

# Strawberry Horticulture Research Updates: Nitrogen Rate, Planting Date, and Transplant Digging Date



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**1**

**Planting date**

**2**

**Nitrogen rate**

**3**

**Digging date**



<b>Cultivar</b>	<b>Planting date</b>
• Pearl® '109'	• Oct 10
• Pearl® '66' (new)	• Oct 17
	• Oct 24

# 1. Planting date | Results

Cultivar	Transplanting date	Marketable yield (lb/acre)				Fruit set (no./plant)	Fruit size (g/berry)
		Nov-Dec	Jan	Feb	Total		
Pearl '109'	Oct 10	2,014 a	3,766 ab	15,852 a	21,632 a	29.6 a	19.1 c
	Oct 17	1,213 ab	3,544 b	12,187 ab	16,943 b	22.2 b	20.0 bc
	Oct 24	964 bc	4,457 ab	10,531 bc	<b>15,951 bc</b>	<b>26%↓</b>	20.5 b
Pearl '66'	Oct 10	1,761 a	5,547 a	14,913 a	22,222 a	27.7 a	20.9 ab
	Oct 17	1,386 ab	4,162 ab	12,531 ab	18,079 ab	22.4 b	21.1 ab
	Oct 24	609 c	3,891 ab	8,931 c	<b>13,432 c</b>	<b>40%↓</b>	15.8 c
Pooled data							
Pearl '109'		1,397	3,922	12,856	18,175	24.1 a	19.8 b
Pearl '66'		1,252	4,534	12,125	17,911	22.0 b	21.4 a
	Oct 10	1,887 a	4,657	15,383 a	21,927 a	28.7 a	20.0 b
	Oct 17	1,299 b	3,853	12,359 b	17,511 b	22.3 b	20.5 ab
	Oct 24	787 c	4,174	9,731 c	14,691 c	18.1 c	21.2 a
<i>p</i> value							
Cultivar		0.1482	0.0664	0.1599	0.6577	<b>0.0282</b>	<b>&lt;0.0001</b>
Transplanting date		<b>&lt;0.0001</b>	0.1829	<b>0.0001</b>	<b>&lt;0.0001</b>	<b>&lt;0.0001</b>	<b>0.0013</b>
Cultivar × Transplanting date		0.0506	<b>0.0332</b>	0.2090	0.0663	0.0531	0.3712

- Pearl '66' has similar yield as Pearl '109' but with slightly larger fruit size.
- Both Pearl cultivars are adapted to early planting (Oct 5–10).
- Delaying planting date (after Oct 20) may have a higher yield loss risk for Pearl '66' than for Pearl '109'.
- Field evaluation needs to be repeated at least one more season to obtain conclusive data.

1

Planting date

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Nitrogen rate

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Digging date

### Cultivar

- Brilliance
- Medallion
- Pearl® '109'
- Pearl® '66' (new)

