Nitrogen Fertilization Recommendations for 'Medallion' and 'Pearl'

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Summary

This study demonstrated distinctly different nitrogen (N) requirements between 'Medallion' and 'Pearl'. 'Medallion' was very responsive to N fertilization throughout the season. However, using a high N rate (e.g., 2 lb/acre/d) for 3 to 6 wk during establishment appears to be a more effective fertilization strategy than increasing N rate during the mid to late season. Importantly, increasing N rate has no negative impact on fruit size and Brix for this cultivar. By contrast, 'Pearl' is a low N requiring cultivar. Its N requirement is probably even lower than that of Sensation®. Furthermore, excessive N fertilization can reduce fruit Brix in this cultivar. All trials in this report were conducted on sandy soil (97% sand) with 0.6% organic matter and low CEC (5.3 meq/100g). Soil characteristics should also be considered to adjust the fertilization program.

Nitrogen Fertilization

Our previous studies suggest that, instead of applying pre-plant N, applying N at high rates between 1.96 and 2.24 kg/ha/d during the establishment and gradually switching to lower rates is an efficient fertilization practice. The initial high-dose fertilization is important for improving the establishment of strawberry transplants, but this practice must be tailored for each cultivar based on its growth characteristics and nutrient requirements.

Methods

Two strawberry fertility experiments were conducted using 'Medallion' and 'Pearl' during the 2020-2021 season at the UF/IFAS GCREC in Balm, FL. Treatments in the first experiment is shown in Table 1. We evaluated six durations of initial high N fertilization (2 lb/acre/d): 0, 1, 2, 3, 4, and 6 wk. Total N application rates ranged from 121 to 163 lb/acre. Transplants were planted on Oct 13, 2020. Treatments in the second experiment is shown in Table 2. We evaluated four mid–late (post-establishment) N rates: 0.5, 1, 1.5, and 2 lb/acre/d. Total N application rates ranged from 92 to 242 lb/acre. Transplants were planted on Oct 14, 2020. In both experiments, bare-root transplants were shipped from Crown nursery (Red Bluff, CA) to GCREC on Oct 3, 2020. Transplants were stored at 2 °C until transplanting. Harvests were performed 22 times between November 24, 2020 and February 25, 2021.

Table 1. Early-season nitrogen (N) fertilization treatments.

Duration of initial high N	N fertilizatio rate (lb/acre/d)					Total N (lb/acre)
	Oct	Nov	Dec	Jan	Feb	
0 wk	Sprinkler	1				121
1 wk	Sprinkler	2	1			128
2 wk	Sprinkler	2	1			135
3 wk	Sprinkler	2	1			142
4 wk	Sprinkler	2	1			149
6 wk	Sprinkler	2	1			163

↑ Transplanting

Table 2. Mid–late season nitrogen (N) fertilization treatments.

Mid-late season N rate	N fertilizatio rate (lb/acre/d)					Total N (lb/acre)
	Oct	Nov	Dec	Jan	Feb	
0.5 lb/acre/d	Sprinkler	2	0.5			92
1.0 lb/acre/d	Sprinkler	2	1			142
1.5 lb/acre/d	Sprinkler	2	1.5			192
2.0 lb/acre/d	Sprinkler	2	2			242

↑ Transplanting

Results

Early-season N fertilization effects on canopy growth

'Medallion' was relatively more responsive to initial high N fertilization than 'Pearl'. In 'Medallion', canopy area increased with increasing the duration of initial high N fertilization (Table 3). For example, extending the initial high N fertilization from 0 to 1 wk increased canopy area by 4% (112 DAT) to 39% (53 DAT). The response of canopy area to N was described as a significant linear function at 112 DAT. Canopy growth promotion by N was most pronounced during the early season (53 DAT). These results suggest that initial high-dose fertilization can accelerate the establishment of strawberry transplants. By contrast, 'Pearl' showed no significant response.

Early-season N fertilization effects on yield

In 'Medallion', extending the duration of initial high N fertilization increased Nov, Dec, Jan, Feb, and total-season yields by up to 99%, 38%, 8%, 34%, and 27%, respectively (Table 4). The yield response to N in Dec was a significant quadratic function peaking with 3-wk high N fertilization, whereas that in Feb was a linear function with the greatest increase with 6-wk high N fertilization. The total-season yield response to N was also a linear function. In 'Pearl', by contrast, only Feb yield showed a significant linear yield increase to N. Total-season yield showed minimum differences among N treatments.

Early-season N fertilization effects on fruit size and Brix

In both cultivars, fruit size was unaffected by the duration of initial high N fertilization (Table 5). Fruit Brix was affected by N differently between the two cultivars. Fruit Brix measured during the peak harvest was unaffected by N in 'Medallion', but it declined linearly with extending the duration of initial N fertilization in 'Pearl' (0.23–0.55 °Brix reductions).

Table 3. Canopy area growth of 'Medallion' and 'Pearl' strawberry as affected by the duration of initial high nitrogen (N) fertilization.

