

Plant Tissue Sampling & Analysis

NCDA&CS Agronomic Division

by Dianne Farrer, Ph.D.

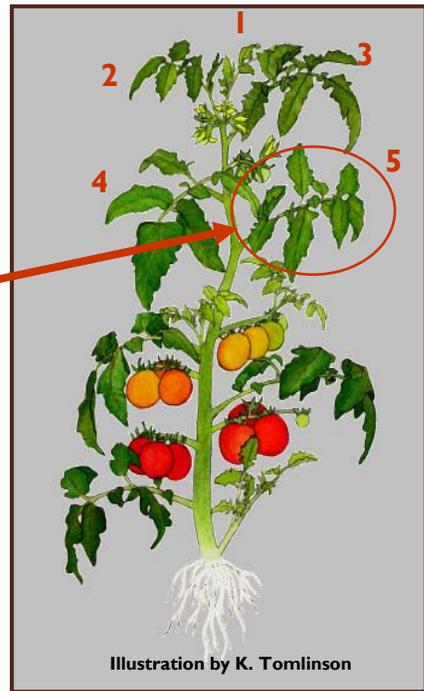


Collecting Plant Tissue Samples: When & Why

- Why
 - Fine tune fertility program
 - Detect problems
 - Diagnose problems
- When
 - Fruit and Vegetable crops – just before or during flowering/fruiting
 - Diagnose problems
- How often
 - Bi-weekly

What Part of the Plant to Collect

- Most common is the MRML or the Most Recently Matured Leaf
- Usually found as the 3rd to 5th leaf down from the growing point





Crop	Growth Stage		Plant Part Description	Code	Plant Position Code	Number of leaves to collect	Extra tests	Cost
	Description	Code						
Blackberry	Post Harvest	M	MRML on primocane (non-fruitlet laterals)	M	U	20-40	--	\$5
Cucumber	All growth Stages	S, E, B, F, M	MRML or 5th leaf from a growing point	M	U	15-20	--	\$5
Melons	Prior to or during flowering; prior to fruit set	E, B	MRML or 5th leaf from a growing point	M	U	12-30	--	\$5
Strawberry	Early	E Weeks 1-8	MRML and petioles, Separate petioles in the field	M	U	30-50	Petiole NO ₃ -N	\$7
	Bloom/Fruit: Initiated when there are 5 to 10 bloom on 75% of the plants	B/F Weeks 1-12	MRML and petioles, Separate petioles in the field	M	U	30-50	Petiole NO ₃ -N	\$7
	Mature	M Weeks 1-4	MRML and petioles, Separate petioles in the field	M	U	30-50	Petiole NO ₃ -N	\$7
Tomato	Early growth (5-leaf stage through first flower)	S, E	MRML, 3rd to 5th compound leaf back from the growing point	M	U	20-25	--	\$5
	Early flower through first fruit set	B						
	First fruit set through harvest	F, M						

How to Collect a Representative Sample

- Stop at 8 to 12 random spots in the field
- Collect 15 to 50 leaves
- Diagnostic sample
 - Same as above but collect from “good” and “bad” areas in the field
- Get sample to the lab ASAP
 - Store in refrigerator
 - Air dry sample

Complete Plant Sample Information Form

Form AD-4 (May 2010)

PLANT SAMPLE INFORMATION

NCD&CS Agronomic Division Plant/Waste/Solution/Media Section
 Mailing Address: 1040 Mail Service Center, Raleigh NC 27699-1040
 Physical Address (UPS/FedEx): 4300 Reedy Creek Road, Raleigh NC 27607
 Phone: (919) 733-2655 Web Address: www.ncagr.gov/agronomi