### N rate

- Early, mid, and late season
- 0, 0.5, 1, 2, and 3 lb/acre/d

## 2. N rate | Treatments

### 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	

### Mid season (6 wk)

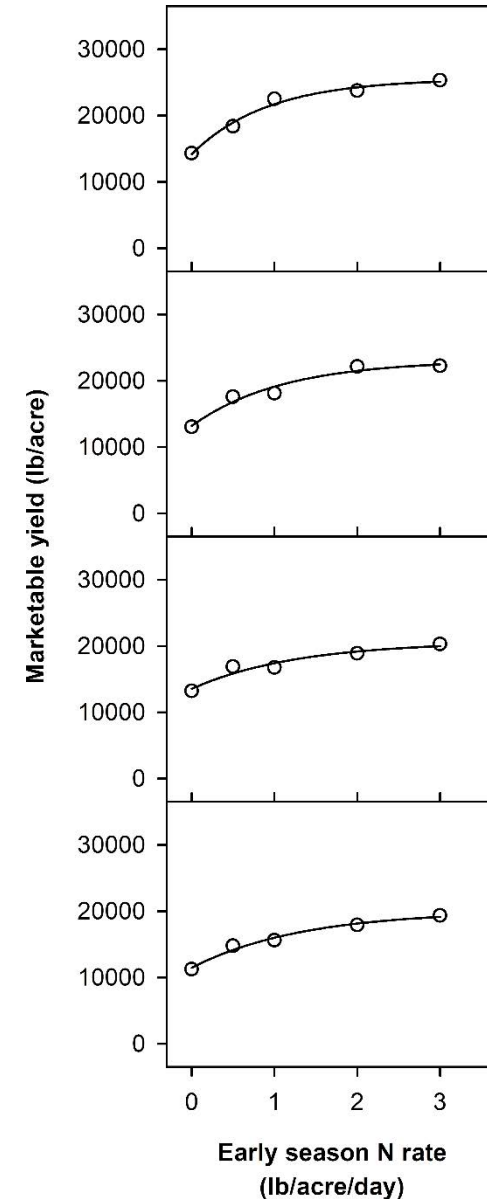
Mid-season N rate	Daily N application rate (lb/acre/d)					Total N (lb/acre)
	Oct	Nov	Dec	Jan	Feb	
0 lb/acre/d	Sprinkler	1.0	0.0	1.0	84	
0.5 lb/acre/d		1.0	0.5	1.0	105	
1 lb/acre/d		1.0	1.0	1.0	126	
2 lb/acre/d		1.0	2.0	1.0	168	
3 lb/acre/d		1.0	3.0	1.0	210	

### 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	

# 2. N rate (early season) | Results

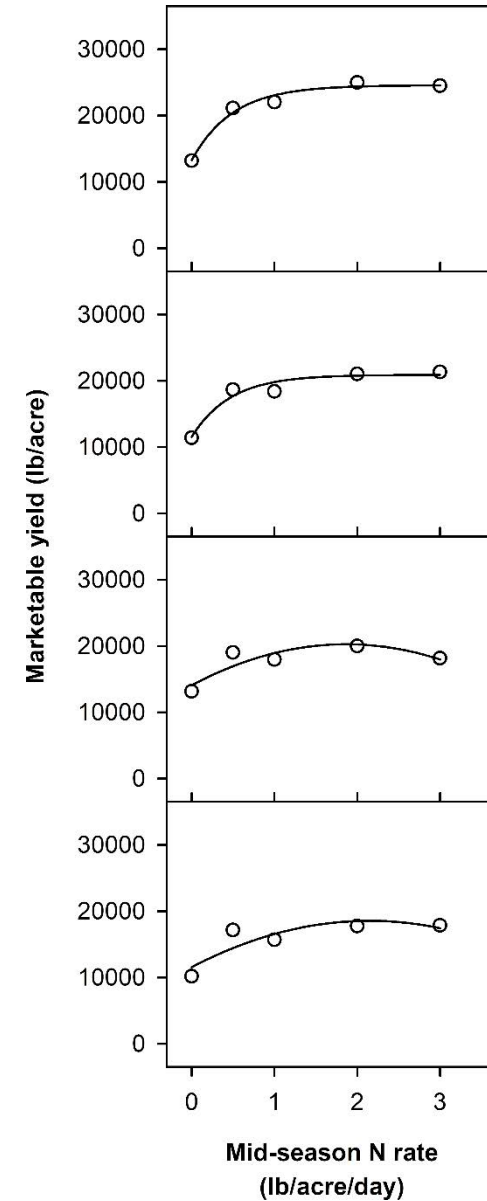
Cultivar	Early season N rate (lb/acre/day)	Marketable yield (lb/acre)			
		Nov-Dec	Jan	Feb	Total
Florida Brilliance	0.0	735	1,491	12,087	14,314
	0.5	1,625 (221)	2,556 (171)	14,202 (117)	18,384 (128)
	1.0	2,311 (314)	3,847 (258)	16,358 (135)	22,517 (157)
	2.0	2,671 (363)	4,342 (291)	16,723 (138)	23,736 (166)
	3.0	3,045 (414)	3,353 (225)	18,926 (157)	25,325 (177)
Medallion	0.0	962	1,903	10,172	13,037
	0.5	1,996 (207)	3,772 (198)	11,813 (116)	17,581 (135)
	1.0	2,064 (214)	4,250 (223)	11,816 (116)	18,130 (139)
	2.0	2,602 (270)	5,085 (267)	14,468 (142)	22,154 (170)
	3.0	2,637 (274)	5,313 (279)	14,286 (140)	22,236 (171)
Pearl '109'	0.0	779	1,115	11,311	13,205
	0.5	1,408 (181)	2,148 (193)	13,316 (118)	16,872 (128)
	1.0	1,420 (182)	1,604 (144)	13,734 (121)	16,757 (127)
	2.0	1,358 (174)	1,501 (135)	16,035 (142)	18,894 (143)
	3.0	1,457 (187)	2,237 (201)	16,582 (147)	20,277 (154)
Pearl '66'	0.0	461	995	9,792	11,249
	0.5	1,133 (246)	1,859 (187)	11,806 (121)	14,798 (132)
	1.0	1,254 (272)	1,835 (184)	12,542 (128)	15,631 (139)
	2.0	1,469 (319)	2,063 (207)	14,390 (147)	17,923 (159)
	3.0	1,449 (314)	2,511 (252)	15,400 (157)	19,361 (172)





