Fertigation of Fluid Nitrogen and Phosphate Fertilizers in Pears in Pacific Northwest

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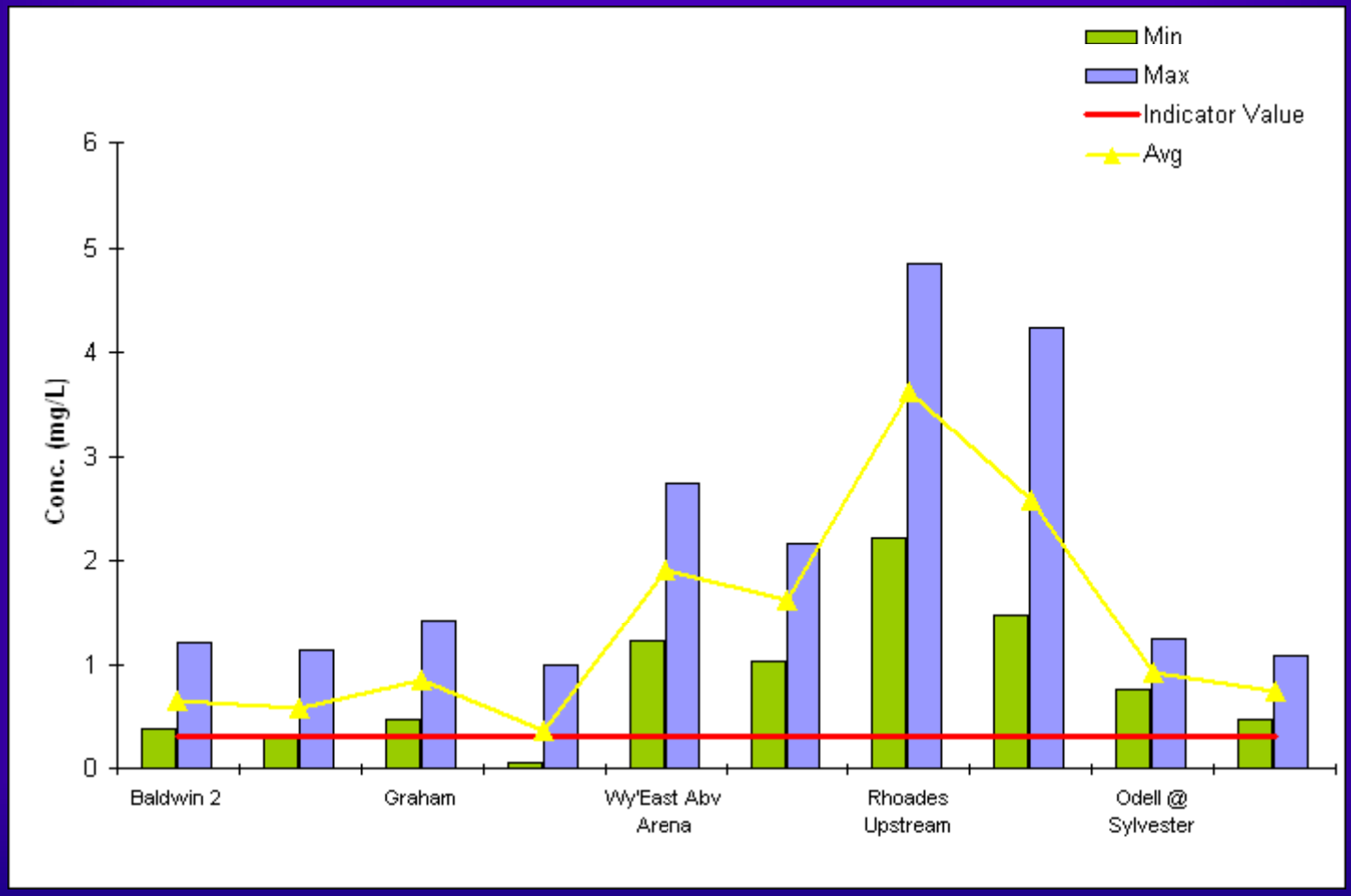
Current N and P Management System

Surface Broadcasting
Single Application
80-100 lbs N/acre
100-125 lbs P_2O_5/acre

- ✓ Not into root zone
- ✓ High single application rate
- ✓ Over- or under-application
- ✓ Low flexibility for late application

NO_3^- Concentration in Surface Water



Split Fertigation - Management Alternative?