Cultivar	Initial high N at 2 lb/acre/d	Canopy projected area (cm^2/plant) 53 DAT	84 DAT	112 DAT	137 DAT
Medallion	0 wk	105	233	358	411
	1 wk	145	268	372	461
	2 wk	132	239	362	424
	3 wk	138	256	390	448
	4 wk	118	242	397	455
	6 wk	130	276	396	471
	Regression	NS	NS	Linear↑	NS
Pearl	0 wk	117	362	547	591
	1 wk	128	382	543	577
	2 wk	119	397	574	624
	3 wk	121	384	551	590
	4 wk	110	384	557	609
	6 wk	108	366	515	577
	Regression	NS	NS	NS	NS

NS = non-significant ($P > 0.05$)

Linear↑ = significant positive linear function ($P \leq 0.05$)

Table 4. Monthly and total-season yields of 'Medallion' and 'Pearl' strawberry as affected by the duration of initial high nitrogen (N) fertilization.

Cultivar	Initial high N at 2 lb/acre/d	Marketable yield (8-lb flat/acre) Nov	Dec	Jan	Feb	Total
Medallion	0 wk	37	127	301	817	1,282
	1 wk	74	161	277	870	1,382
	2 wk	73	149	200	954	1,375
	3 wk	47	175	265	928	1,416
	4 wk	70	146	319	899	1,435
	6 wk	68	136	324	1,096	1,624
	Regression	NS	Quadratic	NS	Linear↑	Linear↑
Pearl	0 wk	34	60	281	1,168	1,543
	1 wk	51	81	259	1,214	1,605
	2 wk	35	90	225	1,238	1,588
	3 wk	36	67	211	1,278	1,593
	4 wk	23	104	160	1,323	1,610
	6 wk	30	66	184	1,311	1,591
	Regression	NS	NS	Linear↓	Linear↑	NS

NS = non-significant ($P > 0.05$)

Linear↑ = significant positive linear function ($P \leq 0.05$)

Linear↓ = significant negative linear function ($P \leq 0.05$)

Quadratic = significant quadratic function ($P \leq 0.05$)

Table 5. Average fruit size of 'Medallion' and 'Pearl' strawberry as affected by the duration of initial high nitrogen (N) fertilization.

Cultivar	Initial high N at 2 lb/acre/d	Average fruit size (g) Nov	Dec	Jan	Feb	Total
Medallion	0 wk	15.0	14.6	24.4	26.8	23.8
	1 wk	14.3	16.3	24.6	26.8	23.6
	2 wk	14.1	15.9	21.3	26.1	22.6
	3 wk	14.7	14.3	24.8	26.9	23.4
	4 wk	14.9	15.3	23.6	26.9	23.4
	6 wk	14.4	14.4	25.9	27.1	24.2
	Regression	NS	NS	NS	NS	NS
Pearl	0 wk	12.9	13.0	22.9	25.9	23.6
	1 wk	13.4	12.6	22.7	25.1	22.9
	2 wk	13.2	13.0	20.7	25.5	22.9
	3 wk	13.0	12.2	20.7	26.3	23.8
	4 wk	13.4	13.6	20.1	25.8	23.6
	6 wk	12.6	12.6	22.1	25.4	23.5
	Regression	NS	NS	NS	NS	NS

NS = non-significant ($P > 0.05$)

Table 6. Total soluble solids content (Brix) of 'Medallion' and 'Pearl' strawberry as affected by the duration of initial high nitrogen (N) fertilization.

Cultivar	Initial high N at 2 lb/acre/d	Total soluble solids (°Brix)
Medallion	0 wk	6.90
	1 wk	7.23
	2 wk	6.90
	3 wk	6.70
	4 wk	6.85
	6 wk	7.08
	Regression	NS
Pearl	0 wk	6.35
	1 wk	6.13
	2 wk	6.13
	3 wk	5.80
	4 wk	5.83
	6 wk	5.93
	Regression	Linear↓

NS = non-significant ($P > 0.05$)

Linear↓ = significant negative linear function ($P \leq 0.05$)

Mid–late season N fertilization effects on canopy growth

Canopy growth was affected by mid–late season N rates differently between the two tested cultivars (Table 7). Canopy area of 'Medallion' increased linearly with N rate from 112 and 138 DAT (Feb 3 to Mar 1), whereas that of 'Pearl' showed quadratic responses with peaks occurring at N rates of 1 to 1.5 lb/acre/d from 84 to 138 DAT (Jan 6 to Mar 1).

Mid–late season N fertilization effects on yield

Marketable yield was affected by mid–late season N rate differently between the two tested cultivars (Table 8). In 'Medallion', increasing mid–late season N rate increased Jan, Feb, and total-season yields by up to 33%, 32%, and 24%, respectively. All these increases were described as a significant linear function. In 'Pearl', increasing mid–late season N rate linearly increased Jan yield by up to 38%. However, the dose-response changed to a quadratic function with a peak at N rate of 1 lb/acre/d for Feb and total-season yields.

