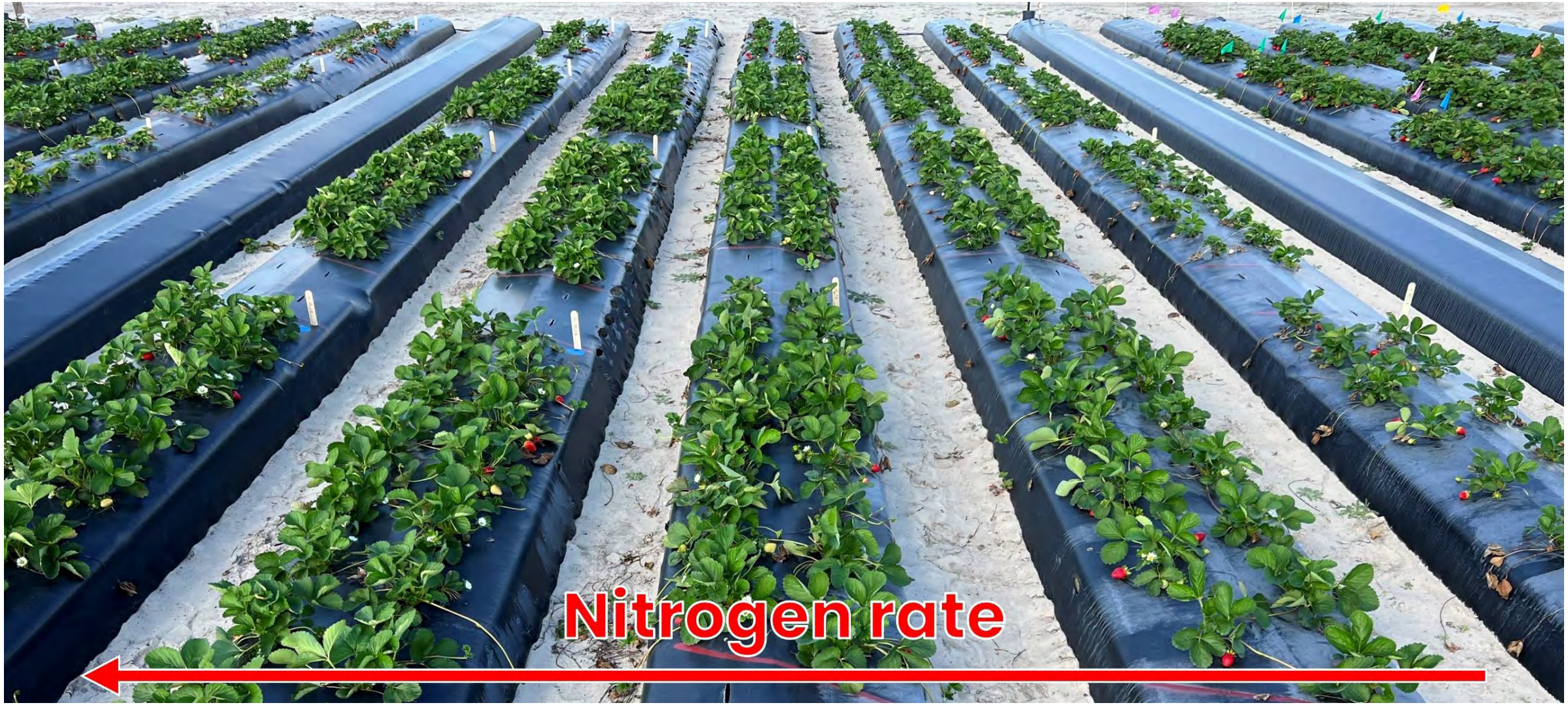
Mid-season N rate	Daily N application rate (lb/acre/d)					Total N (lb/acre)
	Oct	Nov	Dec	Jan	Feb	
0 lb/acre/d	Sprinkler	1.0	0.0		1.0	84
0.5 lb/acre/d		1.0	0.5		1.0	105
1 lb/acre/d		1.0	1.0		1.0	126
2 lb/acre/d		1.0	2.0		1.0	168
3 lb/acre/d		1.0	3.0		1.0	210

