SCHEDULING AND CONDUCTING TISSUE SAMPLING

Mike Buttress

A & L Western Agricultural Laboratories

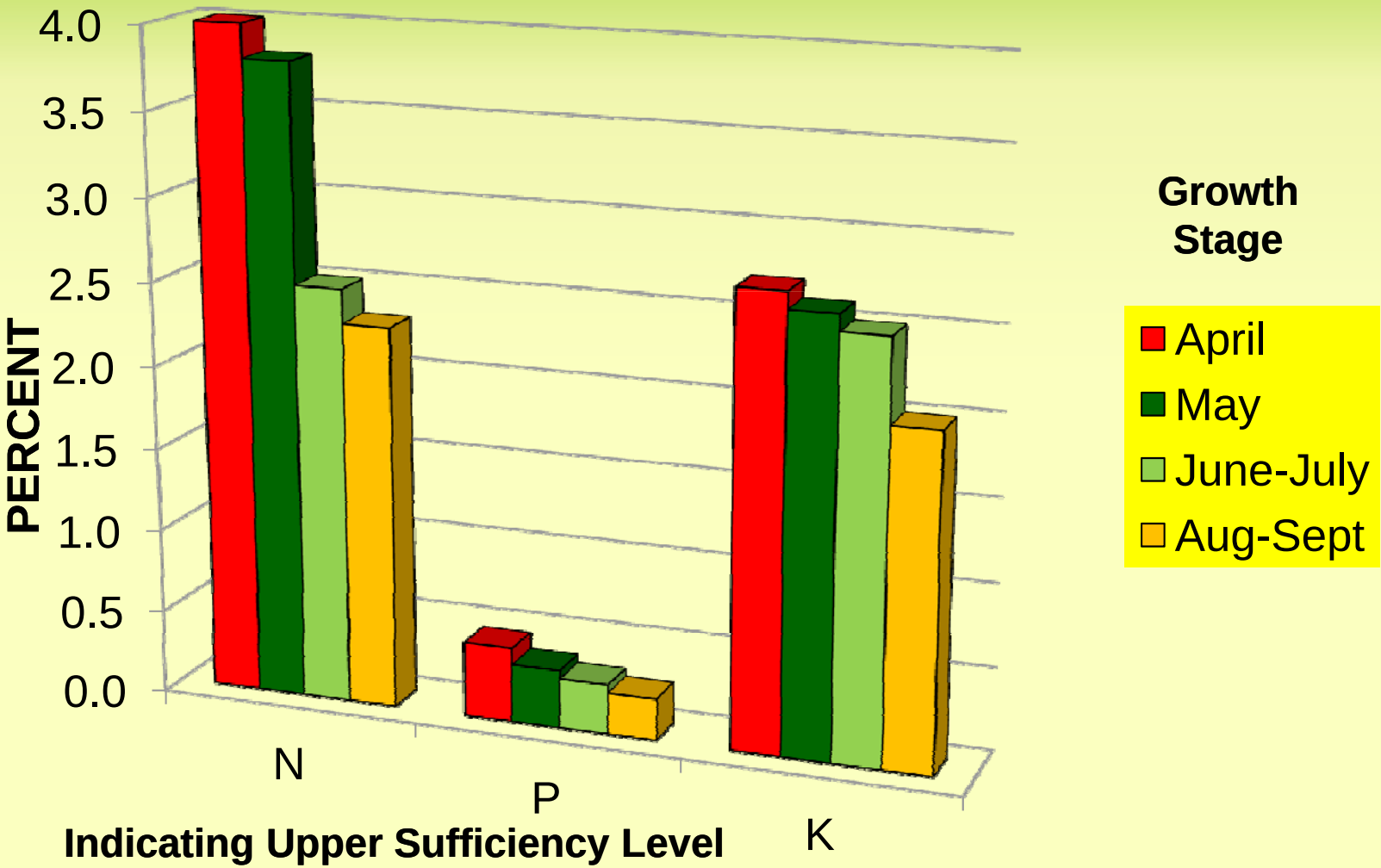
INTRODUCTION

- **When** should I be doing all this?
- **Where** should the sample come from?

- The Two R's of Plant Tissue Sampling…
  - Right Time
  - Right Place

SCHEDULING TISSUE SAMPLING

ALMOND SUFFICIENCY LEVELS

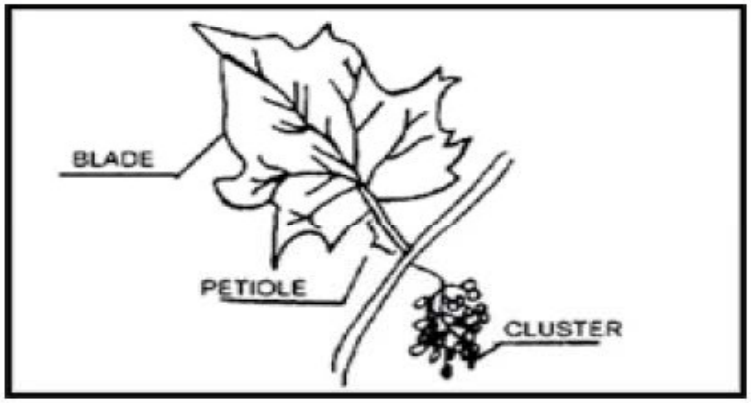


Tissue: Field & Row Crops

Crop	Plant Part to Sample	Time of Sampling
Alfalfa	Midstems for NO3-N, PO4-P, K Leaves for SO4-S Tops for Mo, B	1/10 Bloom
Asparagus	Fern needles 4" tip section	September
Cabbage/Lettuce	Midrib of wrapper leaf	Heading
Cantaloupe/Cucumber	Petioles of 6th leaf/ from growing tips 6-8 true leaves	Early fruit set
Corn	Midrib from young mature leaf Midrib from leaf opposite ear Leaf - young mature Leaf opposite ear	Before ear formation After ear formation Before ear formation After ear formation
Cotton	Young, mature petiole	June thru Sept 15
Onion/Garlic	"Y" leaf from 6" plant height to pre-harvest	Pre-harvest
Sorghum/Milo	Young mature leaf	Pre-harvest
Tomato	Petiole of recently matured leaf (4th leaf from growing tip)	Early Bloom, 1" Fruit, lst Color
Wheat/Barley	2" of above-ground stem	6" tall to pre-harvest

Tissue: Permanent Crops

Crop	Plant Part to Sample	Time of Sampling
Blueberries	Leaves - mid-shoot	April thru September
Citrus	Mature leaves from non-fruiting terminals (avoid recent flush)	July 15 to May 15
Deciduous Fruit/Nut Trees(except those noted below)	Mature Leaves - from spurs	May thru September
Grapes	Petiole - opposite cluster	Bloom
	Petiole	Veraison
	Leaf blade - opposite cluster	April & June
	Leaf blade - young mature	July thru Sept 15
Peaches & Nectarines	Leaves - mid-shoot from current season's growth	April 15 thru Sept 15
Pistachios	Young, mature leaves from non-fruiting terminals	May thru August
Walnuts & Pecans	Terminal leaflet of compound leaf	Terminal leaflet of compound leaf



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PLANT ANALYSIS SAMPLING PROCEDURES

SAMPLE PREPARATION

Collect about one pint of loosely packed tissue per sample. One cupful may be sufficient if gathering petioles. Submit in plant tissue sample bags or plain paper bags if possible. Plastic bags are not advised. Consider sampling "Good" and "Bad" areas for comparison. If in doubt, sample *most recently mature leaves (MRM).* Samples are washed at the lab only on request (additional $1 per sample)

PLANT ANALYSIS RATINGS

Ratings are a function of factors such as plant type, and time and method of sampling. They may become misleading if the client provides insufficient information to the lab when submitting samples, or if wrong plant parts or test packages are selected.

Ratings are provided only on request. See CAUTION! at end of page2.

Please follow these simple instructions if ratings are required:

1. Always enter "crop" or variety (up to 14 characters).

   a. **The standard report** provides data and ratings in a numeric format. At the bottom of the report the average of the sufficiency range is reported as a norm for the indicated crop. For this reason, do not include more than one crop per report.
   b. **The graphical report** form is limited to 1 sample and 1 "crop" per page. Therefore, order of crops listed is not important in this case.

2. Enter the CROP CODE ***exactly*** as shown here for your crop (***limited options***).

3. Enter your sample reference, such as field # (up to 5 alphanumeric characters).

e.g. Sample ID: 23-SB ZINFANDEL BLM P = Zinfandel grapes sampled at bloom stage and petioles were sampled. (Note that rootstock may have an impact though.)

KEY TO STAGES OF GROWTH

BLM bloom sampling	EGF early green fruit	PBL prebloom
VER veraison	PRE preharvest	EBL early bloom
HAR harvest	ERF early ripe fruit	FBL full bloom
ESN early season	FRF full ripe fruit	LBL late bloom
MSN midseason/growth	MIT mid tillering	FSQ first square
LSN late season	MAT maximum tillering	EBL first bloom
VEG vegetative growth	PAI panicle initiation	PBL peak bloom
EFL early flowering	SIL silking	FOB first open boll
BUT buttoning	TAS tasseling	ESN 3-4 leaf
BUL fruit bulking	EFG early fern growth	TIL tillering
HEA early heading	MID midgrowth	JNT jointing
PRE preharvest	MFG mature fern growth	BOO booting
HAR first harvest	MRM most recently mature	HEA heading

KEY TO PLANT PARTS

B blade	L leaf/leaflet	S stem/midstem/seedling
C center/cluster	M midrib	T tops
F flag leaf	P petiole	U underground stem
H hulls	R root	W whole above-ground portion

AVAILABLE LIST OF CROP CODES

ALFALFA - EBL-T (PT2) [EBL-C (SO_4-S) + EBL-S (PO_4-P + K) + EBL-W (B + Mo)]
Whole Bale = HAR-W Top 6-inch [center leaves + center stems + whole top third]

ALMONDS/APPLES/PEARS/ASIAN PEARS/PLUMS/PRUNES/CHERRIES/ APRICOTS/SHIPP APRICOTS/CANNG APRICOTS -
MAR-L APR-L MAY-L MSN-L (Jun-Jul) LSN (Aug-Sep) HAR-H (boron in hulls)
Select MRM leaves from non-fruiting, non-expanding spurs.

ARTICHOKES - EBL-P FBL-P (midharvest) HAR-P (lower 6-inch petiole) HAR-L

ASPARAGUS - MFG-T (top 12" of fern for total nutrients) MID-T (top 4" fern for NO_3-N, PO_4-P, K)

AVOCADOS - LSN-L (mid Aug-mid Oct. Select 5 to 7-month-old spring cycle terminal leaves)

BANANAS - HAR-L (center strip of 2nd to 3rd fully developed leaf from top)

BEANS - EBL-B (MRM trifoliate leaf or blade) ESN-P PBL-P EBL-P

BEET/TABLE - ESN-L (5 weeks after seeding) PRE-L (9 weeks after seeding)

BLUEBERRIES - MSN-L (midshoot leaves off current season's growth, near/at harvest, Jun-Aug)

BROCCOLI - BUT-L ESN-M BUT-M PRE-M

BRUSSELS SPRTS - MID-L or MID-M (midgrowth, early sprouts) PRE-M

CABBAGE - HEA-L or HEA-M (2- to 3-month-old wrapper leaves or midribs)

CANEBERRIES/RASPBERRIES/BLACKBERRIES/BOYSENBERRIES - ESN-L (pre/early bloom)
MSN-L (Jun-Aug) MRM leaves from laterals of primo canes.

CARROTS - MSN-L (tallest leaf) MSN-P (petiole of tallest leaf) After 4" tall/60 days after seeding.

CAULIFLOWER - BUT-L ESN-M BUT-M PRE-M

CELERY/ CELERIAC - MID-L or MID-P (4 to 6 wks after seeding) PRE-L or PRE-P (preharvest)
MRM leaf, or petiole below 1st node. Petiole above 1st node of MRM leaf.

CHARD - ESN-L (5 weeks after seeding) PRE-L (9 weeks after seeding)

CHESTNUTS - MSN-L (MRM leaves on current season's growth)

CHINESECABBAGE - HEA-L HEA-M

CITRUS - LSN-L Select terminal spring-flush leaves from non-fruiting shoots in Sep-Oct.

