

Optimization of Nitrogen Fertilization Rate for Florida Strawberry Cultivars

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Summary

We evaluated five nitrogen (N) rates from 0 to 3 lb/acre/d during early (Wk 3-8), middle (Wk 9-14), and late (Wk 15-20) seasons for four cultivars, 'Florida Brilliance', Medallion®, Pearl '109' and Pearl '66'. The effectiveness of N fertilization was high, moderate, and negligible during the early, mid-, and late seasons. It also depended highly on cultivars. The effectiveness of N fertilization depends highly on cultivars and plant growth stages. Based on the previous and this season's experiments, N requirement is highest in the order: Medallion > Brilliance > Pearl 'FL18.52-66' > Sensation = Pearl 'FL16.78-109'

Nitrogen Fertilization

The previous fertility trials demonstrated that the effectiveness of N fertilization is high, moderate, and low during the early, mid-, and late seasons, respectively. The optimum N rate depends on cultivars. For example, Medallion® requires higher N rates than Pearl® '109' especially during the early season. Pearl® FL18.52-66 (Pearl '66') is a new pineberry selection, and its season-specific N demands are unknown. The objective of this study was to quantify the optimum N rates during early, middle, and late seasons for 'Florida Brilliance', Medallion®, Pearl '109' and Pearl '66'.

Methods

We evaluated early, mid, and late season N rates in three separate field experiments during the 2023-24 season at the UF/IFAS GCREC in Balm, FL. Tables 1–3 show the N rates in the three experiments. Total N application rates ranged from 84 to 210 lb/acre. All three experiments were conducted using a split-plot

design with N rate as the main plot factor and cultivar as the sub-plot factor with 4 replicates per treatment. Bare-root transplants (Crown Nursery, CA) were planted on Oct 16, 2023. Commercial production and pest management practices were followed. Strawberries were harvested weekly from November through February.

Table 1. Early-season N fertilization treatments.

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	1.0	84
0.5 lb/acre/d		0.5	1.0	1.0	1.0	105
1 lb/acre/d		1.0	1.0	1.0	1.0	126
2 lb/acre/d		2.0	1.0	1.0	1.0	168
3 lb/acre/d		3.0	1.0	1.0	1.0	210

Transplanting = Oct 12, 2022

Wk 1–2 = establishment with sprinkler irrigation

Wk 3–8 (6 wk) = early season

Wk 9–14 (6 wk) = mid-season

Wk 15–20 (6 wk) = late season

Table 2. Mid-late season N fertilization treatments.

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	1.0	84
0.5 lb/acre/d		1.0	0.5	1.0	1.0	105
1 lb/acre/d		1.0	1.0	1.0	1.0	126
2 lb/acre/d		1.0	2.0	1.0	1.0	168
3 lb/acre/d		1.0	3.0	1.0	1.0	210

Transplanting = Oct 12, 2022

Wk 1–2 = establishment with sprinkler irrigation

Wk 3–8 (6 wk) = early season

Wk 9–14 (6 wk) = mid-season

Wk 15–20 (6 wk) = late season

Table 3. Late–late season N fertilization treatments.

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

Transplanting = Oct 12, 2022

Wk 1–2 = establishment with sprinkler irrigation

Wk 3–8 (6 wk) = early season

Wk 9–14 (6 wk) = mid-season

Wk 15–20 (6 wk) = late season

Results

Early season N rate effects on yield (Table 4)

Increasing early season N rate increased yield, but the four cultivars showed different responsiveness, both in the magnitude of yield increases and the N rate thresholds.

In ‘Florida Brilliance’, yield responded positively to early season N rate up to 3 lb/acre/d. Increasing N rate from 0 to 3 lb/acre/d increased yield in Nov-Dec, Jan, Feb, and the entire season by 320%, 2343%, 43%, and 140%, respectively. In comparison, increasing N rate from 0 to 2 lb/acre/day resulted in yield increases of 254%, 1538%, 31%, and 99% for the same periods.

In Medallion®, yield responded positively to early season N rate up to 2 lb/acre/d. Increasing N rate from 0 to 2 lb/acre/d increased yield in Nov-Dec, Jan, Feb, and the entire season by 167%, 433%, 76%, and 128%, respectively. Increasing N rate further to 3 lb resulted in relatively small or negligible yield increases.

In Pearl® ‘109’, yield responded positively to early season N rate up to 3 lb/acre/d, but the extent of yield increases were smaller compared to the other cultivars. Increasing N rate from 0 to 3 lb/acre/d increased yield in Nov-Dec, Jan, Feb, and the entire season by 216%, 237%, 41%, and 81%, respectively. In comparison, increasing N rate from 0 to 2 lb/acre/day resulted in yield increases of 196%, 193%, 22%, and 60% for the same periods.