Trial 3

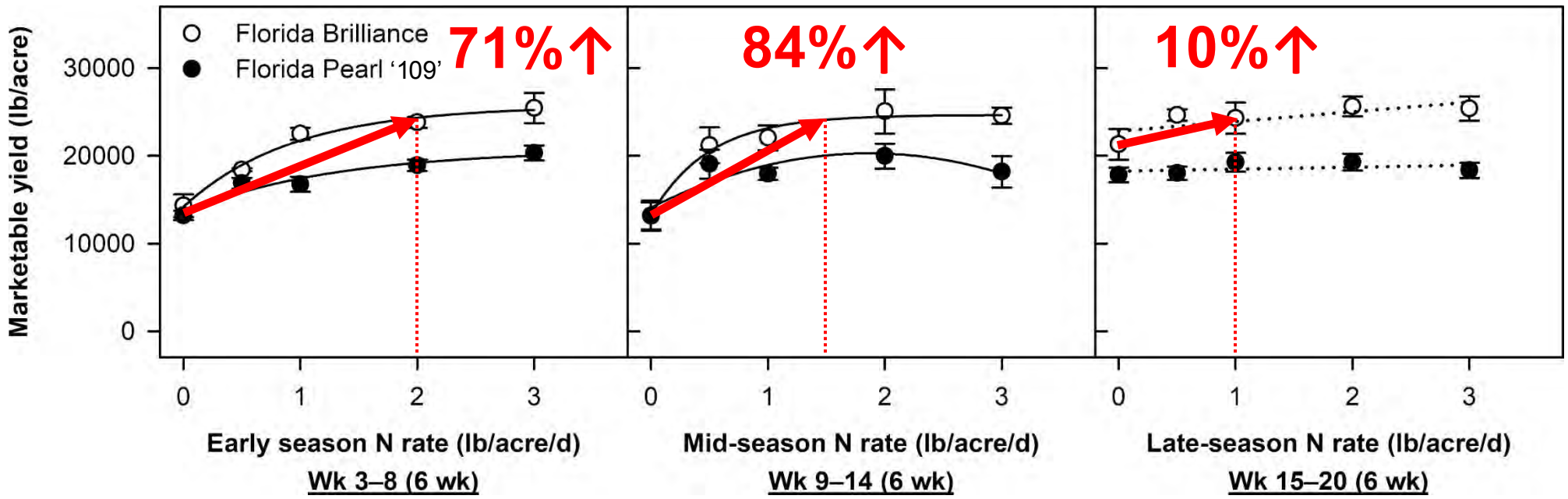
Late season (6 wk)

Late-season N rate	Daily N application rate (lb/acre/d)					Total N (lb/acre)
	Oct	Nov	Dec	Jan	Feb	
0 lb/acre/d	Sprinkler	1.0	1.0		0.0	84
0.5 lb/acre/d		1.0	1.0		0.5	105
1 lb/acre/d		1.0	1.0		1.0	126
2 lb/acre/d		1.0	1.0		2.0	168
3 lb/acre/d		1.0	1.0		3.0	210

Canopy growth



Yield responses to N

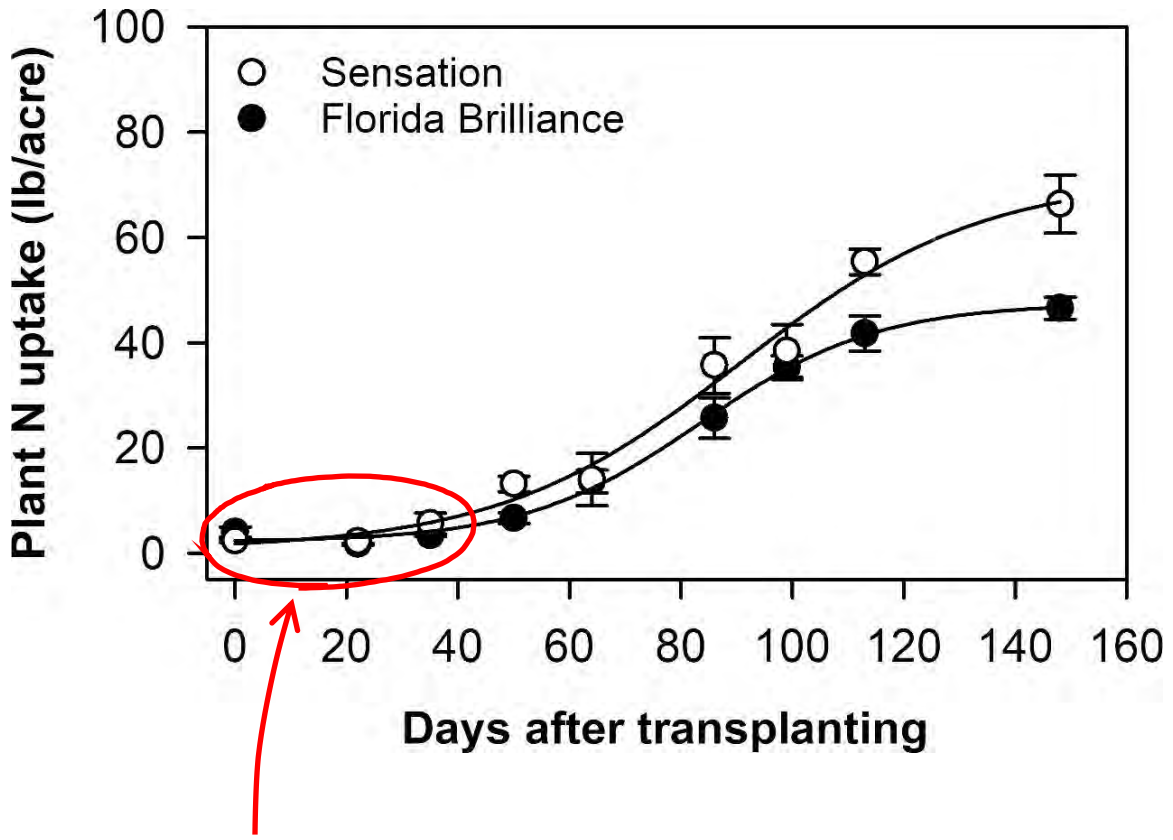


New nitrogen recommendation

	Preplant (lb/acre)	Daily N application rate (lb/acre/d)							Total (lb/acre)
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	
Old	0–40	0.6	0.6	0.6	0.6	0.75	0.75	0.6	150
New	**0**	**1.5–2.0**	**1.0–2.0**	**1.0–1.5**	**0.75–1.0**	**0.5–1.0**	**0.5–0.75**	**0.5–0.75**	**175**