CLOVER - EBL-T (top third of plant)

COFFEE - NON-L (non-bearing, 4th pair from tips) BEA-L (bearing branch, 4th pair from tips)
Sample after flowering/before cherry ripening

CONIFERS - No code except for seedlings. Select 3rd whorl or terminal 3" cuttings from current season's growth, ¼ to ½ way down from top, mid Sep-mid Dec.
S (whole seedlings, including washed roots, after mid Oct)

CORN- ESN-W (6"-16" tall) whole seedling MSN-L (pretassel) 3rd leaf/45-80 days TAS-L (tasseling) SIL–L (silking) opposite/below ear

ESN-M (6"-12" tall) MSN-M (3ft-6ft tall) TAS-M (tasseling-silking)
Select basal 4"-5" of midrib if requiring NO_3-N, PO_4-P, and K.

COTTON - FSQ-P (PT5) EBL-P (PT5) FBL-P or L FOB-P (PT5) PRE-P (PT5)
Usually before early July, ~end July, ~end August, ~mid September.
Select from 4th to 5th node from tip of plant at all stages of growth.

CRANBERRIES - LSN-T (tops above fruiting uprights on current season growth, mid-Aug to mid-Sep)

FEIJOAS/GUAVAS - MSN-L (3rd pair of leaves back from fruiting terminals, Jul-Aug)

FILBERTS/HAZELNUTS - MSN-L (MRM midshoot leaves from current season's growth, Jul-Aug)

FLOWERS - No code, but generally select MRM leaves.

GARLIC/CHIVES - ESN-L (before bulbing) BUL-L (bulbing) LSN-L (post-bulbing)
Discard lower white section of MRM leaves.

GINSENG - No code, but select MRM leaves.

GRAPES - PBL-P or B or L Usually before May. Select petioles P, only from unshaded leaves.
BLM-P or B or L Select from opposite the basal cluster when ⅔ calyptras fallen off.
MSN-P or B or L Berry filling. Select 2nd leaf away from last cluster.
VER-P or B or L Berry softening. Select 6th to 7th leaf from growing tip.
HAR-P or B or L Select MRM leaf, usually 6th to 7th leaf from growing tip.
Petioles are better for determining sodium and chloride toxicities.
Blades are better for determining boron toxicities.

GRASS/PASTURE/TIMOTHY/ORCHARDGRASS/ - No code, but select whole tops.

HOPS - JUN-P JUL-P AUG-P
Select petioles from MRM leaves on main vine, 5 to 6 ft from ground. Sap will stain!

KIWIFRUIT - MAY-P or MAY-L MSN-P or MSN-L NOV-P or NOV-L
Select 1st to 3rd leaf beyond fruit, or mid-cane leaves on non-bearing vines.

LETTUCE/ENDIVE - ESN-L or ESN-M (4th to 6th leaf stage) HEA-L or HEA-M HAR-L or HAR-M
FES-M FHE-M FHA-M Select MRM leaves L, or midribs M. F = Fall planting

LITCHI - No code, but select MRM leaves.

MACADAMIAS - No code, but select leaves from 2nd whorl below bud before new flush.

MELONS/CANTALOUPES/SQUASH/PUMPKINS/CUCUMBERS [GH CUCUMBER/LETTUCE]
WATERMELONS VEG-P or VEG-L EFL-P or EFL- L BUL-P or L HAR-P or L [MRM-L]
CUCURBITS- Select MRM leaves, 5th to 6th from growing tip. [GH = GREENHOUSE PROD]

MINT - EBL-L Select leaves from top 6" of first unbranched stem. Test for total levels.
ESN-S MAY-S JUN-S JUL-S AUG-S Test for nitrate nitrogen only.
Select top 6" of first unbranched stem, stripped of leaves.

NECTARINES/OLIVES/PEACHES/FREEST PEACHES/CLING PEACHES/FIGS -
MAR-L APR-L MAY-L MSN-L (June-July) LSN (Aug-Sep)
Select basal to midshoot leaves/leaflets from current season's fruiting shoots.

ONIONS - ESN-P or ESN-L (tallest leaf before bulb enlargement) MSN-P or L LSN-P or L
ESN-R (washed roots before bulb enlargement) More reliable for NO_3-N readings.

ORNAMENTALS - No code, but select MRM leaves for general guidelines.

PALMS - No code, but select middle leaflets from MRM leaves, discarding the petiole/midrib.

PAPAYAS - PBL-P (when flower buds are just visible in the axil)
PARSLEY - No code
PEAS - EBL-L (Select MRM leaves, usually 3rd to 5th from growing tips)

PECANS - MSN-L (paired midshoot leaflets from non-fruiting shoots in July) LSN-L (Aug-Sep)

PEPPERS - VEG-P or VEG-L EFL-P or EFL-L EGF-P or L PRE-P or L MRM leaves
[**GH PEPPERS** = MRM-L]

PERSIMMONS - LSN-L (MRM leaves from non-fruiting shoots, Sep-Oct)

PINEAPPLES - EFL-L (leaf at early inflorescence, discarding white base)

PISTACHIOS - MAR-L APR-L MAY-L MSN-L (Jun-Jul) LSN-L (Aug-Sep) Select terminal leaflets

POMEGRANATES – **NO OFFICIAL DATA**

POTATOES - ESN-P or ESN-L MSN-P or MSN-L LSN-P or LSN-L
PT6 on petioles prebloom-50 days fullbloom-70 days 90 days
Select MRM leaves, usually 4th to 5th from growing tip. Petioles = PT6 Leaves = PT2

RICE/WILD RICE - MIT L (35 55 days) MAT L (55 65 days) PAI L (60 80 days) BOO F (flag)
May-June June-July panicle initiation Boot/heading
After 5th leaf stage Select MRM "Y" leaf Leaf below ear

ROSEMARY - No code, but select 2" to 3" terminal cuttings in summer.

SAFFLOWER - -L (midstem leaves) To determine total levels of nutrients.
ESN-S (8"-12" bolted) PBL-S EBL-S Select stem half way down, discarding leaves.

SORGHUM - ESN-W (12" tall) MSN-L (37-65 days) HEA-L (2nd to 3rd leaf below head)
SOYBEANS - EBL-B
SPINACH - ESN-L (30-50 days) PRE-L MID-P

STRAWBERRIES - MSN-P or MSN-L (early fruiting stage) MSN-B for SO_4-S
PT6 or PT5

SUDAN GRASS - No code, but select whole tops, 5 weeks between clippings.

SUGARBEET - ESN-P MSN-P or MSN-B PRE-P
6" to 8" growth 5 to 6 weeks prior to harvest

SUGARCANE - MSN-L (4th to 6th leaf from top) MSN-N (discard midrib for nitrogen, N)

SUNFLOWERS - PBL-L (3rd to 4th leaf below flower bed)

SWEET POTATOES - MSN-P or MSN-L (MRM leaves during first half of growing season)
Also VEG-P (vining) and BUL-P (root bulking) but for NO3-N only

SWEET CORN - TAS-L (6th leaf from base) SIL-L (leaf opposite 1st ear) For total levels.
ESN-M (6" to 12" tall) MSN-M (3ft to 6ft tall) TAS-M (tasseling-silking)
Select basal 4" to 5" of midrib for NO_3-N, PO_4-P, and K.

TOMATOES - CANNG PR CH GR FM TRELLIS [**GH TOMATOES** = MRM-L]
[Also EGGPLANTS] VEG-P or L EFL-P or L EGF-P or L (1"diam) ERF-P or L (10-20% red)
[but only MRM-B] Select MRM leaves, usually 4th to 5th from top, or opposite top flowering cluster.
[at 1st small fruit] Also FRF-P (full ripe, for **fresh market tomatoes – FM TOMATOES**)

TURF - No code, but specify variety for accurate ratings.

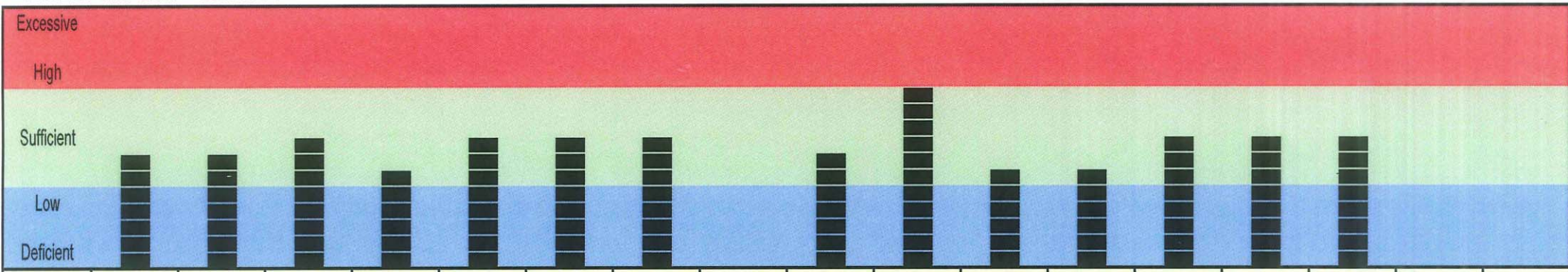
WALNUTS - MAR-L APR-L MAY-L MSN-L (June-July) LSN-L (Aug-Sept)
Select terminal leaflets from non-fruiting fully expanded midshoot spur leaves.

WHEAT/BARLEY/OATS - ESN-W or ESN-U (3rd to 4th leaf stage) TIL-T or TIL-S
GRAIN/MIXED GRAIN JNT-T or JNT-S BOO-T or BOO-S HEA-T
W = whole tops U = 2"stem underground S = 2" stem aboveground T=top 4 leaves

CAUTION! ***Official ratings for elements other than NO_3–N, PO_4–P, and soluble K on petioles or midribs may not exist. Therefore, interpret with caution when requesting the PT2 or PT5A package.***

Graphical Plant Analysis Report

DATE OF REPORT: 05/03/04 **LAB NO:** 43518 **SAMPLE ID:** 111 **CROP:** CHARDONNAY **PAGE:** 1



Analyte	Nitrogen N %	Sulfur S %	Phosphorus P %	Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %	Chloride Cl %	Iron Fe ppm	Aluminum Al ppm	Manganese Mn ppm	Boron B ppm	Copper Cu ppm	Zinc Zn ppm	Nitrate-N NO_3-N ppm	Phosphate PO_4-P ppm	
Test Results	1.08	0.18	0.30	1.65	0.64	1.86	0.07		62	168	40	31	12	62	1048		
Normal Range	0.70 – 2.00	0.12 – 0.35	0.15 – 0.60	1.50 – 3.00	0.30 – 1.25	1.25 – 3.00	0.01 – 0.19		30 – 200	20 – 200	25 – 650	30 – 70	6 – 25	26 – 100	500 – 2000		

Ratios	N/S	N/P	N/K	Ca/Mg	N/Ca	K/Mg	P/S	Fe/Mn	Fe/Al	K/Mn	Ca/B	Cu/Mo	P/Zn				
Actual	6.1	3.6	0.7	2.9	0.6	2.6	1.7	1.5	0.4	410	592		48				
Expected	11.0	3.5	0.6	2.6	0.8	3.3	3.1	0.6	0.8	192	450		67				

DATE SAMPLED: 05/27 **GROWTH STAGE / PLANT PART:** BLM/P

Bloom stage - petiole

COMMENTS

INVESTIGATE cause of imbalances before taking corrective measures. GROWTH STAGE and PLANT PART will have a large impact on results. View ratios with caution. NOTE that N, P, K, Zn, Cu and S levels may be naturally higher earlier on in the growing season, whereas Ca, Mg, Fe, Al, Mn, B, Na, and Cl may be lower.

DEFINITION OF INTERPRETATION RATINGS

Deficient: Plants should be showing visible symptoms of a nutritional deficiency. Plant growth would definitely be curtailed by an insufficient amount of this element.

Low: Plants may be normal in appearance but probably will be responsive to fertilization with this element.

Sufficient: Plants contain adequate amounts of this element for maximum yield and are normal in appearance.

High: Optimum yields can be expected and plants are normal in appearance. However, concentrations of this element are higher than normally expected.

Excessive: Plants probably show symptoms of a nutritional disorder or stunted growth. Yields may be reduced significantly by an excessive amount of this element.

STRAWBERRY PLANT TISSUE ANALYSIS

Test Description	Result	Units	Optimum Range	Graphical Results Presentation
				Deficient | Low | Ample | High | Excessive
Macro Nutrients				
Total Nitrogen (Leaf)	3.35	%	2.5 - 4.0	
Phosphate - P (Petiole)	1200	ppm	1000 - 5000	
Potassium (Petiole)	2.91	%	0.90 - 8.9	
Calcium (Leaf)	0.865	%	0.80 - 2.5	
Magnesium (Leaf)	0.31	%	0.25 - 1.0	
Micro Nutrients				
Zinc (Leaf)	16.9	ppm	19 - 300	
Manganese (Leaf)	163	ppm	30 - 500	
Iron (Leaf)	57	ppm	50 - 300	
Copper (Leaf)	8	ppm	6.0 - 75	
Boron (Leaf)	82.4	ppm	25 - 100	
Sodium (Leaf)	0.008	%	0.0 - 0.30	

Good — Problem — Indicates physical conditions and/or phenological and amendment requirements.