1. Deliver into root zone.
2. Lower dose - split application.
3. Avoid over- and under-application.
4. Greater flexibility for late application.
5. Time-saving - automatic delivery system.
6. Reduce soil compaction.

Objectives

- ✓ Compare fruit yields, quality, and storability under split fertigation of N and P or band application of N and P with single broadcast application of dry N and P on the soil surface.
- ✓ Compare the costs on installing and maintaining a N and P fertigation system with those for a surface broadcasting of dry N and P system.

Treatments

1. Surface broadcasting of N & P under drip irrigation.
2. Band application of N & P under drip irrigation.
3. Surface broadcasting of N & P plus soil disturbance caused by band application (no fertilizer was banded) under drip irrigation.
4. Split fertigation of N & P under drip irrigation.
5. Split fertigation of N & P under micro sprinkler irrigation.

Treatments (Conti.)

Trt	N rate	P_2O_5 rate	Application	Timing
	lbs acre^{-1}	lbs acre^{-1}		
1	100	125	1	April
2	100	125	1	April
3	100	125	1	April
4	80	100	5	May-Aug.
5	80	100	5	May-Aug.

Fertigation & Irrigation System

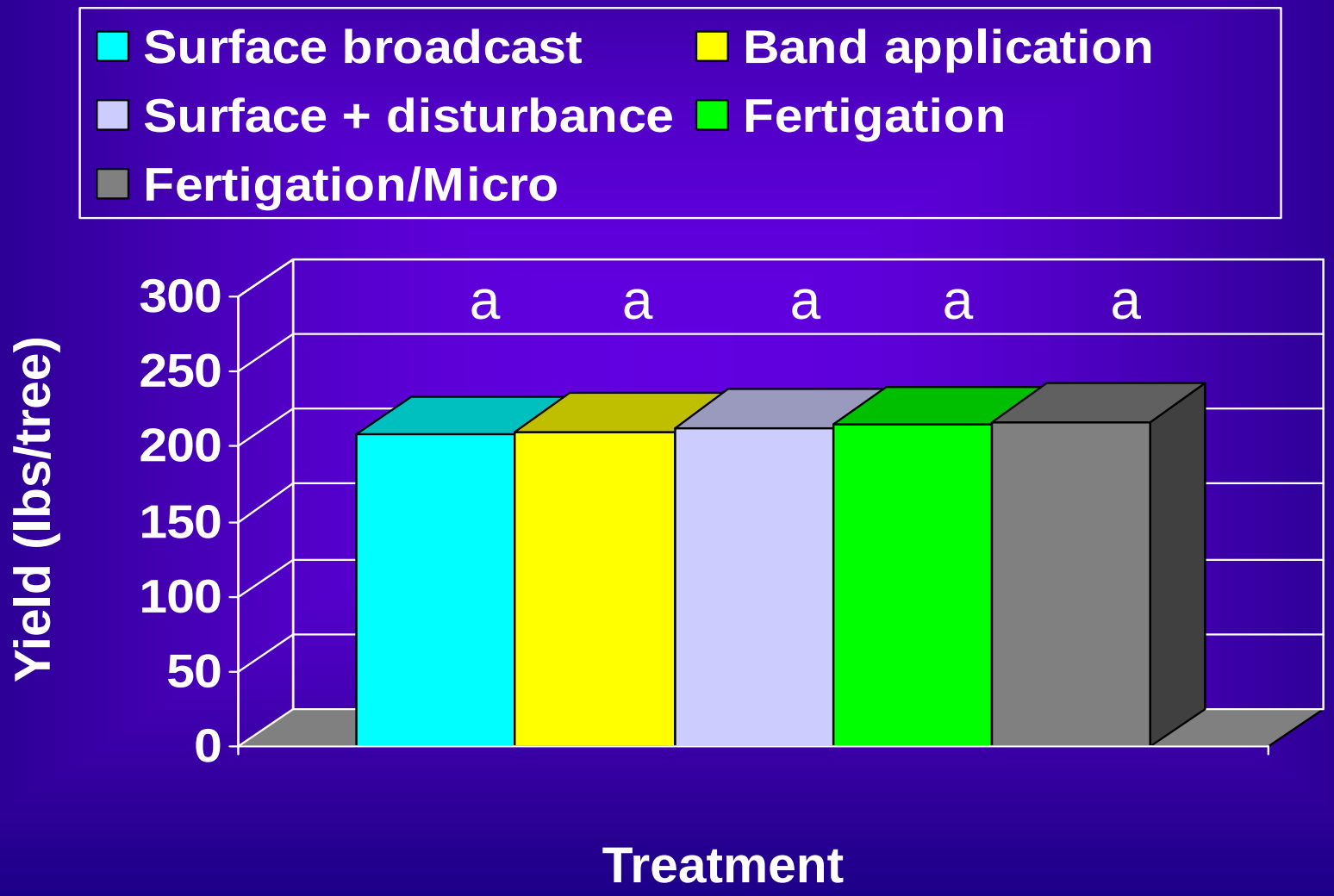
Sampling and Measurement

- Soil NH_4^+, NO_3^-, amino sugar N, total N, available P, total P, pH, and organic matter.
- Leaf N, P, etc.
- Tree vigor.
- Fruit yield, size, firmness, color, titratable acidity, and sugar content.
- Fruit superficial scald: 3-month evaluation.