- Preplant N is acceptable when using controlled-released fertilizers.
- The target total N rate is 175 lb/acre, but it can go up to 200 lb/acre, depending on tissue analysis results and season extension.
- N requirements: Medallion > Brilliance = Pearl ’66’ > Sensation = Pearl ‘109’

Why more N when plants are small?



Low N demand during the initial growth stage

Lillian Pride, PhD student

Initial root development

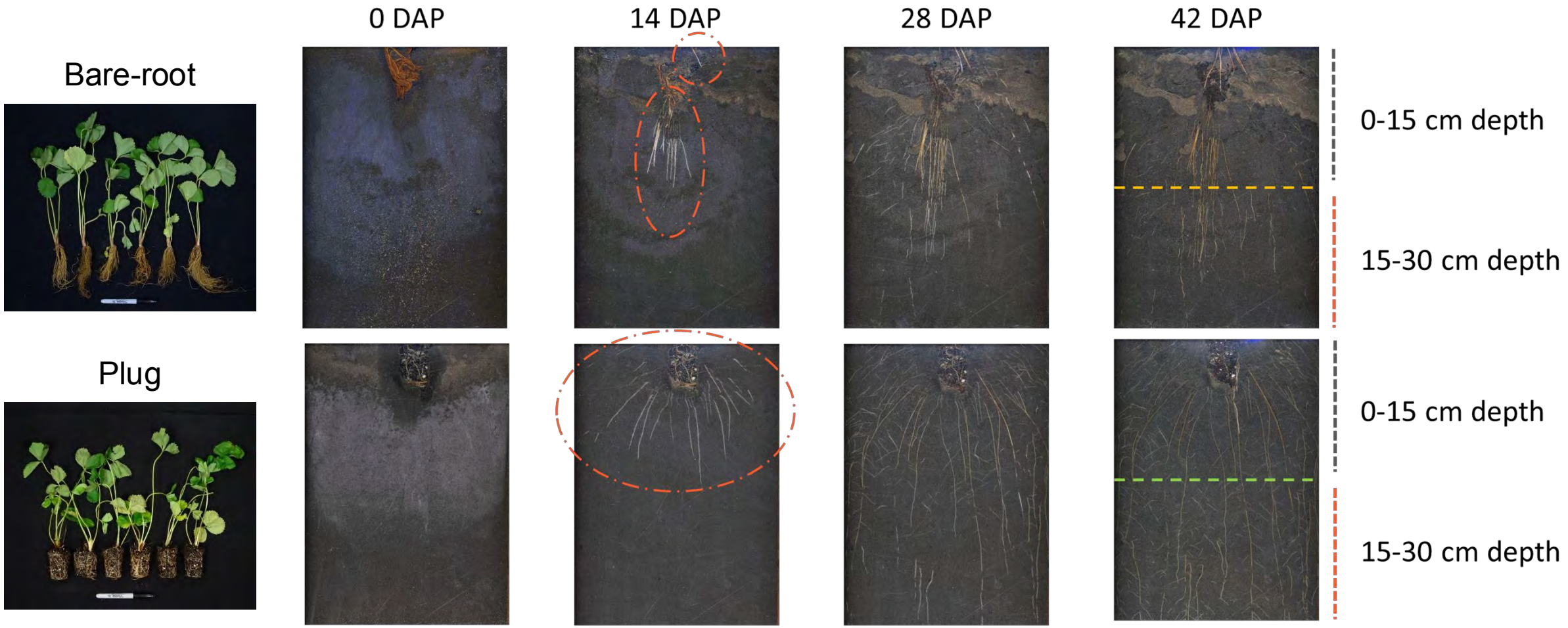
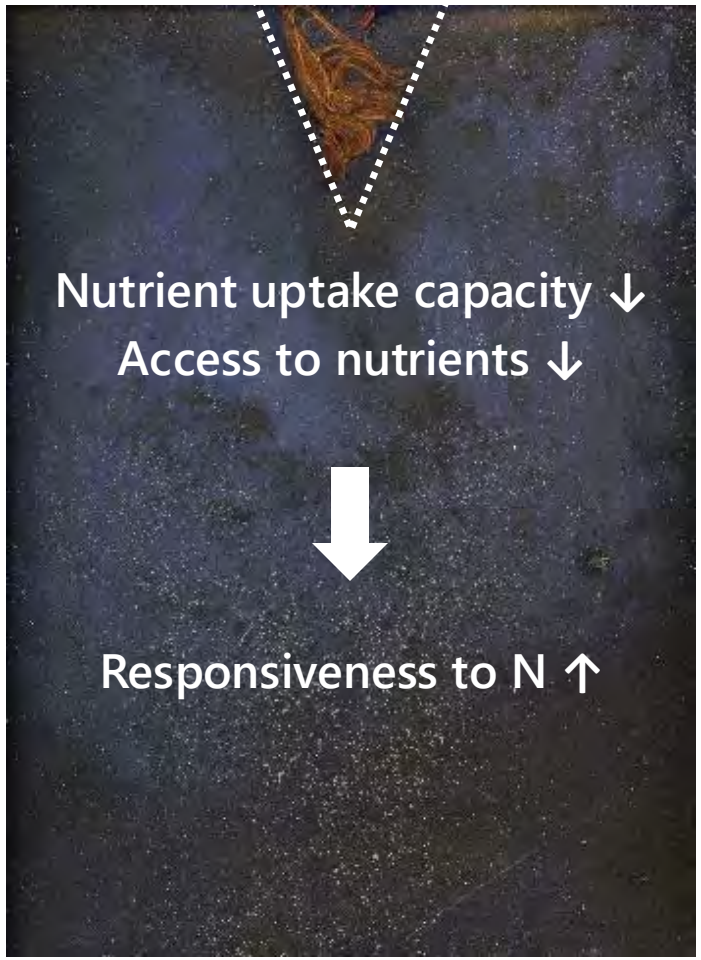
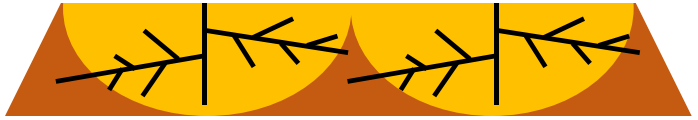
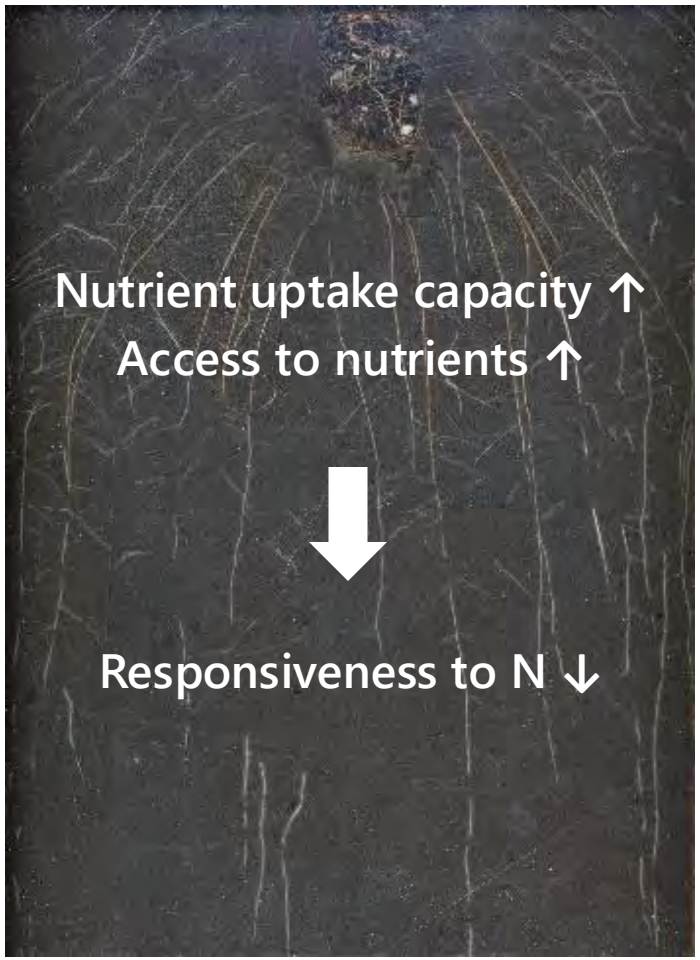