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

** Salt damage is indicated by values above 0.5% for Chloride and/or 0.10% for Sodium.All leaves and/or petioles are thoroughly washed prior to drying.

BLUEBERRIES

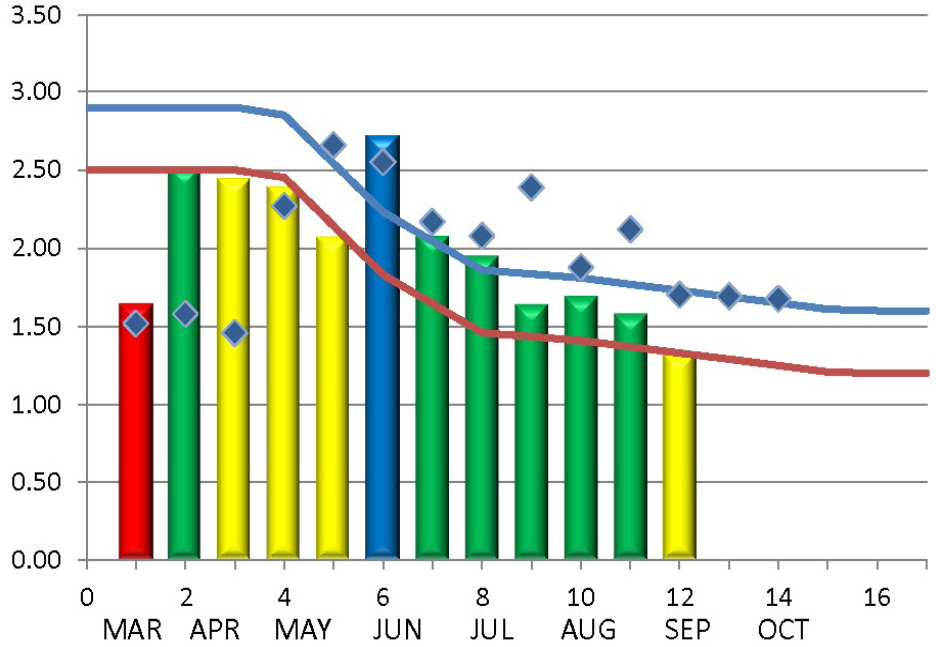
Above Optimal | Optimal | Warning | Low

2009

2008

By month…

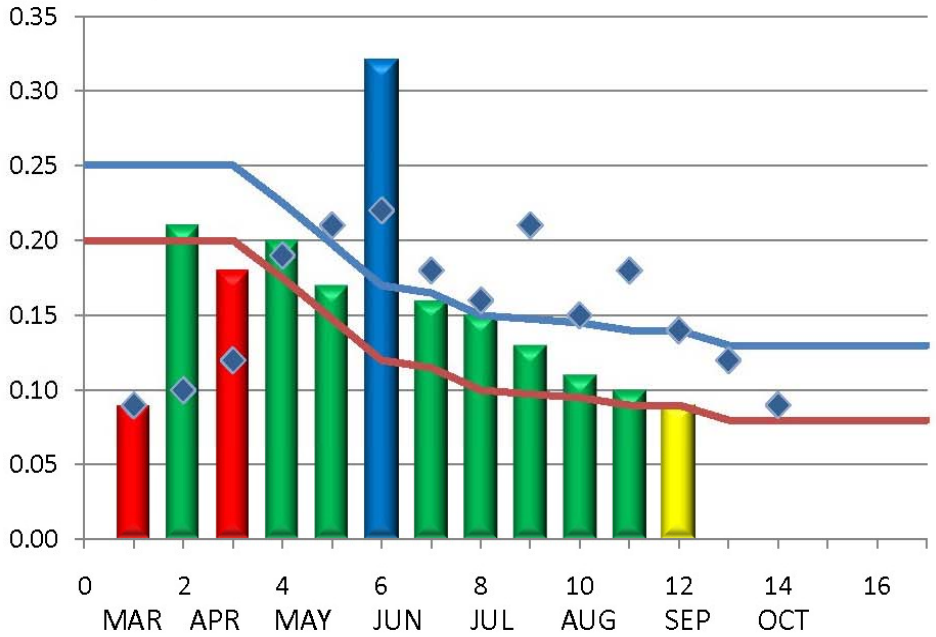
Nitrogen (%)



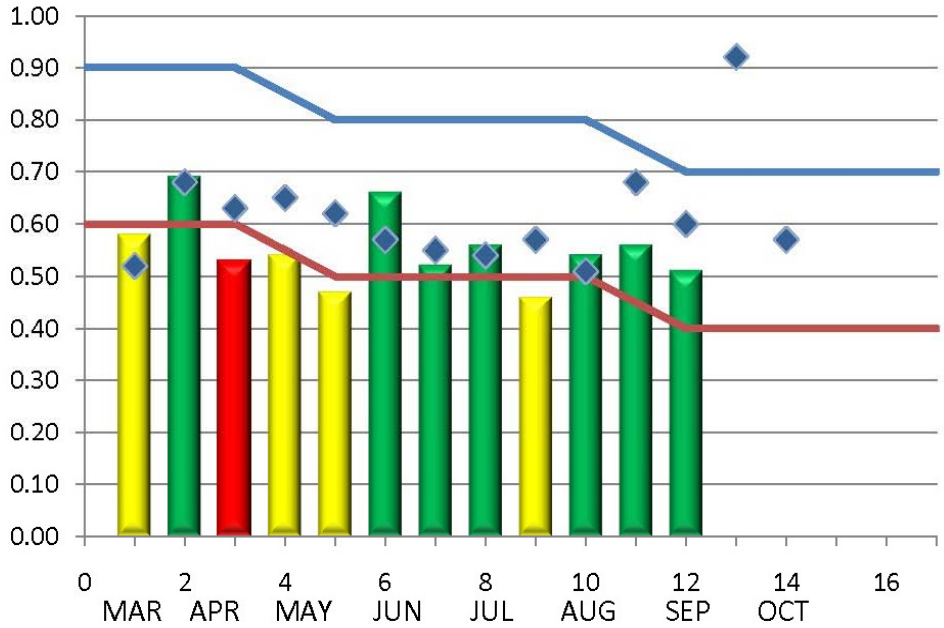
Sat%	EC	NO_3	PO_4	K	Ca	Mg	Zn	B	Fe	Mn	Cu	SO_4	ESP	Cl	pH

	S-P Date	%N	%P	%K	%Ca	%Mg	Zn	B	Fe	Mn	Cu	%S	%Na	%Cl
Optimal Zone					0.6	0.2	35	40	75	60	8	0.25	0.1	0.1
1	2/2/10	1.64	0.09	0.58	1.00	0.14	41	192	170	464	3	0.18	0.37	0.05
2	3/4/10	2.52	0.21	0.69	0.26	0.11	12	38	44	150	4	0.17	0.11	0.08
3	3/30/10	2.44	0.18	0.53	0.33	0.13	12	42	67	93	4	0.14	0.02	0.05
4	5/4/10	2.39	0.20	0.54	0.53	0.17	12	51	71	136	5	0.16	0.04	0.05
5	6/3/10	2.07	0.17	0.47	0.47	0.16	12	35	65	95	3	0.13	0.01	0.05
6	6/30/10	2.72	0.32	0.66	0.29	0.13	27	21	48	54	8	0.17	0.08	0.04
7	8/3/10	2.08	0.16	0.52	0.37	0.14	14	35	91	69	5	0.13	0.01	0.04
8	9/1/10	1.95	0.15	0.56	0.55	0.12	14	61	58	75	4	0.13	0.09	0.06
9	10/7/10	1.64	0.13	0.46	0.42	0.11	10	64	87	98	4	0.14	0.20	0.06
10	11/3/10	1.69	0.11	0.54	0.59	0.15	10	100	97	122	4	0.14	0.23	0.06
11	12/2/10	1.58	0.10	0.56	0.77	0.16	8	183	101	222	3	0.17	0.34	0.02
12	1/4/11	1.32	0.09	0.51	0.77	0.14	8	237	99	265	2	0.21	0.44	0.05
13														
14														
15														
16														
17														

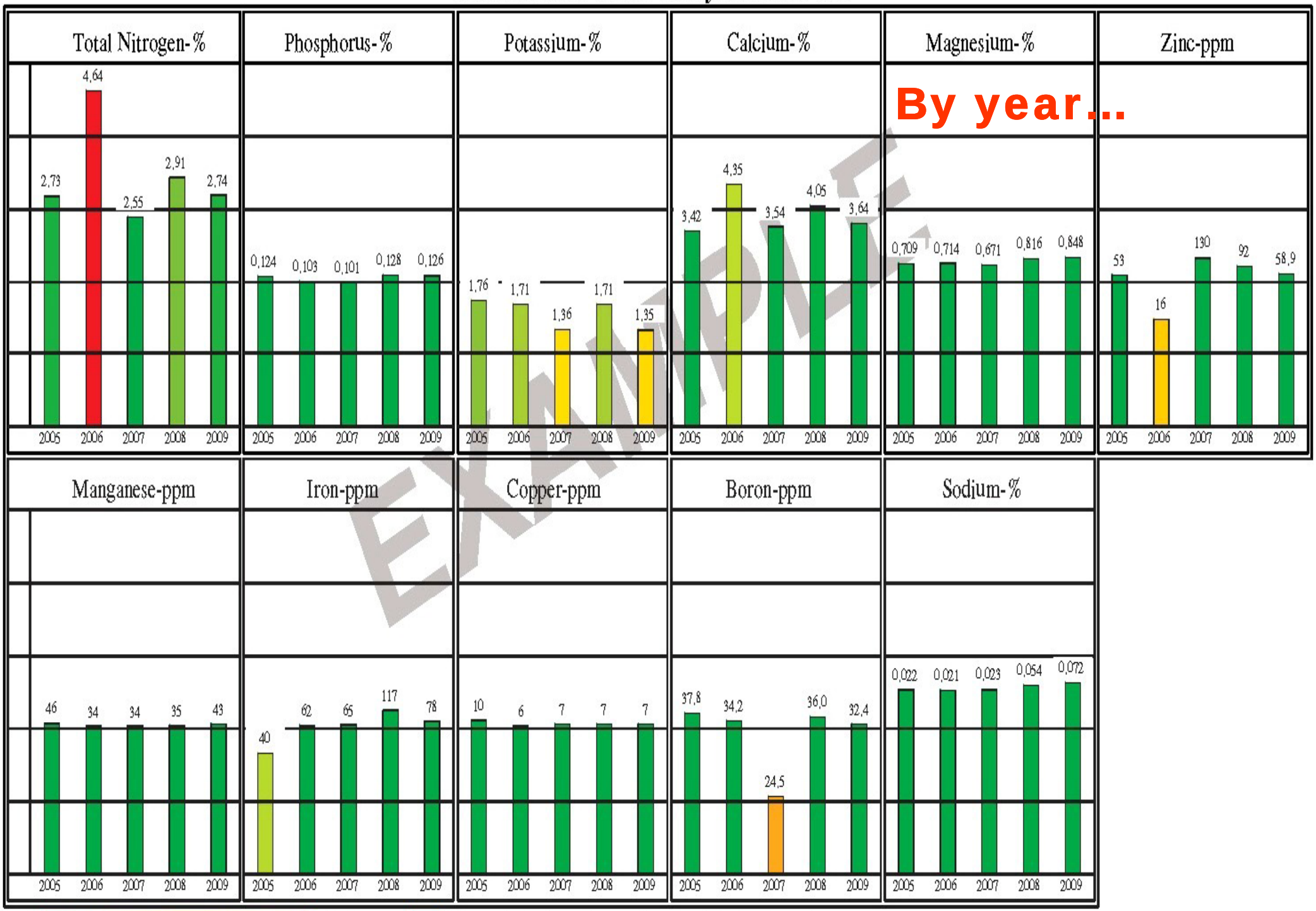
Phosphorus (%)



Potassium (%)



Almond Plant Tissue Analysis: 2005-2009



Good — Problem — Indicates physical conditions and/or phenological and amendment requirements.

