Evaluation of Pear Tissue Sampling Protocols for Improving Nutrient Management

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Current Leaf Sampling Recommendations in Calif.

- Non-bearing spur leaves in mid-summer
  - Leaves 3 months old, not strong nutrient sink
  - Static in nutrient mobilization
- Shoot or bearing spur leaves are a better indicator of nutrient status
  - Real-time status of nutrient mobilization
- Shoot leaves used throughout world
  - Also in Calif. before 1983

Spring Sampling

- With spring sampling, can make in-season fert. adjustments based on crop load
  - Reduce vigor potential
  - Anticipate fruit quality problems from nutrient imbalances

Leaf Sampling

- No benefit has ever been documented from N application when July leaf N > 2.2%
- Leaves not always indicative of fruit nutrient status, especially Ca
  - Fruit sampling may be more indicative

Objectives

- Compare nutrient levels & ratios from different tissues and timings
- Determine if a better sampling protocol can improve nutrient management
- Lead-in to likely CDFA-FREP project
- Possibly revise UC recommendations for sampling & nutrient management

Sampling

(in 4 alternating drive rows)

- Late April (after early fruit drop)
  - Fruits and leaves
- July
  - Mid-shoot and non-bearing spur leaves
  - Fruit just before first pick
  - Soil

Three Bartlett Blocks

- Block A – Very productive, loam soil
- Block F – Struggled for years, low production, drainage problems, loam soil
- Block O – Organic transition, younger, highly uniform, higher density but one with lower production, clay soil
- No foliar nutrients applied

Soil Sampling Results

	NO_3-N	Olsen-P	X-K	X-Ca	X-Mg	CEC	OM	pH
Block	ppm		meq/100g				%	
A	5.3	54.3	1.5	7.4	3.5	12.5	2.0	6.1
F	10.7	40.9	1.8	17.6	6.2	26.7	3.5	6.9
O	19.8	46.5	1.3	21.7	9.5	33.0	4.9	6.6

Leaf Sampling Results – N & K

	Block	N (%)		K (%)	
April Mid-Shoot	A	2.86	b	1.44	a
	F	3.14	a	1.33	b
	O	2.95	b	1.47	a
July Mid-Shoot	A	2.43	ab	1.01	b
	F	2.52	a	0.98	b
	O	2.40	b	1.26	a
July N-B Spur	A	1.98	ns	1.65	b
	F	1.95	ns	1.73	b
	O	2.03	ns	2.16	a

Fruit Sampling

- No relation:
  - Leaf vs. fruit analyses
  - Fruit analyses in April vs. July

July Leaf Prediction Model

Nonpareil Almond (Excel Spreadsheet)

- Sample all leaves of 5-8 non-fruiting spurs/tree 6 weeks after full bloom when reach full size (mid-April)
- Collect leaves from 18–28 trees /orchard, place in a single bag
  - EACH SAMPLED TREE AT LEAST 30 YARDS APART
  - 100 leaves/sample bag
- Send to lab, ask for a FULL NUTRIENT ANALYSIS
  - N, P, K, B, Ca, Zn, Cu, Fe, Mg, Mn, S

July Leaf Prediction Model – Almond

Pear Leaf Samples 2014 (mid-shoot leaves)

Enter the tissue nutrient values for leaves collected **in spring**										
N (%)	P (%)	K (%)	S (ppm)	B (ppm)	Ca (%)	Mg (%)	Zn (ppm)	Mn (ppm)	Fe (ppm)	Cu (ppm)

Block	July % N **Predicted**	Predicted % of Trees above C.V.	July % N **Actual** (Mid-Shoot)	July % N **Actual** (N-F Spur)
A	2.41	94.7%	2.43	1.98
F	2.45	97.1%	2.52	1.95
O	2.44	96.6%	2.40	2.03

Conclusions

- Little to no relationship in nutrient values of leaves or fruit between April and July sampling dates
- Mid-shoot leaves higher in N, lower in K
- Little relationship between soil, leaf nutrients
- Strong fit of April leaf levels with predicted July leaf levels (shoot leaves)
- Would knowledge of July N levels in April affect pre-harvest N fertilization?

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