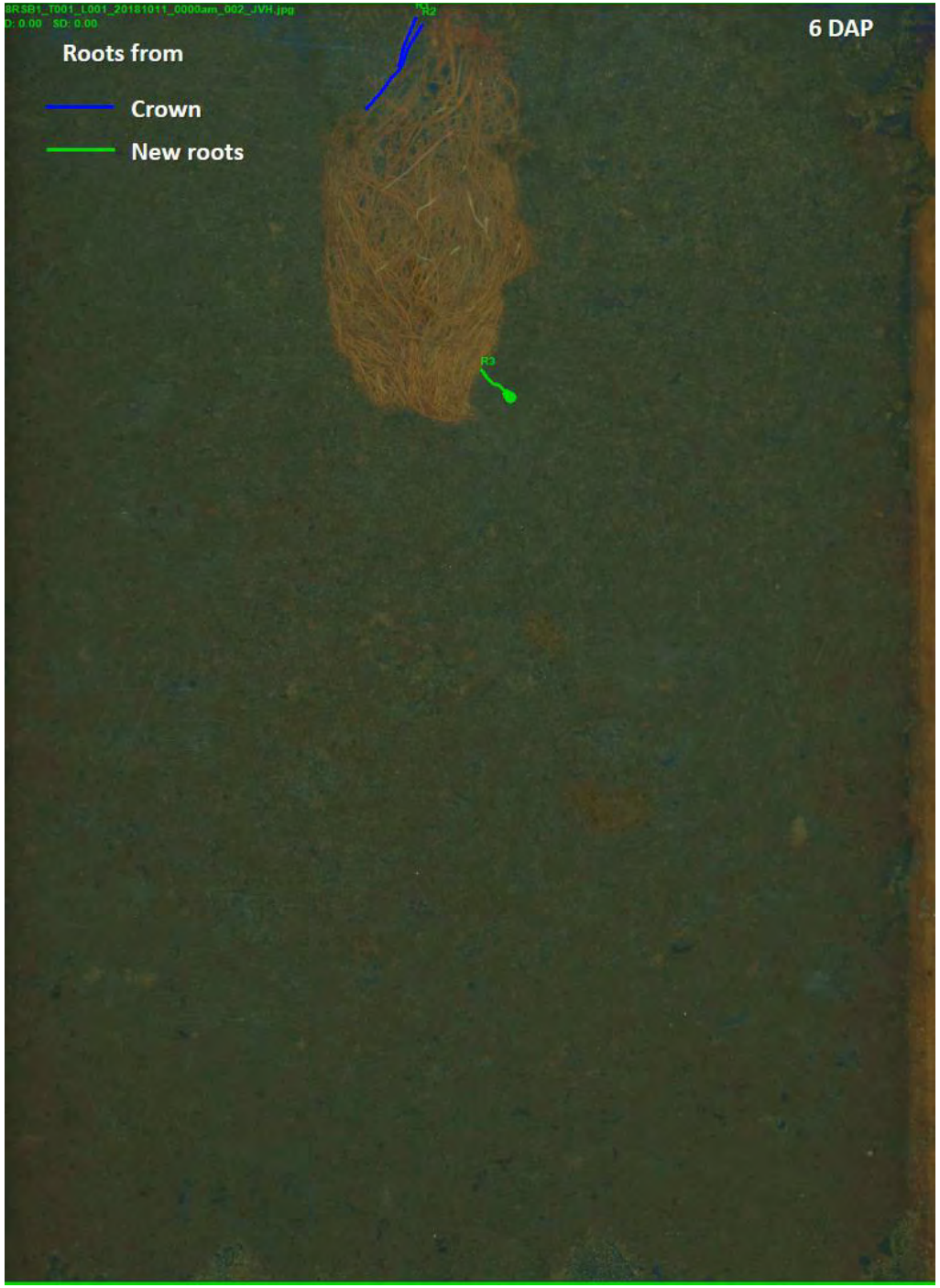
Fig. 1. Post-planting root growth dynamics and morphology in bare-root and plug transplants. DAP = days after planting.