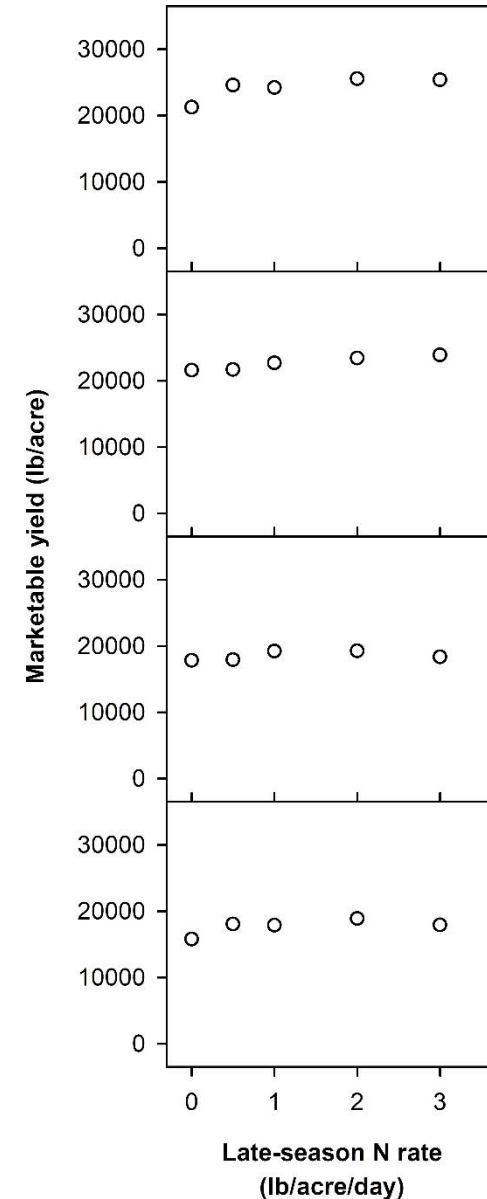
# 2. N rate (mid-season) | Results

Cultivar	Mid-season N rate (lb/acre/day)	Marketable yield (lb/acre)			
		Nov-Dec	Jan	Feb	Total
Florida Brilliance	0.0	2,402	2,214	8,551	13,167
	0.5	2,154 (90)	3,654 (165)	15,317 (179)	21,125 (160)
	1.0	2,675 (111)	3,757 (170)	15,575 (182)	22,007 (167)
	2.0	2,137 (89)	4,439 (201)	18,408 (215)	24,983 (190)
	3.0	2,135 (89)	3,939 (178)	18,403 (215)	24,478 (186)
Medallion	0.0	2,397	2,045	6,946	11,389
	0.5	2,375 (99)	3,823 (187)	12,449 (179)	18,647 (164)
	1.0	2,068 (86)	4,061 (199)	12,251 (176)	18,380 (161)
	2.0	2,058 (86)	4,072 (199)	14,885 (214)	21,015 (185)
	3.0	2,014 (84)	4,137 (202)	15,182 (219)	21,333 (187)
Pearl '109'	0.0	1,296	839	11,011	13,146
	0.5	1,302 (101)	1,644 (196)	16,066 (146)	19,013 (145)
	1.0	1,229 (95)	1,686 (201)	15,022 (136)	17,938 (136)
	2.0	1,427 (110)	2,364 (282)	16,177 (147)	19,969 (152)
	3.0	1,156 (89)	2,235 (266)	14,769 (134)	18,159 (138)
Pearl '66'	0.0	1,358	1,247	7,586	10,191
	0.5	1,297 (96)	2,354 (189)	13,499 (178)	17,151 (168)
	1.0	1,222 (90)	1,550 (124)	12,917 (170)	15,689 (154)
	2.0	1,138 (84)	2,069 (166)	14,528 (192)	17,736 (174)
	3.0	1,332 (98)	2,457 (197)	14,048 (185)	17,838 (175)



# 2. N rate (late season) | Results

Cultivar	Late-season N rate (lb/acre/day)	Marketable yield (lb/acre)			
		Nov-Dec	Jan	Feb	Total
Florida Brilliance	0.0	2,550	4,392	14,293	21,235
	0.5	2,519	4,913 (112)	17,157 (120)	24,589 (116)
	1.0	2,331	4,650 (106)	17,229 (121)	24,209 (114)
	2.0	2,773	5,434 (124)	17,357 (121)	25,565 (120)
	3.0	2,264	4,567 (104)	18,548 (130)	25,380 (120)
Medallion	0.0	3,052	5,893	12,629	21,574