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

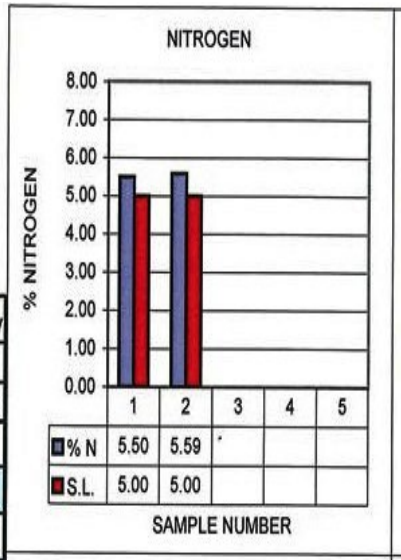
PLANT TISSUE ANALYSIS REPORT

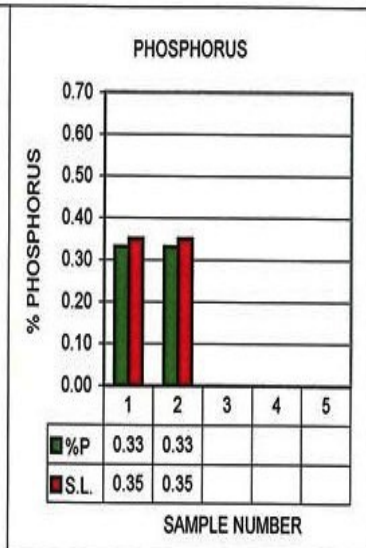
5 Samples...

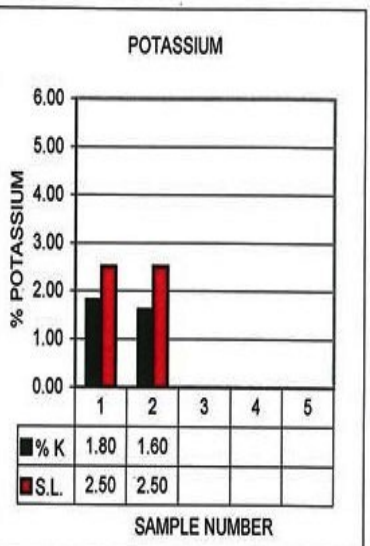
DATE: 5/23/2008
Submitted By: Joe
GROWER: Joe Farmer

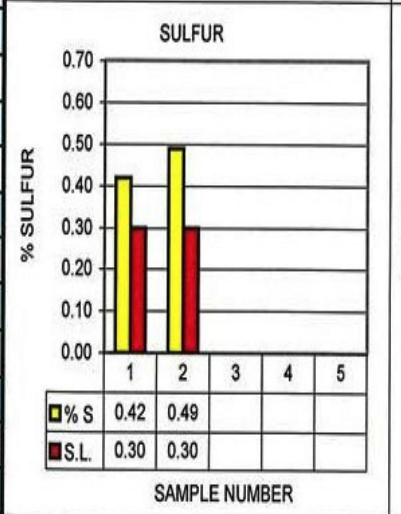
CROP: ALFALFA

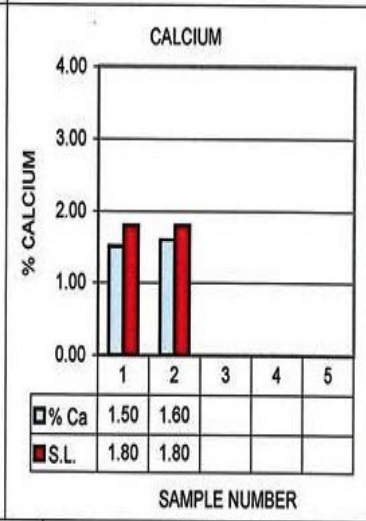
LAB ID	L727001	L727002				Sufficiency
Graph Number	1	2				Levels
Sample ID:	Lower 40	Upper 40				Prior to Flowering
Nitrogen%	5.50	5.59				5.00
Phosphorus%	0.33	0.33				0.35
Potassium%	1.80	1.60				2.50
Sulfur%	0.42	0.49				0.30
Calcium%	1.50	1.60				1.80
Magnesium%	0.25	0.24				0.40
Sodium%	0.09	0.08				0.3max
Boron ppm	82	80				30
Zinc ppm	36	37				25
Iron ppm	82	102				40
Manganese ppm	37	38				35
Copper ppm	2	2				7
Chlorides ppm						8000max
Molybdenum ppm						

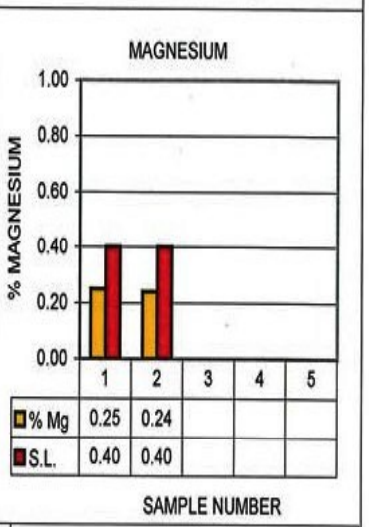


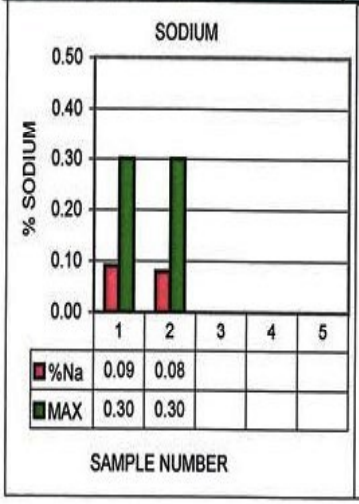


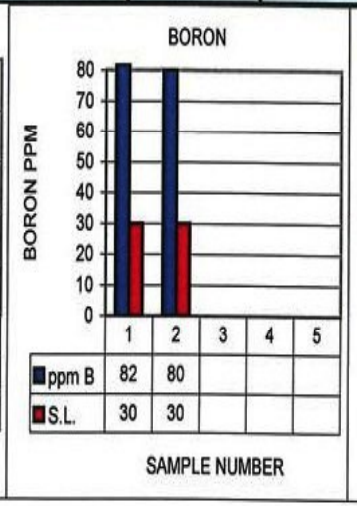


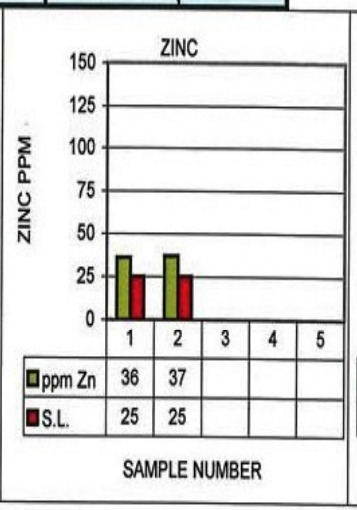


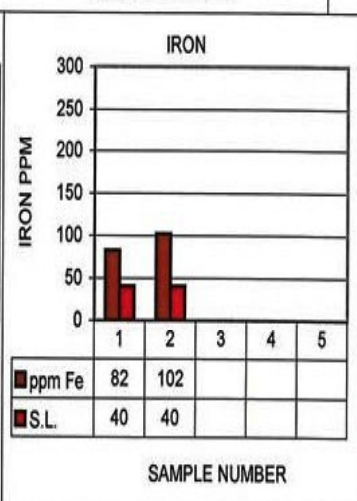


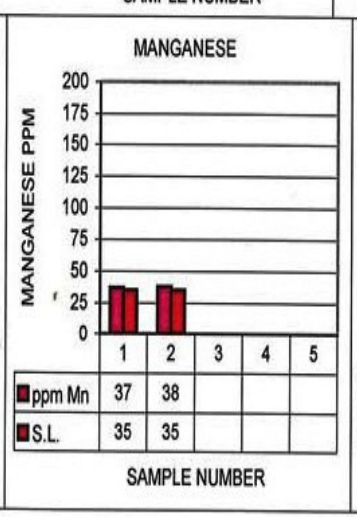


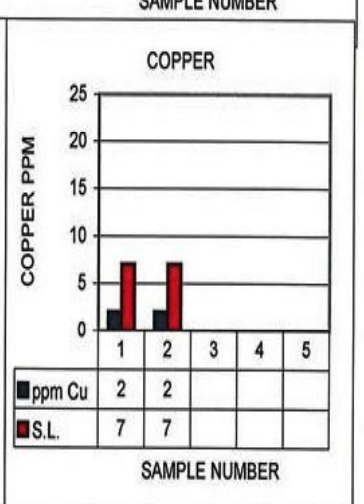












ALMONDS

MODEL FOR INTERPRETATION OF EARLY SEASON TISSUE SAMPLING AND PREDICTION OF N VALUES

Creators: Sebastian Saa, Emilio Laca, Patrick Brown

"The results generated utilizing this approach represent the best available model for prediction of July leaf N values. Please note that results have not been validated under all conditions and hence must be used with care"
www.ucanr.edu/sites/scri/Crop_Nutrient_Status_and_Demand__Patrick_Brown

ALMONDS

MODEL FOR INTERPRETATION OF EARLY SEASON TISSUE SAMPLING AND PREDICTION OF N VALUES

Creators: Sebastian Saa, Emilio Laca, Patrick Brown

"* NOTE:

1) For greatest accuracy leaves should be collected in Mid-April from non-fruiting spurs and all the elements listed at the left should be included".
2) The currently accepted critical value for N in July in Almond is 2.2% This may be adjusted if you prefer a lower N value to help minimize disease incidence...

MODEL FOR INTERPRETATION OF EARLY SEASON TISSUE SAMPLING AND PREDICTION OF N VALUES

Creators: Sebastian Saa, Emilio Laca, Patrick Brown
UC Davis
Version 1 UC, Davis Last Update: 11/04/2012

Model For Big Sets of Data (up to 1,000 samples at once)

NOTE: This model was developed from 4 years of research conducted fro
at four locations. The model was then validated at six different almond
between leaf N concentrations predicted utilizing the model and th
Two outputs are provide
1) Estimated leaf N in Ju
2) Predicted percentage of trees in July that will meet or

The results generated utilizing this approach represent the best availabe
note that results have not been validated under all condition

Enter the July Critical Value (C.V.)
(Default setting is = 2.2)

Units	Value
%	2.2

Enter the tissue nutrient values for leaves collected in spring.

ID	N (%)	P (%)	K (%)	S (ppm)	B (ppm)	Ca (%)	Mg (%)	Zn (ppm)	Mn (ppm)	Fe (ppm)	Cu (ppm)	July N (%) Predicted	Predicted % of Trees above C.V.
1	3.5	0.35	2.2	0.2	50	1.2	0.4	40	90	110	10	2.49564	**98.71**
2												N.A.	#VALUE!
3												N.A.	#VALUE!
4												N.A.	#VALUE!
5												N.A.	#VALUE!
6												N.A.	#VALUE!
7												N.A.	#VALUE!
8												N.A.	#VALUE!
9												N.A.	#VALUE!
10												N.A.	#VALUE!
11												N.A.	#VALUE!
12												N.A.	#VALUE!
13												N.A.	#VALUE!
14												N.A.	#VALUE!
15												N.A.	#VALUE!