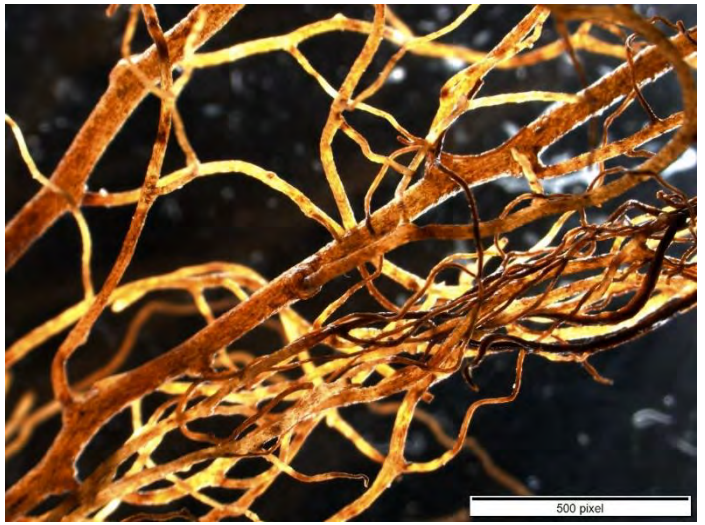

Nutrient uptake capacity ↓
Access to nutrients ↓
Responsiveness to N ↑




Nutrient uptake capacity ↑
Access to nutrients ↑
Responsiveness to N ↓

Lillian Pride, PhD student





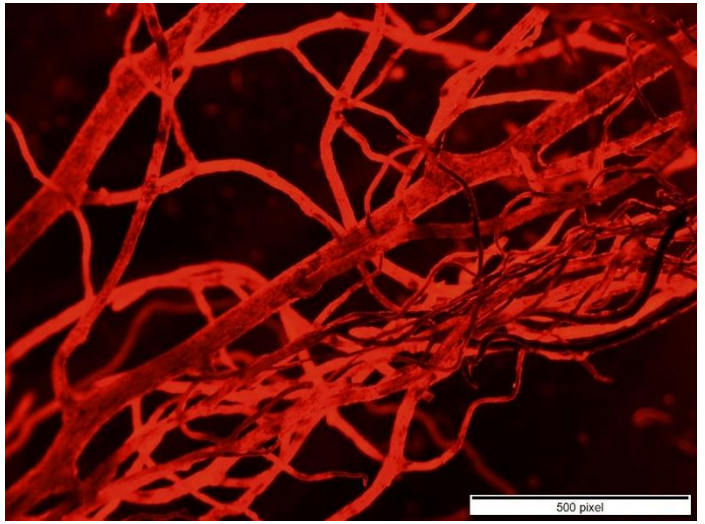
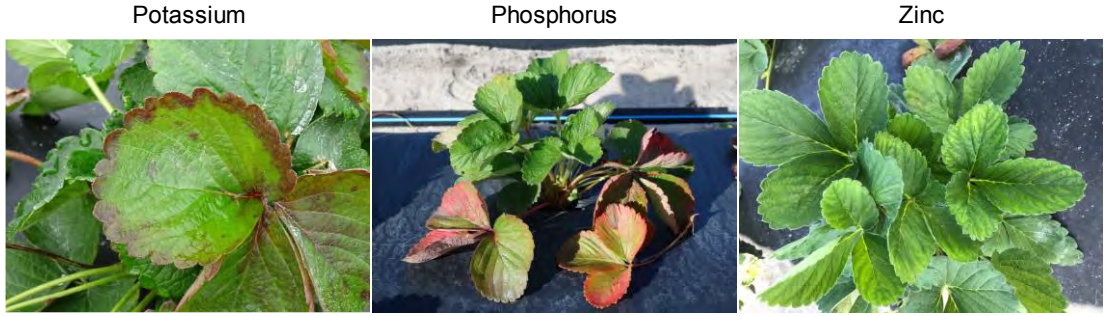
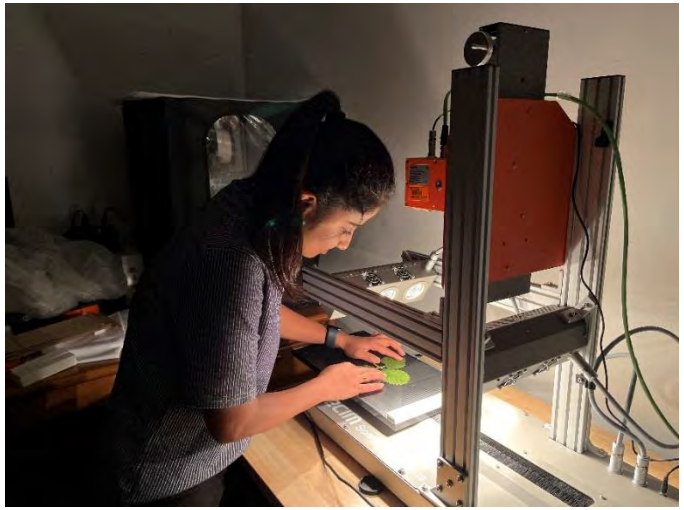
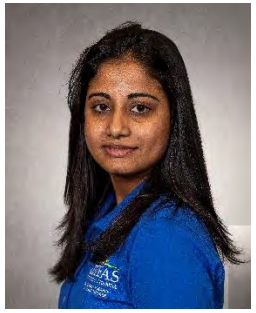


Image-based nutrient deficiency diagnosis

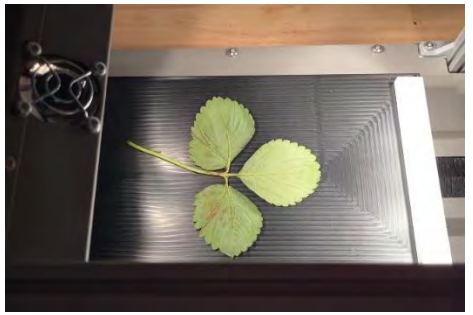






Kalara Dissanayake

PhD student



2023–24 season trials

Nitrogen rate

Planting date

Transplant digging date (chill hours)

Treatments

- **Planting date:** 10/10, 10/18, and 10/24
- **Cultivar:** Pearl ’66’, Encore (‘FL 20.34-183’), and Ember (‘FL 20.80-4’)