	0.5	2,643	4,680 (79)	14,350 (114)	21,674 (100)
	1.0	2,771	5,689 (97)	14,221 (113)	22,681 (105)
	2.0	2,855	4,978 (84)	15,571 (123)	23,405 (108)
	3.0	2,748	5,472 (93)	15,659 (124)	23,880 (111)
Pearl '109'	0.0	1,602	2,173	14,046	17,821
	0.5	1,437	2,081 (96)	14,414 (103)	17,932 (101)
	1.0	1,632	2,029 (93)	15,571 (111)	19,232 (108)
	2.0	1,498	1,678 (77)	16,061 (114)	19,237 (108)
	3.0	1,535	1,411 (65)	15,396 (110)	18,342 (103)
Pearl '66'	0.0	1,715	2,418	11,648	15,781
	0.5	1,690	2,608 (108)	13,736 (118)	18,034 (114)
	1.0	1,591	2,503 (104)	13,781 (118)	17,876 (113)
	2.0	1,670	2,602 (108)	14,613 (125)	18,885 (120)
	3.0	1,657	1,810 (75)	14,454 (124)	17,921 (114)



- The effectiveness of N fertilization depends highly on the plant growth stage.
- 2 lb/acre/d is recommended during the early growth stage.
- 1–1.5 lb/acre/d is recommended during the mid-growth stage.
- 0.5–1.0 lb/acre/d is sufficient during the late growth stage.
- Based on 2021-22 and 2022-23 data, N requirement is higher in the order: Medallion > Brilliance > Pearl '66' > Sensation = Pearl '109'

## 2. N rate | New 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
<b>New</b>	<b>0</b>	<b>1.5–2.0</b>	<b>1.0–2.0</b>	<b>1.0–1.5</b>	<b>0.75–1.0</b>	<b>0.5–1.0</b>	<b>0.5–0.75</b>	<b>0.5–0.75</b>	<b>175</b>

- Preplant N: 0–40 lb/acre → 0 lb/acre (controlled-release N is optional for preplant N)
- In-season daily N rate: 0.3–0.75 lb/acre/d → 0.5–2.0 lb/acre/d
- Total N rate: 150 lb/acre → 175 lb/acre
- This new recommendation was approved by IFAS in March 2023.
- Additional changes may be submitted when more data are available for new cultivars.