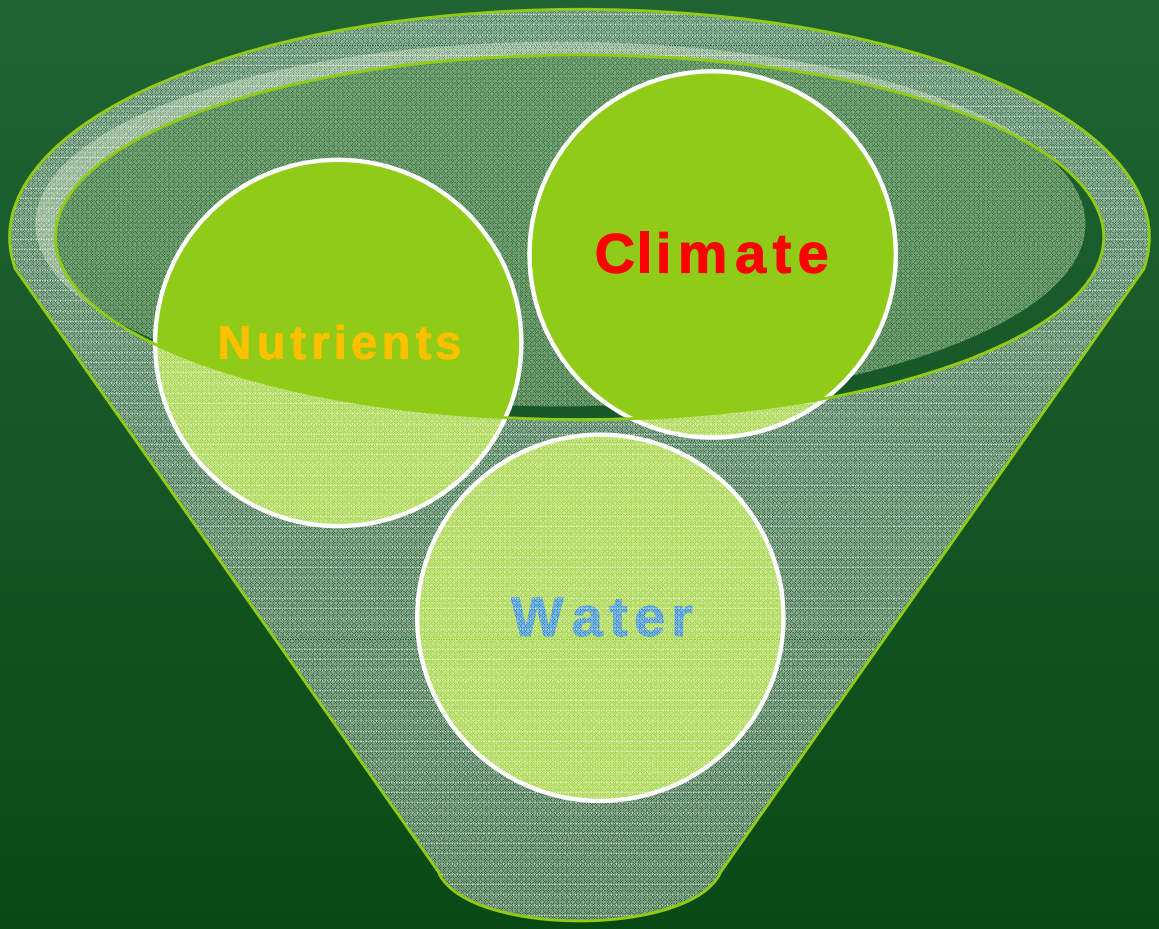
*Note:
1) For greatest
fruiting spur le
2) If value for a
3)The program
nutrient conce

*Note: The cur
2.2%. This may
disease inciden
This data is use
which th esamp
upon the sprin

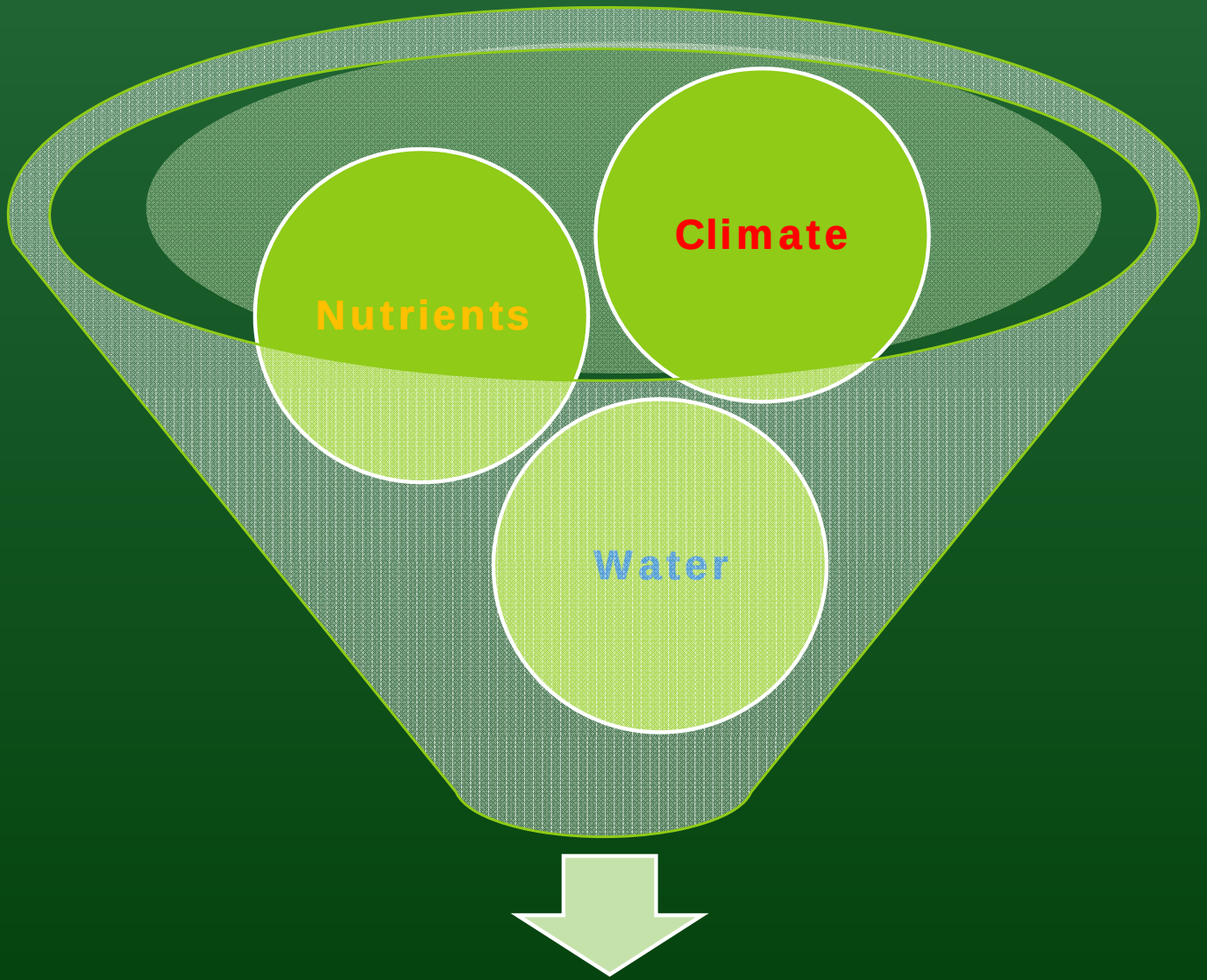
Mid April 3.5%N

Mid July 2.5%N

Percent 99% Trees Over Critical Value of 2.2% N



Optimum Yield and Quality



Plant Analysis under Constant Fertigation?

ALMONDS

MODEL FOR INTERPRETATION OF EARLY SEASON TISSUE SAMPLING AND PREDICTION OF N VALUES

Creators: Sebastian Saa, Emilio Laca, Patrick Brown

"The results generated utilizing this approach represent the best available model for prediction of July leaf N values. Please note that results have not been validated under all conditions and hence must be used with care"
www.ucanr.edu/sites/scri/Crop_Nutrient_Status_and_Demand__Patrick_Brown

CONDUCTING TISSUE SAMPLING

IT'S ALL GOOD?

Question…

What’s a petiole?

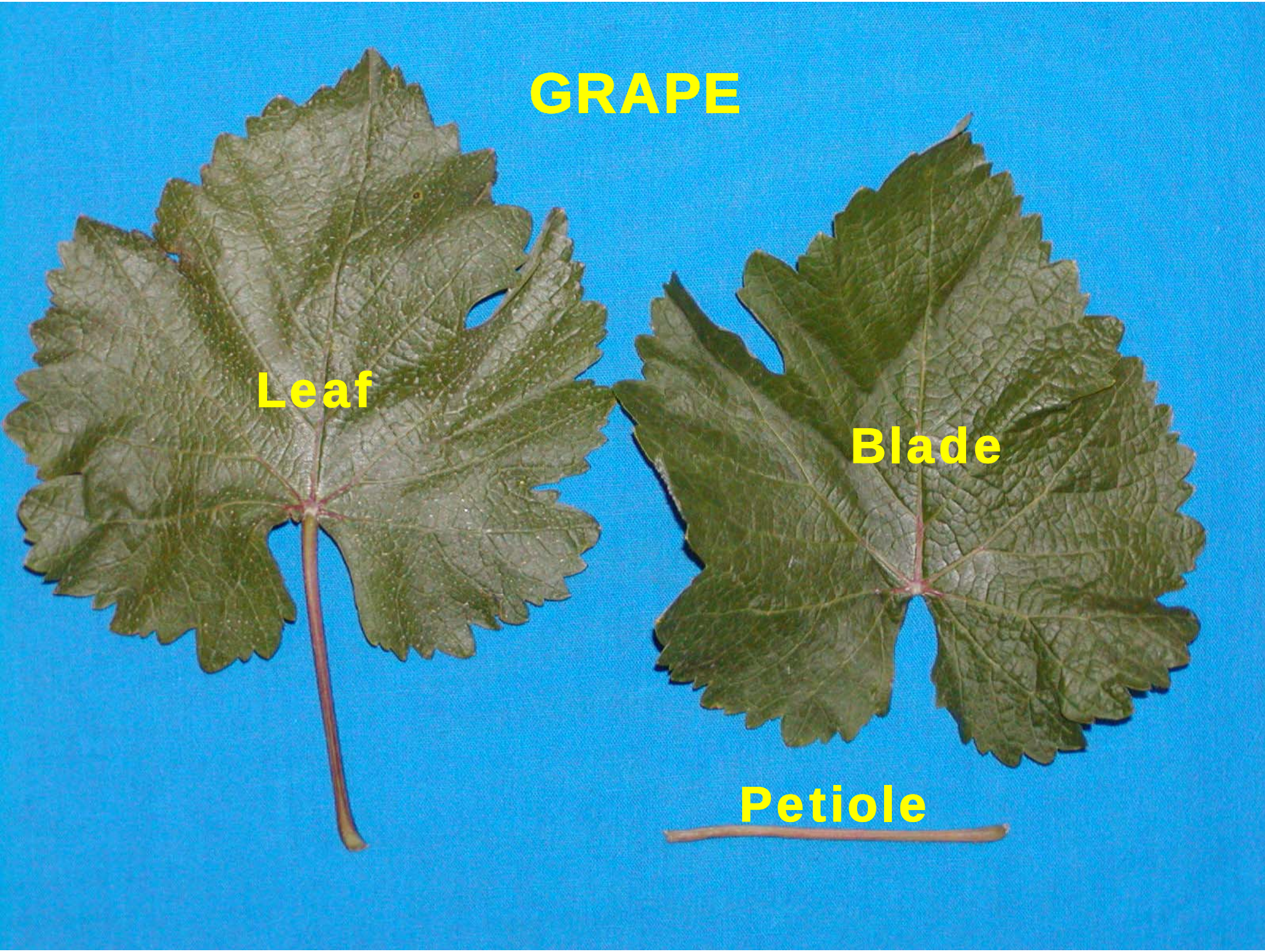
Plant Part

- Petioles?
- Blades?
- Leaves?

Petioles are attached to blades or leaflets

Several leaflets make up a leaf

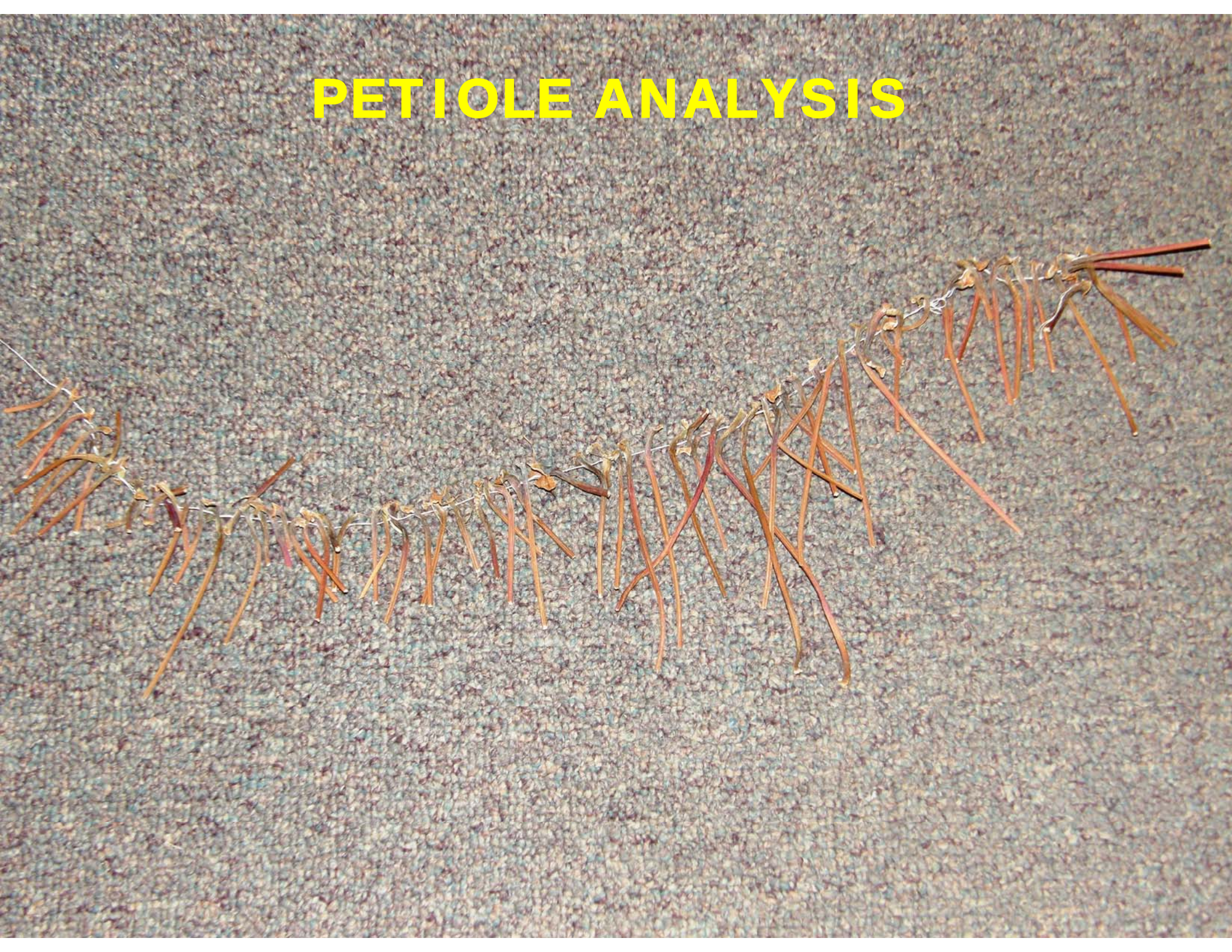
Generally, sample most recently matured leaf