In Pearl® ‘66’, yield responded positively to early season N rate up to 3 lb/acre/d. Increasing N rate from 0 to 3 lb/acre/d increased yield in Nov-Dec, Jan,

Feb, and the entire season by 377%, 356%, 82%, and 150%, respectively. In comparison, increasing N rate from 0 to 2 lb/acre/day resulted in yield increases of 321%, 333%, 67%, and 129% for the same periods.

Table 4. Marketable yield of four strawberry cultivars as affected by early season nitrogen (N) rates.

Cultivar	Early season N rate (lb/acre/d)	Marketable yield (8-lb flat #/acre)			
		Nov–Dec	Jan	Feb	Total
Florida Brilliance	0.0	84	17	549	650
	0.5	164	97	643	905
	1.0	207	222	746	1,175
	2.0	297	280	719	1,296
	3.0	353	418	788	1,558
	0 → 1 lb	146%↑	1197%↑	36%↑	81%↑
	0 → 2 lb	254%↑	1538%↑	31%↑	99%↑
0 → 3 lb	320%↑	2343%↑	43%↑	140%↑	
Medallion	0.0	114	53	403	571
	0.5	174	91	528	792
	1.0	246	206	520	972
	2.0	306	284	710	1,300
	3.0	343	276	669	1,287
	0 → 1 lb	115%↑	287%↑	29%↑	70%↑
	0 → 2 lb	167%↑	433%↑	76%↑	128%↑
0 → 3 lb	200%↑	417%↑	66%↑	125%↑	
Pearl ‘109’	0.0	113	117	829	1,059
	0.5	140	176	827	1,143
	1.0	230	282	931	1,443
	2.0	334	344	1,013	1,691
	3.0	356	396	1,170	1,922
	0 → 1 lb	104%↑	140%↑	12%↑	36%↑
	0 → 2 lb	196%↑	193%↑	22%↑	60%↑
0 → 3 lb	216%↑	237%↑	41%↑	81%↑	
Pearl ‘66’	0.0	99	95	610	803
	0.5	159	205	688	1,051
	1.0	273	337	912	1,522
	2.0	416	410	1,017	1,843
	3.0	472	432	1,108	2,011
	0 → 1 lb	176%↑	256%↑	50%↑	89%↑
	0 → 2 lb	321%↑	333%↑	67%↑	129%↑
0 → 3 lb	377%↑	356%↑	82%↑	150%↑	

Mid- season N rate effects on yield (Table 5)

Similar to the response to early season N rate, the four cultivars showed different responsiveness to mid-season N rate, both in the magnitude of yield increases and the N rate thresholds.

In ‘Florida Brilliance’, yield responded positively to mid-season N rate up to 2 lb/acre/d. Increasing N rate from 0 to 2 lb/acre/d increased yield in Jan, Feb,

and the entire season by 60%, 198%, and 85%, respectively. Increasing N rate further to 3 lb negatively affected yield.

In Medallion®, yield responded positively to mid-season N rate up to 3 lb/acre/d. Increasing N rate from 0 to 3 lb/acre/d increased yield in Jan, Feb, and the entire season by 49%, 294%, and 85%, respectively. In comparison, increasing N rate from 0 to 2 lb/acre/day resulted in yield increases of 34%, 229%, and 66% for the same periods.

In Pearl® ‘109’, yield responded positively to mid-season N rate only up to 1 lb/acre/d. Increasing N rate from 0 to 1 lb/acre/d increased yield in Jan, Feb, and the entire season by 26%, 205%, and 81%, respectively. Increasing N rate further to 2 or 3 lb had relatively small or negligible effects on yield.

In Pearl® ‘66’, yield responded positively to early season N rate up to 3 lb/acre/d. Increasing N rate from 0 to 3 lb/acre/d increased yield in Jan, Feb, and the entire season by 27%, 175%, and 71%, respectively. In comparison, increasing N rate from 0 to 2 lb/acre/day resulted in yield increases of 17%, 145%, and 60% for the same periods.

Table 5. Marketable yield of four strawberry cultivars as affected by mid-season nitrogen (N) rates.