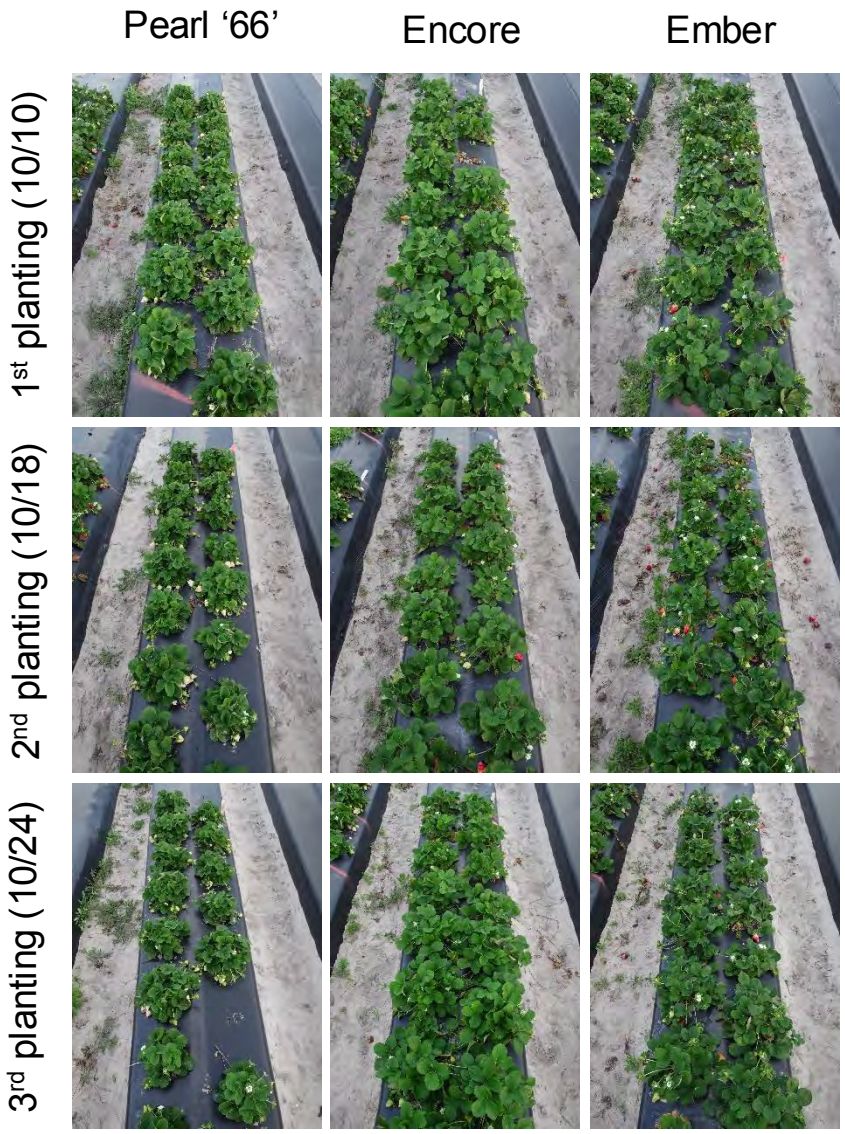
Yield

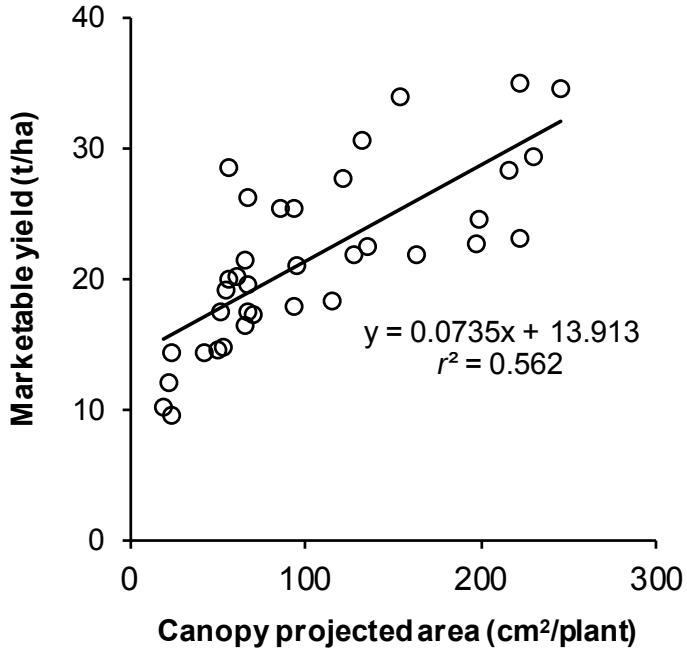
Cultivar	Transplanting date	Marketable yield (lb/acre)			
		Nov–Dec	Jan	Feb	Total
Pearl '66'	Oct 10	1,907	3,845	13,082	18,834
	Oct 18	1,172	2,880	10,196	14,247
	Oct 24	644	1,629	7,995	10,268
		66%↓	**58%↓**	**39%↓**	**45%↓**
Encore	Oct 10	4,439	8,195	17,025	29,659
	Oct 18	3,469	6,611	14,333	24,412
	Oct 24	2,506	6,035	12,904	21,445
		44%↓	**28%↓**	**24%↓**	**28%↓**
Ember	Oct 10	3,635	8,618	9,758	22,010
	Oct 18	2,256	5,230	7,884	15,369
	Oct 24	2,019	4,991	10,206	17,216
		44%↓	**42%↓**	**--**	**30%↓**

% Marketable & unmarketable

Cultivar	Transplanting date	Marketable yield (%, no./no.)	Unmarketable yield (%, no./no.)				
			Small	Thrips	Other culls	Misshapen	Disease
Pearl '66'	Oct 10	87.5	1.75	5.36	4.27	0.94	0.20
	Oct 18	87.5	1.19	4.78	5.18	1.14	0.21
	Oct 24	88.9	1.56	3.26	4.23	1.89	0.18
Encore	Oct 10	87.3	0.72	7.49	2.96	1.08	0.43
	Oct 18	88.7	1.15	4.15	4.05	1.06	0.87
	Oct 24	88.2	0.47	6.06	4.40	0.62	0.21
Ember	Oct 10	87.9	0.41	5.63	5.08	1.00	0.00
	Oct 18	86.3	0.20	4.69	7.38	1.09	0.32
	Oct 24	86.1	0.38	2.96	7.92	2.31	0.35

Canopy growth × Yield





Summary

- All tested new cultivars (Pearl ’66’, Encore, and Ember) are adapted to early planting (optimum planting date = Oct 5–10).
- Delaying planting date delays establishment growth and limits yield potential.
- Delaying planting date had greater impacts on early season yield than late season yield.