GRAPE
Leaf
Blade
Petiole

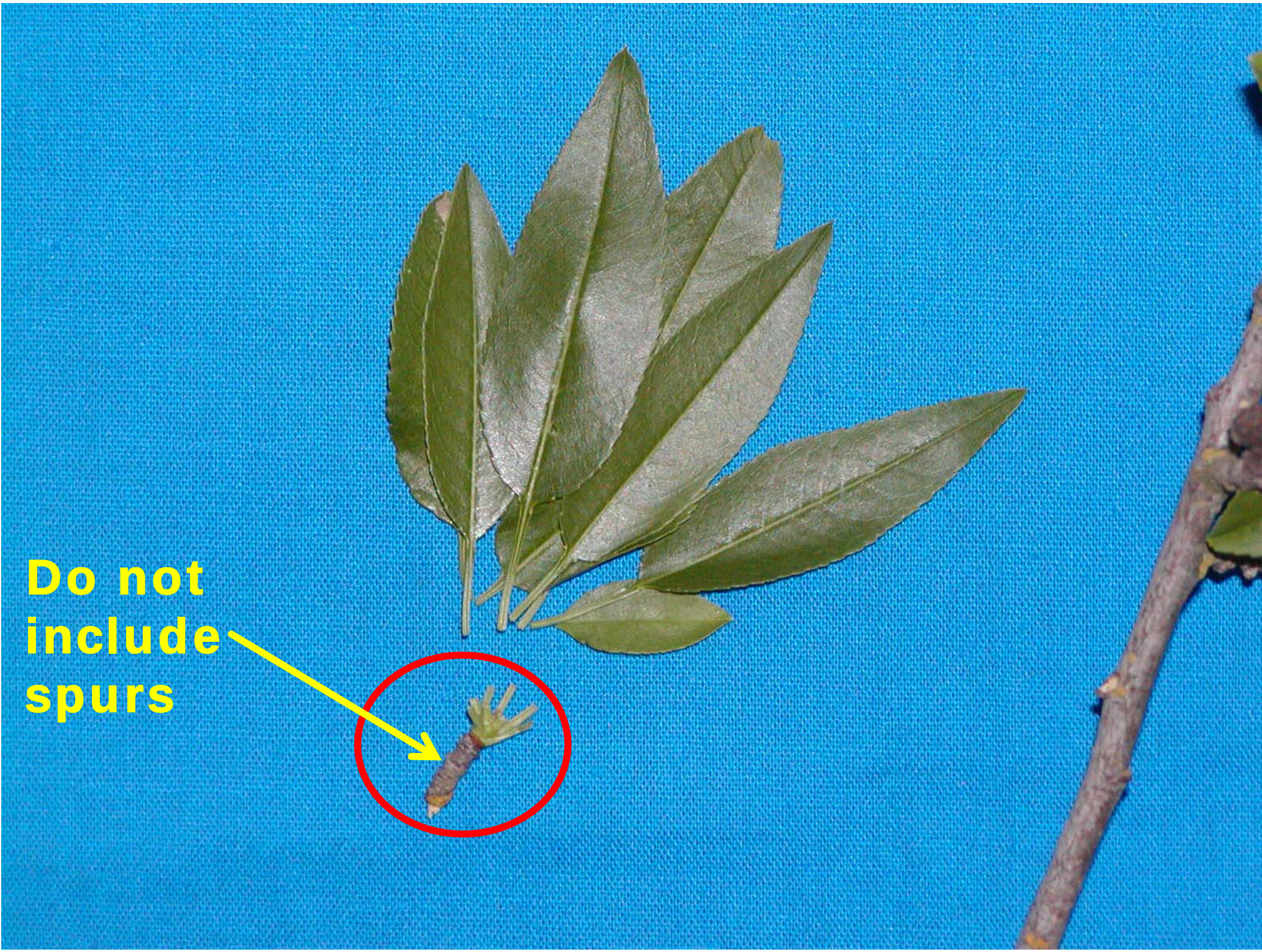
“LEAF” ANALYSIS?

3 Samples

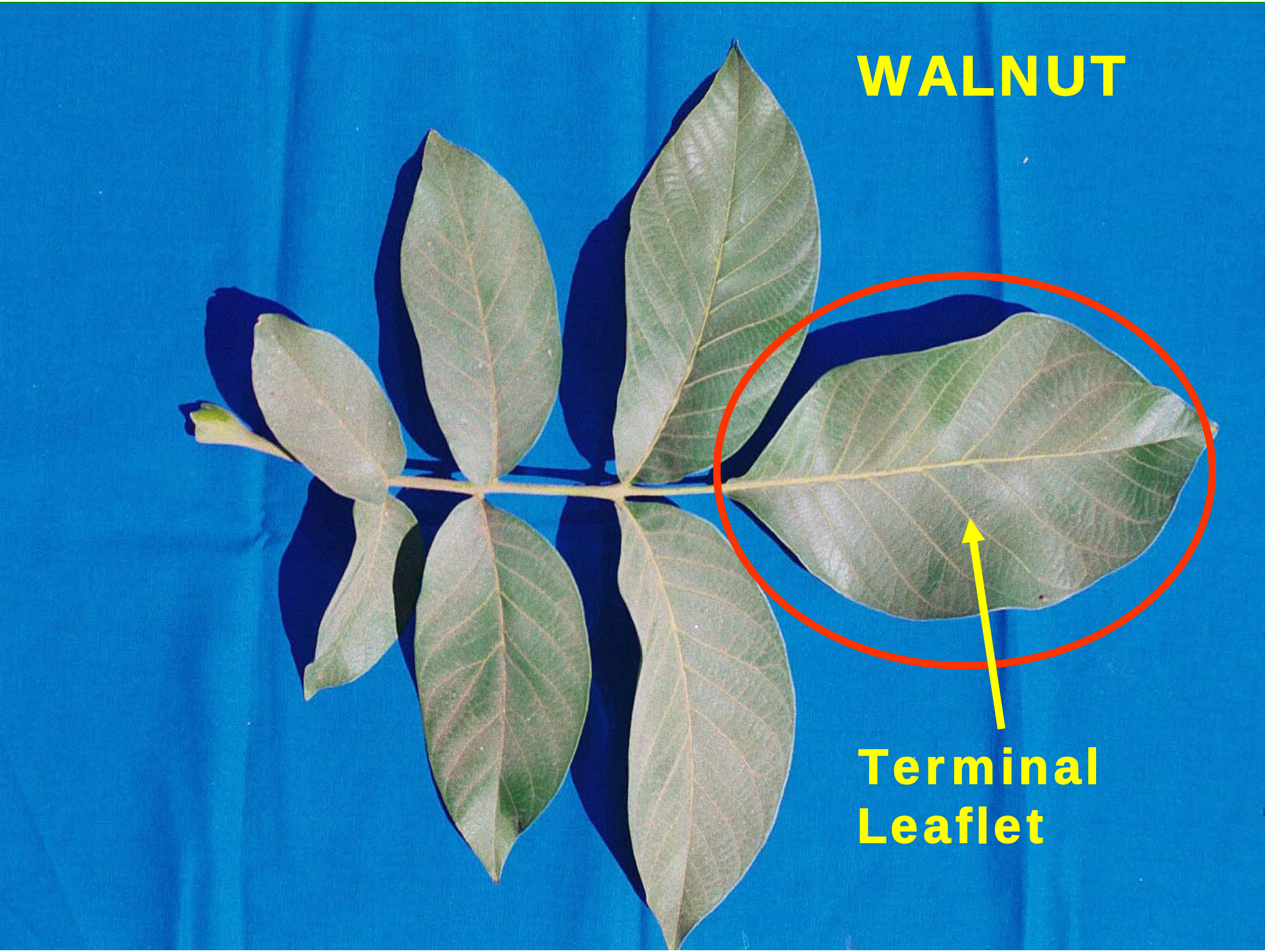
PETIOLE ANALYSIS




Yes
No!

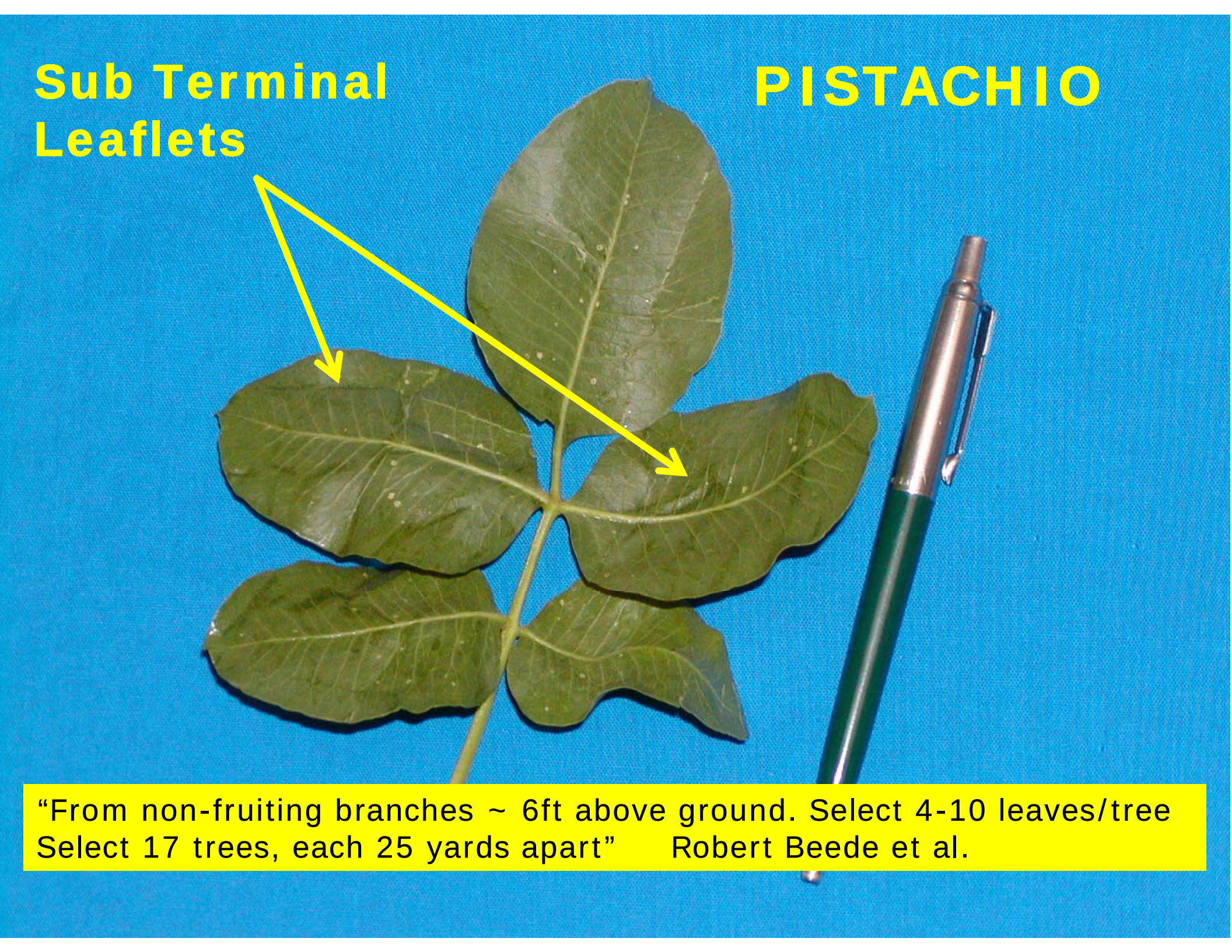

Do not include spurs


A PREPARED LAB SAMPLE


WALNUT
Terminal
Leaflet

Sub Terminal Leaflets

PISTACHIO



"From non-fruiting branches ~ 6ft above ground. Select 4-10 leaves/tree
Select 17 trees, each 25 yards apart" Robert Beede et al.