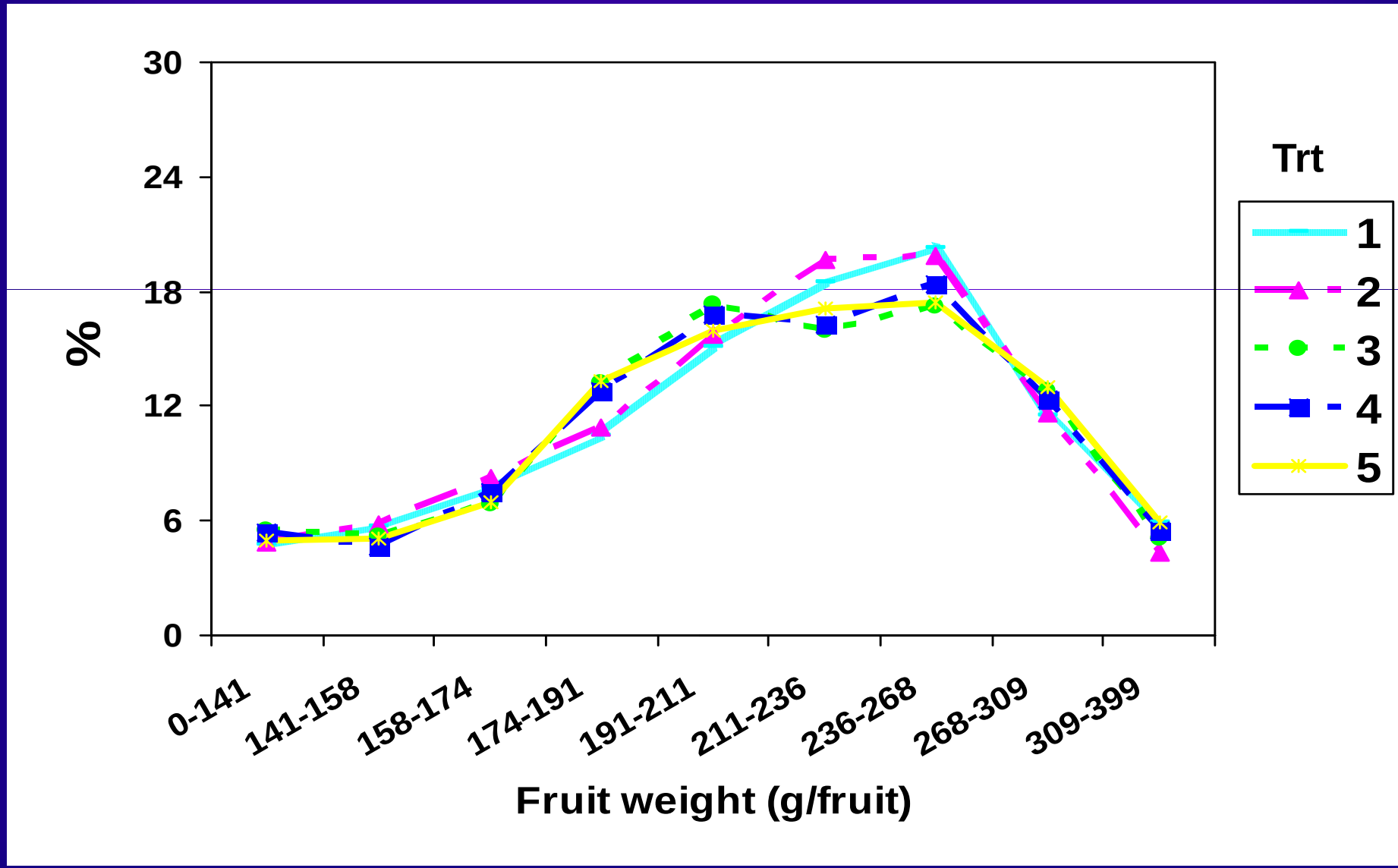
Leaf Nutrition after Pear Harvest

Trt	N	P	K	Ca	Mg	S	B	Zn	Mn	Cu
	(%)	(%)	(%)	(%)	(%)	(%)	(ppm)	(ppm)	(ppm)	(ppm)
1	**1.87**	**0.095b**	1.10	2.66	0.29	0.26	124	218	54	6.1
2	**1.82**	**0.093b**	1.14	2.41	0.26	0.26	137	241	55	6.4
3	**1.76**	**0.091b**	1.07	2.60	0.30	0.26	128	226	57	6.4
4	**1.85**	**0.098b**	1.14	2.66	0.29	0.24	125	221	59	6.2
5	**1.94**	**0.119a**	1.19	2.67	0.27	0.26	139	233	61	6.5
Sig.	**ns**	****	ns	ns	ns	ns	ns	ns	ns	ns

Fruit Yield


Surface broadcast
Band application
Surface + disturbance
Fertigation
Fertigation/Micro
300
250
200
150
100
50
0
Yield (lbs/tree)
a
a
a
a
a
Treatment