Mid–late season N fertilization effects on fruit size and Brix

Fruit size was affected by mid–late season N rates differently between the two tested cultivars (Table 9). In' Medallion', except in Dec, increasing mid–late season N rate linearly increased fruit size. The extent of fruit size increases became greater later in the season, showing up to a 22% increase in Feb. By contrast, fruit size of 'Pearl' was unaffected by mid–late season N rate throughout the season. Fruit Brix was also affected by N differently between the two cultivars. Fruit Brix measured during the peak harvest was unaffected by N in 'Medallion', but it declined linearly with increasing mid–late season N rate in 'Pearl' (0.25–0.73 °Brix reductions).

Table 7. Canopy area growth of 'Medallion' and 'Pearl' strawberry as affected by mid–late season (post-establishment) nitrogen (N) fertilization rates.

Cultivar	Mid–late season N rate	Canopy projected area (cm^2/plant) 53 DAT	84 DAT	112 DAT	138 DAT
Medallion	0.5 lb/acre/d	87	262	358	426
	1.0 lb/acre/d	94	257	379	459
	1.5 lb/acre/d	86	266	395	505
	2.0 lb/acre/d	77	269	403	503
	Regression	NS	NS	Linear↑	Linear↑
Pearl	0.5 lb/acre/d	91	365	506	574
	1.0 lb/acre/d	96	400	565	669
	1.5 lb/acre/d	94	378	591	728
	2.0 lb/acre/d	88	362	546	667
	Regression	NS	Quadratic	Quadratic	Quadratic

DAT = days after transplanting

NS = non-significant ($P > 0.05$)

Linear↑ = significant positive linear function ($P \leq 0.05$)

Quadratic = significant quadratic function ($P \leq 0.05$)

Table 8. Monthly and total-season yields of 'Medallion' and 'Pearl' strawberry as affected by mid–late season (post-establishment) nitrogen (N) fertilization rates.

Dec	Mid–late season N rate	Marketable yield (8-lb flat/acre) Nov	Dec	Jan	Feb	Total
Medallion	0.5 lb/acre/d	39	232	379	833	1,483
	1.0 lb/acre/d	41	195	324	966	1,525
	1.5 lb/acre/d	31	224	440	1,095	1,790
	2.0 lb/acre/d	24	219	503	1,097	1,843
	Regression	NS	NS	Linear↑	Linear↑	Linear↑
Pearl	0.5 lb/acre/d	25	51	119	858	1,054
	1.0 lb/acre/d	18	70	114	1,066	1,268
	1.5 lb/acre/d	29	43	184	980	1,236
	2.0 lb/acre/d	26	37	253	931	1,247
	Regression	NS	NS	Linear↑	Quadratic	Quadratic

NS = non-significant ($P > 0.05$)

Linear↑ = significant positive linear function ($P \leq 0.05$)

Quadratic = significant quadratic function ($P \leq 0.05$)

Table 9. Average fruit size of 'Medallion' and 'Pearl' strawberry as affected by mid–late season (post-establishment) nitrogen (N) fertilization rates.

Cultivar	Mid–late season N rate	Average fruit size (g) Nov	Dec	Jan	Feb	Total
Medallion	0.5 lb/acre/d	14.2	14.8	25.7	26.6	23.0
	1.0 lb/acre/d	14.9	16.3	26.1	29.6	25.4
	1.5 lb/acre/d	14.9	16.6	27.5	30.4	26.5
	2.0 lb/acre/d	15.3	16.1	29.7	32.4	28.0
	Regression	Linear↑	Quadratic	Linear↑	Linear↑	Linear↑
Pearl	0.5 lb/acre/d	13.1	13.1	21.1	24.8	22.9
	1.0 lb/acre/d	13.2	13.1	22.8	27.0	24.8
	1.5 lb/acre/d	12.9	12.0	20.4	26.0	23.5
	2.0 lb/acre/d	13.9	14.7	24.5	27.8	25.8
	Regression	NS	NS	NS	NS	NS

NS = non-significant ($P > 0.05$)

Linear↑ = significant positive linear function ($P \leq 0.05$)

Quadratic = significant quadratic function ($P \leq 0.05$)

Table 10. Total soluble solids content (Brix) of 'Medallion' and 'Pearl' strawberry as affected by mid–late season (post-establishment) nitrogen (N) fertilization rates.

Cultivar	Mid–late season N rate	Total soluble solids (°Brix)
Medallion	0.5 lb/acre/d	7.15
	1.0 lb/acre/d	7.25
	1.5 lb/acre/d	6.78
	2.0 lb/acre/d	7.10
	Regression	NS
Pearl	0.5 lb/acre/d	6.30
	1.0 lb/acre/d	6.03
	1.5 lb/acre/d	6.05
	2.0 lb/acre/d	5.58
	Regression	Linear↓

NS = non-significant ($P > 0.05$)

Linear↓ = significant negative linear function ($P \leq 0.05$)

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