2023–24 season trials

Nitrogen rate

Planting date

Transplant digging date (chill hours)

Are chill hours important?

1. Vernalization (induction of flower development) – 50 hr are sufficient for Florida cultivars

2. Stem thickening and carbohydrate translocation into the crown to store energy for establishment growth

3. Hardening of transplants for improved stress tolerance

Experiment design

- **Nursery:** Cedar Point Nursery (Dorris, CA)
- **Study site:** UF/IFAS Gulf Coast Research and Education Center (Balm, FL)
- **Treatments**

Cultivar	Digging date (chill hours)
Sensation	9/20 (99 hr)
Brilliance	9/27 (148 hr)
Medallion	10/4 (214 hr)
	10/10 (241 hr)

For each digging date, transplants were shipped to the study site by a refrigerated truck and planted in the field one day after arrival.

Transplants

Sweet Sensation

Florida Brilliance

Florida Medallion


MMABLE
FIRE AWAY
Spray
Paint

Field plots

Sep 29, 2023

Feb 5, 2024

Canopy growth

Cultivar	Digging date (chill hours)	Canopy projected area (cm^2/plant)				
		48 DAT	69 DAT	93 DAT	126 DAT	160 DAT
Sensation	9/20 (99 hr)	617	851	1,042	1,187	1,161
	9/27 (148 hr)	218	490	714	991	1,015
	10/4 (214 hr)	248	558	799	1,089	1,082
	10/10 (241 hr)	128	385	529	689	684
		79%↓	**55%↓**	**49%↓**	**42%↓**	**41%↓**
Brilliance	9/20 (99 hr)	542	799	917	1,098	1,057
	9/27 (148 hr)	295	550	715	1,011	1,034
	10/4 (214 hr)	136	388	561	932	935
	10/10 (241 hr)	80	269	400	582	597
		85%↓	**66%↓**	**56%↓**	**47%↓**	**44%↓**
Medallion	9/20 (99 hr)	437	525	593	701	708
	9/27 (148 hr)	158	303	403	592	617
	10/4 (214 hr)	154	310	395	528	557
	10/10 (241 hr)	127	290	381	549	549
		71%↓	**45%↓**	**36%↓**	**22%↓**	**23%↓**

Yield

Cultivar	Digging date (chill hours)	Marketable yield (lb/acre)				
		Nov	Dec	Jan	Feb	Total
Sensation	9/20 (99 hr)	1,949	4,817	11,060	10,538	28,364
	9/27 (148 hr)	746	1,581	5,600	13,250	21,177
	10/4 (214 hr)	1,104	3,674	8,523	11,278	24,579
	10/10 (241 hr)	31	3,454	4,856	5,677	14,018
		99%↓	**30%↓**	**57%↓**	**47%↓**	**51%↓**
Brilliance	9/20 (99 hr)	2,551	5,387	8,616	12,505	29,059
	9/27 (148 hr)	1,592	3,515	6,689	14,666	26,463
	10/4 (214 hr)	834	2,778	6,412	16,563	26,587
	10/10 (241 hr)	125	3,070	4,892	10,587	18,674
		95%↓	**43%↓**	**43%↓**	**18%↓**	**37%↓**
Medallion	9/20 (99 hr)	1,082	2,286	4,138	6,642	14,148
	9/27 (148 hr)	563	2,121	3,051	8,433	14,168
	10/4 (214 hr)	551	2,638	4,075	5,715	12,979
	10/10 (241 hr)	198	3,301	3,968	7,080	14,547
		83%↓	**--**	**--**	**--**	**--**

Summary

- Delaying planting date from Sep 20 to Oct 10 delayed canopy establishment for all tested cultivars.
- Delaying planting date from Sep 20 to Oct 10 resulted in the greatest yield loss in Nov for all tested cultivars, ranging from 83% to 99%.
- Delaying planting date from Sep 20 to Oct 10 reduced total marketable yield of ‘Sweet Sensation’ and ‘Florida Brilliance’ by 51% and 37%, respectively, but it did not affect total marketable yield of ‘Florida Medallion’.
- The results of this study suggest that the impact of digging date or chill hours at a nursery field vary among Florida strawberry cultivars. For ‘Sweet Sensation’ and ‘Florida Brilliance’, chill hours above 50 hr do not appear to play an important role in their plant performance, demonstrating low chilling requirements and high adaptability to early planting.
- This study needs to be repeated at least one more season to obtain conclusive data.

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