Fruit Size Distribution



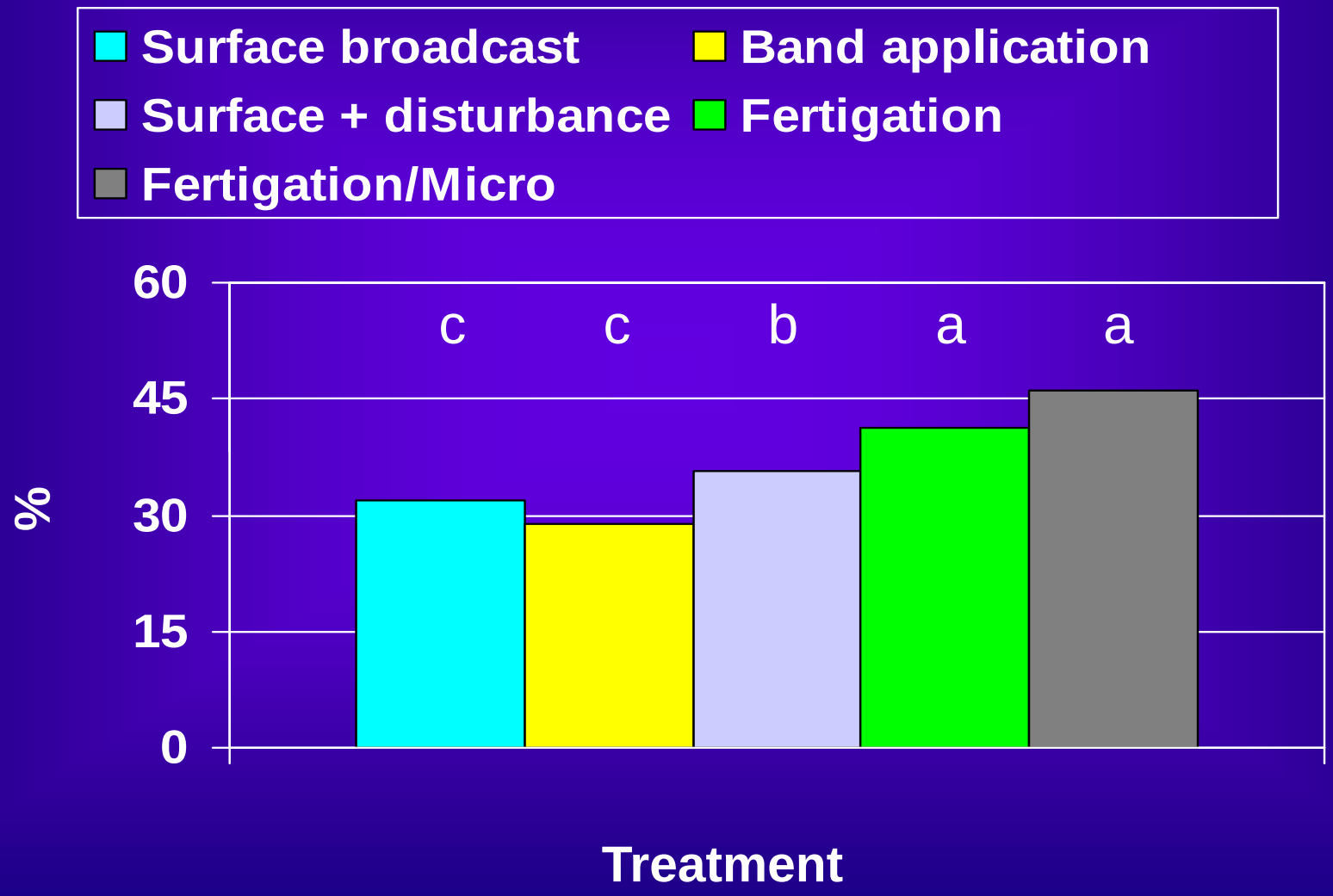
Fruit Quality at Harvest

Trt	Sugar (°brix)	Firmness (lbs)	Titratable acid (meq/100 ml)
1	12.0	13.0	3.9
2	12.1	10.9	4.0
3	12.1	11.0	3.9
4	11.7	12.5	3.8
5	11.8	13.4	3.7
Sig.	ns	ns	ns

Fruit Scald after 3-Month Cold Storage

Trt	Excellent	Very slightly scalded	Slightly scalded	Moderately scalded	Severely scalded
	%	%	%	%	%
1	13.7	18.2	49.6	14.8	3.7
2	11.4	17.4	31.7	35.4	4.1
3	20.3	15.3	33.2	26.1	5.2
4	16.4	24.8	38.7	18.4	1.7
5	23.8	22.4	39.3	14.6	0.0
Sig.	ns	ns	ns	ns	ns

Marketable Fruit after 3-Month Cold Storage



Summary

- Split N and P fertigation, with 20% reduction in application rate, relative to single surface broadcasting, can provide adult pear trees with adequate N and P nutrition.
- Shift from single surface broadcasting of N and P to split fertigation produces compatible fruit yield and quality.
- Split N and P fertigation has significant beneficial effects in reducing fruit superficial scald and N and P fertilizer consumption.

Acknowledgments

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Thanks!!!

Questions???