Cultivar	Mid-season N rate (lb/acre/d)	Marketable yield (8-lb flat #/acre)			
		Nov-Dec	Jan	Feb	Total
Florida Brilliance	0.0	424	313	328	1,065
	0.5	449	462	718	1,629
	1.0	362	364	697	1,424
	2.0	496	500	976	1,972
	3.0	393	419	820	1,632
	0 → 1 lb	--	16%↑	113%↑	34%↑
	0 → 2 lb	--	60%↑	198%↑	85%↑
0 → 3 lb	--	34%↑	150%↑	53%↑	
Medallion	0.0	462	332	266	1,060
	0.5	391	365	482	1,238
	1.0	378	358	688	1,424
	2.0	440	446	874	1,760
	3.0	419	495	1,046	1,960
	0 → 1 lb	--	8%↑	159%↑	34%↑
	0 → 2 lb	--	34%↑	229%↑	66%↑
0 → 3 lb	--	49%↑	294%↑	85%↑	
Pearl ‘109’	0.0	409	352	348	1,108
	0.5	417	383	690	1,491
	1.0	499	443	1,061	2,002
	2.0	440	404	982	1,826
	3.0	479	465	1,103	2,047
	0 → 1 lb	--	26%↑	205%↑	81%↑
	0 → 2 lb	--	15%↑	182%↑	65%↑
0 → 3 lb	--	32%↑	217%↑	85%↑	
Pearl ‘66’	0.0	437	419	449	1,305
	0.5	468	460	759	1,687
	1.0	491	483	1,050	2,024
	2.0	492	491	1,099	2,082
	3.0	470	532	1,236	2,239
	0 → 1 lb	--	15%↑	134%↑	55%↑
	0 → 2 lb	--	17%↑	145%↑	60%↑
0 → 3 lb	--	27%↑	175%↑	71%↑	

Late season N rate effects on yield (Table 6)

Unlike early or mid-season N rate, late season N rate had negligible effects on yield in all four cultivars, with no significant yield increase from additional N.

Table 6. Marketable yield of four strawberry cultivars as affected by late season nitrogen (N) rates.

Cultivar	Late season N rate (lb/acre/d)	Marketable yield (8-lb flat #/acre)			
		Nov-Dec	Jan	Feb	Total
Florida Brilliance	0.0	556	551	906	2,014
	0.5	667	672	1,020	2,358
	1.0	550	566	983	2,099
	2.0	527	597	1,045	2,169
	3.0	589	593	937	2,119
	0 → 1 lb	--	--	8%↑	4%↑
	0 → 2 lb	--	--	15%↑	8%↑
0 → 3 lb	--	--	3%↑	5%↑	
Medallion	0.0	536	597	837	1,969
	0.5	507	491	806	1,805
	1.0	538	596	1,001	2,134
	2.0	451	504	734	1,689
	3.0	495	551	920	1,967
	0 → 1 lb	--	--	20%↑	8%↑
	0 → 2 lb	--	--	12%↓	14%↓
0 → 3 lb	--	--	10%↑	0%↑	
Pearl '109'	0.0	459	431	1,108	1,998
	0.5	473	427	1,079	1,978
	1.0	462	420	1,069	1,951
	2.0	482	514	1,041	2,037
	3.0	472	506	1,191	2,169
	0 → 1 lb	--	--	4%↓	2%↓
	0 → 2 lb	--	--	6%↓	2%↑
0 → 3 lb	--	--	7%↑	9%↑	
Pearl '66'	0.0	491	509	1,235	2,235
	0.5	535	534	1,146	2,215
	1.0	514	434	1,064	2,011
	2.0	481	503	1,161	2,145
	3.0	511	513	1,045	2,068
	0 → 1 lb	--	--	14%↓	10%↓
	0 → 2 lb	--	--	6%↓	4%↓
0 → 3 lb	--	--	15%↓	7%↓	

weather conditions. Adjustments should be made accordingly.

- **Leaf nutrient monitoring:** Use tissue analysis to monitor leaf N status and made adjustments to N rate accordingly (optimum leaf N range = 3.0% to 3.5%).

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<https://www.facebook.com/UFHortLab>

<https://www.youtube.com/channel/UCMyYAFzSib6d4Zl-eaxCTQ>

Takeaways

- **New N recommendation for FL strawberry cultivars:**
<https://edis.ifas.ufl.edu/publication/cv003>
- **Early season:** Apply 2 lb/acre/d for most cultivars; in some cases, yield may increase further with 3 lb/acre/d.
- **Mid-season:** Apply 1–2 lb/acre/d, depending on cultivars.
- **Late season:** Only small amounts of N (0.5 lb/acre/d) are needed for all cultivars.
- **Site-specific adjustments:** Optimum N rate may depend on soil type, plant spacing, and