Pome Fruit
(Apple, pear[1])

AUSTRALIAN DATA

"Leaves from mid shoot position on current season's extension"

Sampling time Late January to mid February (mid summer)

Plant part and growth stage Leaves from mid shoot position on current season's extension

Nutrient	Crop	Deficient	Low	Normal	High	Excess
Nitrogen % (N)	Apple	< 1.6	1.6–1.9	2.0–2.4	2.5–3.0	> 3.0
	Pear[1]	< 1.8	1.8–2.2	2.3–2.7	2.8–3.5	> 3.5
Phosphorus % (P)	Apple & Pear	< 0.10	0.10–0.14	0.15–0.20	0.21–0.30	> 0.30
Potassium % (K)	Apple & Pear	< 0.8	0.8–1.0	1.1–1.5	1.6–2.0	> 2.0
Calcium % (Ca)	Apple & Pear	< 0.7	0.7–1.0	1.1–2.0	2.1–2.5	> 2.5
% (Cl)	Pear					
Copper[2] mg/kg (Cu)	Apple & Pear	< 4	4–5	6–20	21–100	
Zinc[2] mg/kg (Zn)	Apple & Pear	< 10	10–15	16–50	51–100	
Manganese[2] mg/kg (Mn)	Apple & Pear	< 20	20–24	25–100	101–200	> 200
Iron[3] mg/kg (B)	Apple & Pear	< 50				
Boron mg/kg (B)	Apple & Pear	< 15	15–20	21–60	61–200	> 200

[1] Pear has a slightly higher leaf nitrogen standards than apples. Standards for other nutrients are similar for both types of pome fruits.

[2] Leaves sprayed with manganese, copper or zinc nutritional or fungicidal sprays will analyse high and results cannot be interpreted.

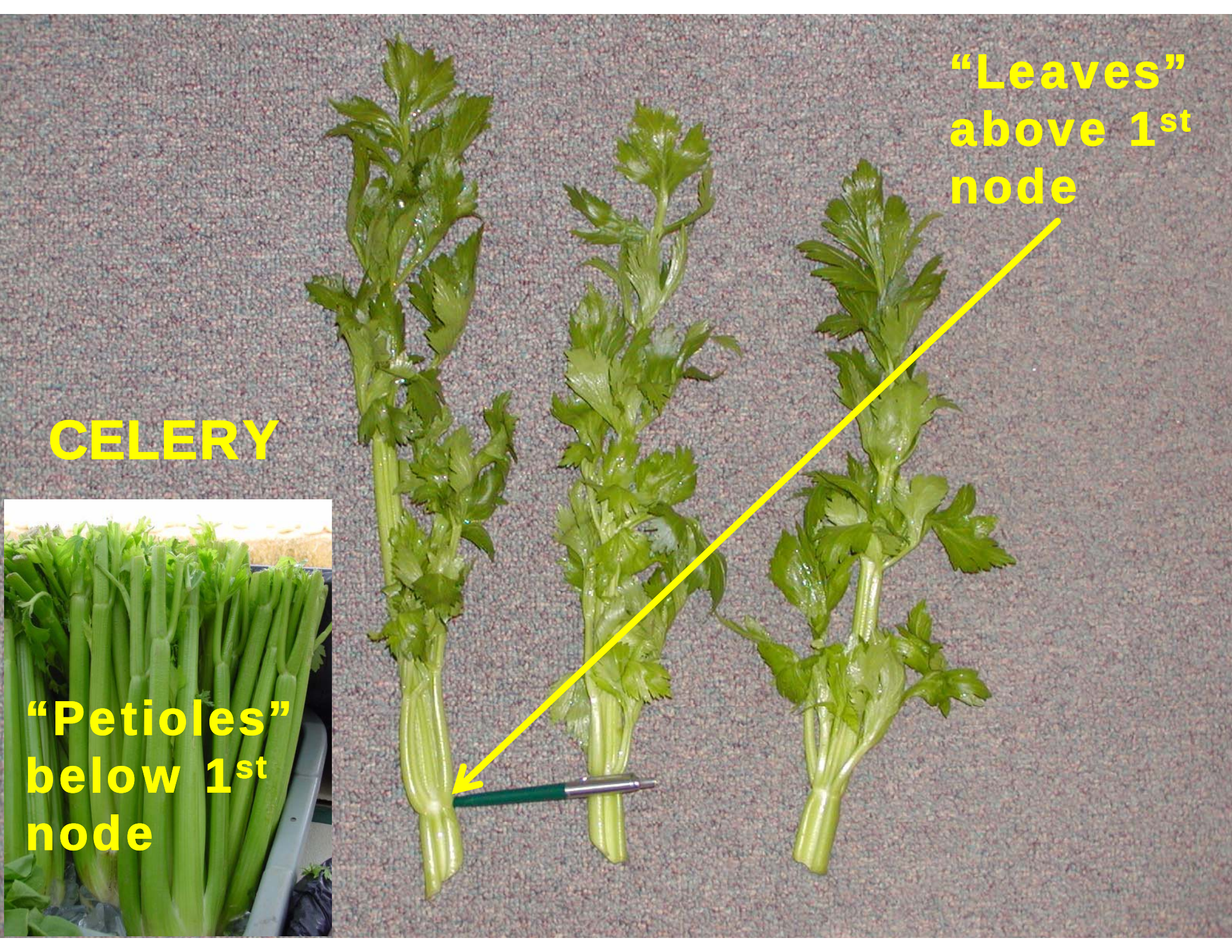
[3] Leaf analysis is not a reliable guide to iron status.

CALIFORNIA DATA

"Non-fruiting spurs rarely gave the best nutrient information"

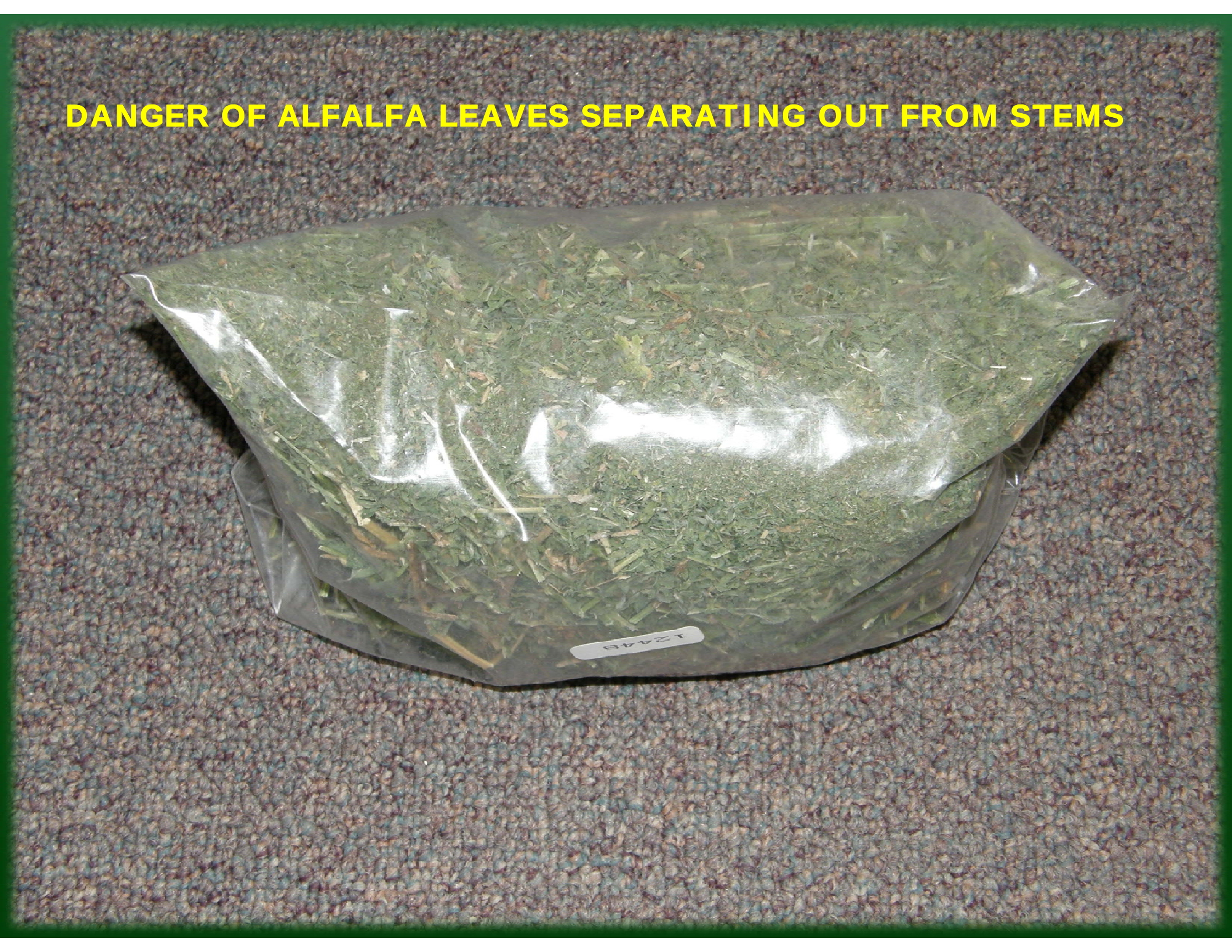
Dr. Kitren Glozer, UC Davis


LETTUCE
LEAF
Midrib


CELERY
"Leaves" above 1st node
"Petioles" below 1st node

ALFALFA SAMPLE

DANGER OF ALFALFA LEAVES SEPARATING OUT FROM STEMS



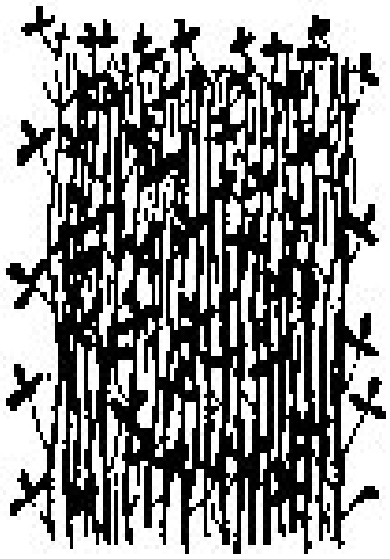
Alfalfa Tissue Sampling

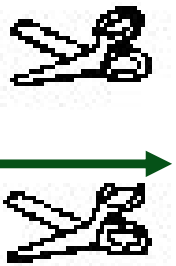
(UNIVERSITY METHOD) C. Analyze

3 sub-samples per “sample”

A. Collect

B. Cut

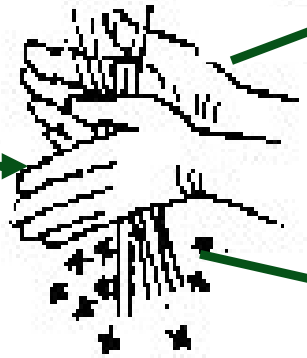




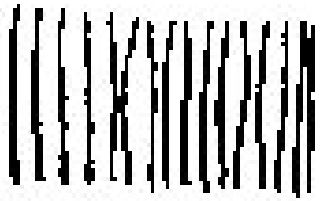
TOP 1/3

MIDDLE 1/3

BOTTOM 1/3

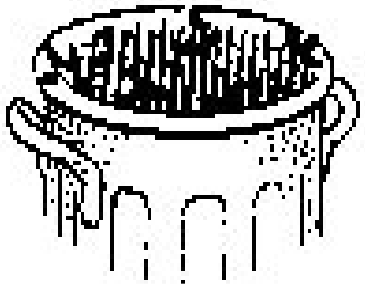


Mo,
Other
Copper



Phosphorus
Potassium

Sulfur



Discard


Top third whole
Middle third stems
Middle third leaves

WHOLE BALE SAMPLING

Steve Orloff

EXAMPLE REPORT - WHOLE ALFALFA BALE SAMPLING

GROWER:

DATE OF REPORT: 08/26/10

PLANT ANALYSIS REPORT

SAMPLE ID	REPORT OF ANALYSIS IN PERCENT								REPORT OF ANALYSIS IN PARTS PER MILLION							
	Nitrogen N	Sulfur S	Phosphorus P	Potassium K	Magnesium Mg	Calcium Ca	Sodium Na	Chloride Cl	Iron Fe	Aluminum Al	Manganese Mn	Boron B	Copper Cu	Zinc Zn	Nitrate-Nitrogen NO_3-N	MO
DLN	3.37	0.26	0.24	2.90	0.31	1.20	0.11		68	20	36	46	7	30		2.4
KGSOU	3.35	0.19	0.22	2.57	0.29	1.08	0.14		87	45	25	35	5	23		5.2
KGNOR	3.16	0.17	0.22	2.47	0.21	0.76	0.11		103	67	17	29	4	10		5
CNVRS	3.17	0.16	0.25	2.36	0.24	1.02	0.11		111	60	27	35	4	22		2.8

Sample #	Date	Lab #	Crop	Stage/Part
DLN	/		ALFALFA	HAR-W
KGSOU	/			
KGNOR	/			
CNVRS	/			

DEFINITION OF INTERPRETATION RATINGS

When interpretation of plant analysis results are given, they will be listed as follows:

D or Deficient — Plants should be showing visible symptoms of a nutritional deficiency. Plant growth would definitely be curtailed by an insufficient amount of this element.