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Planting date

2

Nitrogen rate

3

Digging date

## Cultivar

- Sensation
- Brilliance
- Medallion

## Digging date (chill hours)

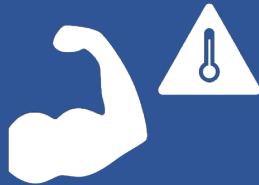
- Sep 20 (46 hr)
- Oct 3 (126 hr)
- Oct 10 (182 hr)
- Oct 17 (242 hr)
- Oct 24 (360 hr)

## Hypothesis 1



Winter chilling promotes stem thickening and carbohydrate translocation into the crown to store energy for establishment growth

## Hypothesis 2



Winter chilling hardens transplants for improved stress adaptation

**What is the optimum digging date and winter chill accumulation?**

# 3. Digging date | Results

Cultivar	Crown diameter (mm)					Leaf number					Leaf area (cm <sup>2</sup> /plant)				
	Sep 20	Oct 3	Oct 10	Oct 17	Oct 24	Sep 20	Oct 3	Oct 10	Oct 17	Oct 24	Sep 20	Oct 3	Oct 10	Oct 17	Oct 24
	(46 hr)	(126 hr)	(182 hr)	(242 hr)	(360 hr)	(46 hr)	(126 hr)	(182 hr)	(242 hr)	(360 hr)	(46 hr)	(126 hr)	(182 hr)	(242 hr)	(360 hr)
Sensation	14.2	16.4	12.2	13.8	15.0	5.83	4.63	3.88	4.13	4.13	461	368	188	245	303
Brilliance	14.9	15.0	14.4	14.9	16.4	5.00	3.63	4.00	4.13	4.50	365	283	196	391	405
Medallion	13.6	15.5	15.1	12.8	14.3	4.33	4.38	4.25	4.38	4.38	302	349	315	261	280