L or Low — Plants may be normal in appearance but probably will be responsive to fertilization with this element.

S or Sufficient — Plants contain adequate amounts of this element for maximum yield and are normal in appearance.

H or High — Optimum yields can be expected and plants are normal in appearance. However, concentration of this element is higher than normally expected.

E or Excessive — Plants probably show symptoms of a nutritional disorder or stunted growth. Yields may be reduced significantly by an excessive amount of this element.

WHOLE BALE SAMPLING

FEED ANALYSIS REPORT

PAGE: 1

Sample Identification	Moisture %	Crude Protein %	Digestible Protein %	Crude Fat %	Fiber %	NFE % (Car-Hyd.)	Total Car-Hyd. %	Ash %	Digestible Nutrients %	Nitrate (NO_3) %	NEL
7-12	0.00	26.75			25.37				63.32		1.43
ALFALFA	11.46	23.69			22.46				56.06		1.27
7-19	0.00	22.33			26.37				62.56		1.41
ALFALFA	10.71	19.94			23.55				55.86		1.26
7-24E	0.00	28.73			23.46				64.75		1.47
ALFALFA	10.59	25.69			20.98				57.89		1.31
40387	0.00	27.06			29.42				60.27		1.36
ALFALFA	9.69	24.44			26.57				54.43		1.23

Nitrogen %	Sulfur %	Phosphorus %	Potassium %	Magnesium %	Calcium %	Sodium %	Iron ppm	Aluminum ppm	Manganese ppm	Copper ppm	Zinc ppm	B	MO
4.28	0.23	0.27	1.43	0.50	1.82	0.09	283	94	54	9	26	42.92	2.71
3.79	0.20	0.24	1.27	0.44	1.61	0.08	251	83	48	8	23	38.00	2.40
3.57	0.18	0.25	1.85	0.41	1.61	0.03	111	43	43	8	20	29.12	0.90
3.19	0.16	0.22	1.65	0.37	1.44	0.03	99	38	38	7	18	26.00	0.80
4.6	0.26	0.28	1.25	0.59	2.05	0.08	179	86	39	8	17	26.84	1.34
4.11	0.23	0.25	1.12	0.53	1.83	0.07	160	77	35	7	15	24.00	1.20
4.33	0.24	0.27	0.90	0.68	2.56	0.13	110	48	32	9	19	36.54	1.11
3.91	0.22	0.24	0.81	0.61	2.31	0.12	99	43	29	8	17	33.00	1.00

Possible to run a mineral analysis at the same time as a feed analysis. These four samples are expressed as moisture as received and on a dry matter basis.


MIXED GRASS
PASTURE

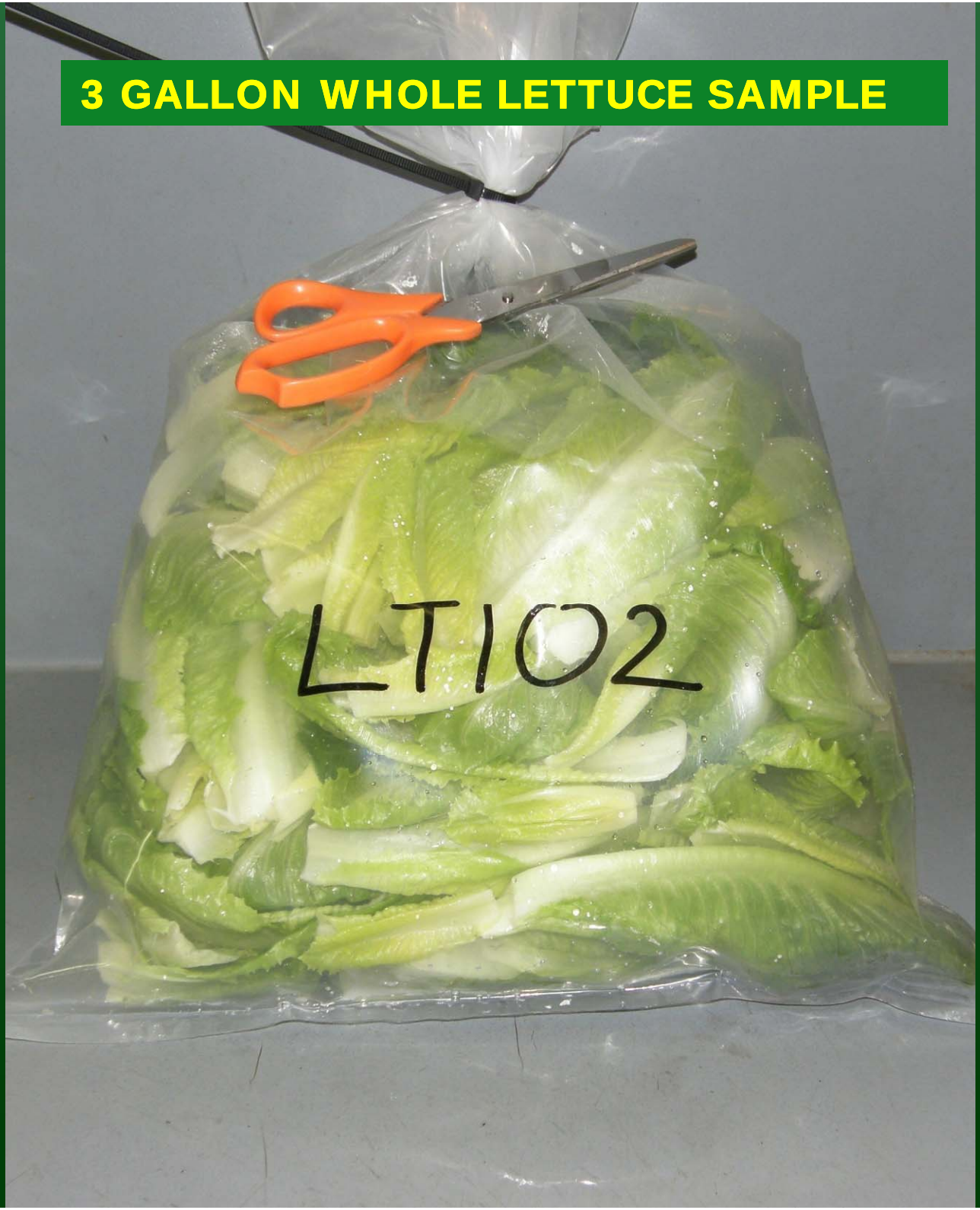
MIXED HAY


CLOVER GRASS MIX

The Long and the Short of It...


POOR LABELING AND EXCESSIVE SAMPLE

3 GALLON WHOLE LETTUCE SAMPLE

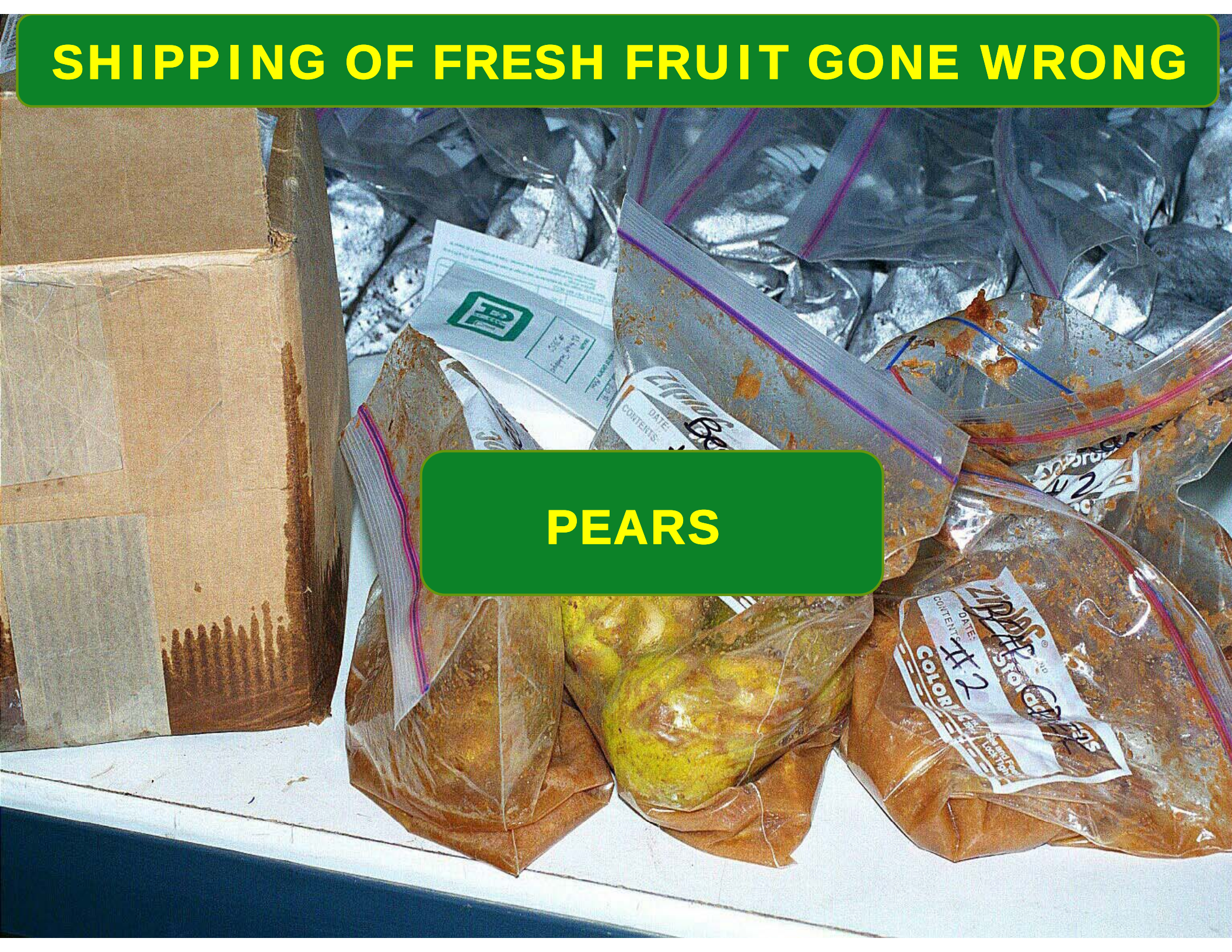



A WHOLE BAG OF WHEAT


CORN SILAGE

ONE GALLON BAGFUL

SHIPPING OF FRESH FRUIT GONE WRONG



SHIPPING OF FRESH FRUIT GONE WRONG


ALMOND HULLS

COLLECT ALMOND HULLS OFF THE TREE!

MOLDY ALMOND HULLS – DELIVER ON TIME!

MOLDY PETIOLES – DELIVER ON TIME!

SOME FINAL CONSIDERATIONS ON CONDUCTING TISSUE SAMPLING

- Effect of water quality/availability?
- Effect of soil texture?
- Effect of pests and diseases?
- Effect of agricultural chemicals?
- Effect of climate/light exposure?
- Effect of foliar sprays and dust?

Thank you