Sensation



Brilliance



Medallion





FLAMMABLE  
KEEP FIRE AWAY

Spray  
Paint

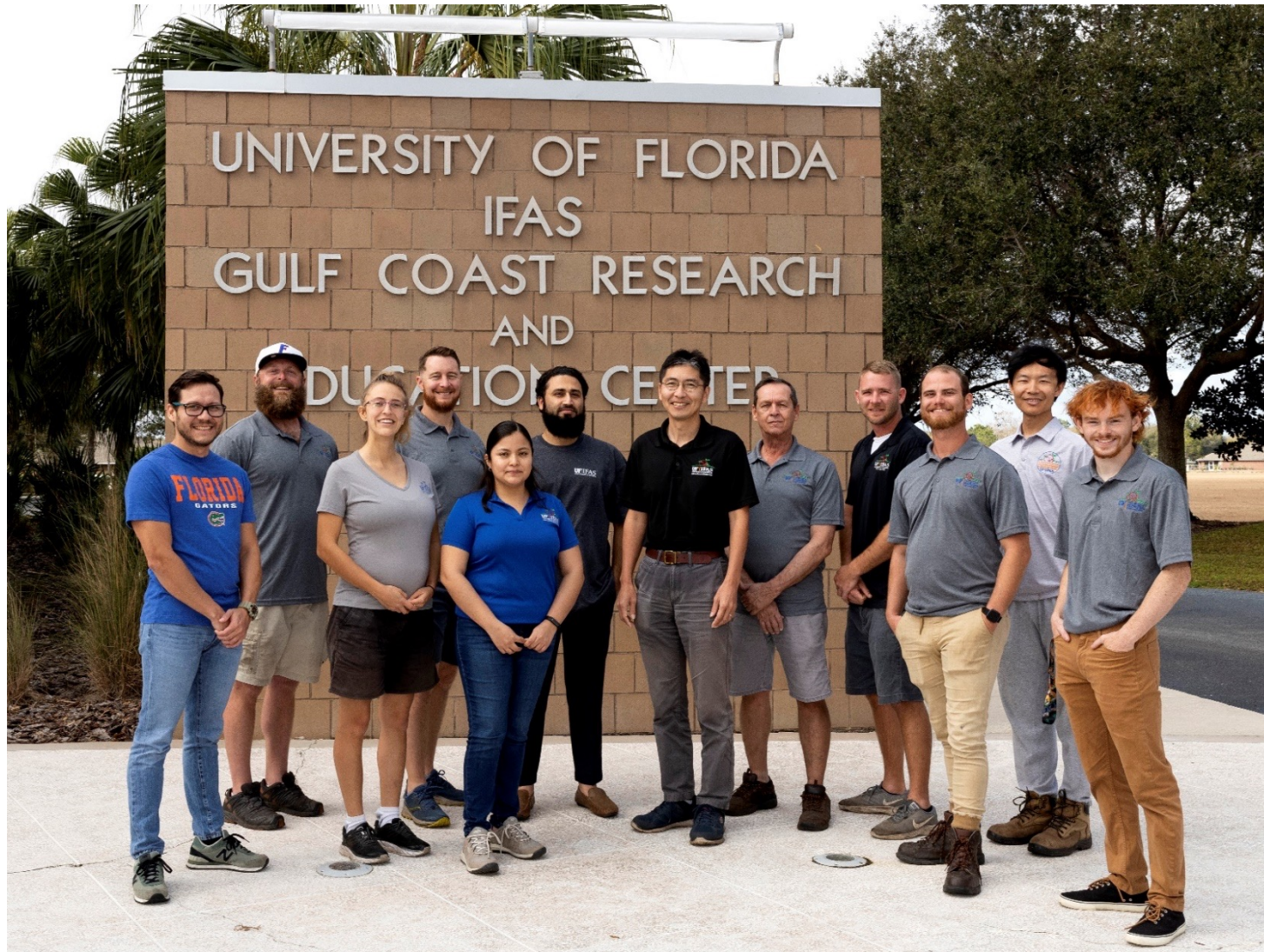


# 3. Digging date | Results

Cv	Digging date (chill hours)	Marketable yield (lb/acre)					Total	
		Nov	Dec	Jan	Feb			
Sensation	9/20 (46 hr)	1,205	3,571	11,063	13,242	29,081	35%↓	
	10/3 (126 hr)	1,163	4,023	8,925	11,808	25,920		
	10/10 (182 hr)	202	3,916	7,426	10,753	22,297		
	10/17 (242 hr)	12	2,277	7,240	10,232	19,761		
	10/24 (360 hr)	0	3,700	6,967	8,218	18,886		
Brilliance	9/20 (46 hr)	1,221	4,294	8,168	17,301	30,983	51%↓	
	10/3 (126 hr)	298	4,502	5,592	11,905	22,296		
	10/10 (182 hr)	257	3,186	5,498	6,321	15,261		
	10/17 (242 hr)	0	3,616	6,100	11,161	20,877		
	10/24 (360 hr)	0	3,641	6,554	11,223	21,418		
Medallion	9/20 (46 hr)	936	3,713	4,853	13,665	23,166	44%↓	
	10/3 (126 hr)	587	4,100	5,514	7,054	17,254		
	10/10 (182 hr)	311	3,668	7,829	13,352	25,160		
	10/17 (242 hr)	64	3,018	6,122	8,393	17,598		
	10/24 (360 hr)	0	2,349	5,530	6,194	14,073		
		Pooled data						
Sensation		517	3,497	8,324	10,851	23,189		
Brilliance		355	3,848	6,382	11,582	22,167		
Medallion		380	3,370	5,969	9,732	19,450		
	9/20 (46 hr)	1,121	3,859	8,028	14,736	27,744	35%↓	
	10/3 (126 hr)	683	4,208	6,677	10,256	21,823		
	10/10 (182 hr)	257	3,590	6,918	10,142	20,906		
	10/17 (242 hr)	25	2,970	6,487	9,929	19,412		
	10/24 (360 hr)	0	3,230	6,350	8,545	18,126		

- The results of this experiment is affected by both different chill hours at the nursery field and different growing conditions in the production field.
- In general, delaying planting date from Sep 20 to Oct 24 decreased yield for all tested cultivars.
- Yield variability among different planting dates was relatively small in Sensation than in other cultivars.
- The importance of winter chilling in transplant quality and yield performance was unclear in this season's experiment.
- This study needs to be repeated at least a few more seasons to obtain conclusive data.

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