FOR OFFICE USE ONLY
 REPORT # _____
 DATE REC'D _____
 INITIAL _____

SAMPLE TYPE <small>(circle designation) (instructions on back)</small> Predictive <input type="radio"/> Diagnostic <input checked="" type="radio"/>		SAMPLE INFORMATION FARM ID: <u>A-1</u> SAMPLED BY: <u>Joe Farmer</u> <input checked="" type="checkbox"/> Grower <input type="checkbox"/> NCD&CS Agronomist <input type="checkbox"/> Advisor <input type="checkbox"/> Coop. Ext. Agent SAMPLE DATE: <u>July 25</u> COUNTY (where collected): <u>Wake</u> NUMBER OF SAMPLES: <u>3</u>		PAYMENT FEE TOTAL: <u>\$17</u> AMT PAID: _____ METHOD OF PAYMENT: <input type="checkbox"/> CASH <input checked="" type="checkbox"/> CHECK (payable to NCD&CS) <input checked="" type="checkbox"/> MONEY ORDER (account name below) <u>Farmer's Produce</u>		GROWER INFORMATION (please print) LAST NAME: <u>Farmer</u> FIRST NAME: <u>Joe</u> ADDRESS: <u>4 Backwoods Rd.</u> CITY: <u>Rolesville</u> STATE: <u>NC</u> ZIP: <u>27571</u> PHONE: <u>919, 834, 0000</u> E-MAIL ADDRESS: <input checked="" type="checkbox"/> Do Not notify me when report is available. <u>joe@ruralNC.net</u>		CONSULTANT/OTHER RECIPIENT LAST NAME: <u>Stevens</u> FIRST NAME: <u>Martin</u> ADDRESS: <u>233 Essex Lane</u> CITY: <u>Rocky Mount</u> STATE: <u>NC</u> ZIP: <u>27571</u> PHONE: <u>252, 972, 0000</u> E-MAIL ADDRESS: <input type="checkbox"/> Do Not notify me when report is available. <u>mstevens@RAGroup.com</u>	
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LAB NUMBER (Repeat 10x)	SAMPLE ID	CROP NAME	GROWTH STAGE	WEEKS	PLANT PART	PLANT POSITION	SOIL	CORRESPONDING SOLUTION	SAMPLE ID	WASTE	PLANT APPEARANCE	PHYSICAL TESTS (Moisture, pH, etc.)
1	<u>BAD</u>	<u>Trellis Tomato</u>	<u>B</u>	<u>M</u>	<u>U</u>	<u>BADT</u>					<u>yellow/stunted</u>	
2	<u>GOOD</u>	<u>Trellis Tomato</u>	<u>B</u>	<u>M</u>	<u>U</u>	<u>GOODT</u>					<u>healthy</u>	
3	<u>FIELD2</u>	<u>Cotton</u>	<u>E</u>	<u>3</u>	<u>M</u>	<u>U</u>						<input checked="" type="checkbox"/>
4												
5												

GROWING CONDITIONS Planting date: <u>May 15</u> Have any other symptoms been present? <u>5 days</u> Are plants infested with disease? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Are plants infested with insects? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Environmental conditions in last three weeks: Temperature: <u>Normal</u> (Below normal, Normal, Above normal) Irrigation (amount): <u>0.5"/day</u> TYPE: <u>drip</u> FUNGICIDES USED: _____ DATE: _____		PROBLEM SAMPLE COMMENTS <u>BAD: The yellowing is marginal with some scorching --- tends to be on the older leaves, good fruit load, have harvested one time</u>		FERTILIZER HISTORY <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Preplant</th> <th>Date</th> <th>Material</th> <th>Rate</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td></td> <td><u>5/15</u></td> <td><u>10-10-10</u></td> <td><u>300 lb/A</u></td> <td><u>broadcast</u></td> </tr> <tr> <td>Postplant:</td> <td><u>weekly</u></td> <td><u>13-0-44</u></td> <td><u>50 lb/A</u></td> <td><u>3 weeks</u></td> </tr> <tr> <td>Microplant:</td> <td><u>6/15</u></td> <td><u>Saluber</u></td> <td><u>125 lb/A</u></td> <td><u>thru drip, foliar</u></td> </tr> </tbody> </table>		Preplant	Date	Material	Rate	Comments		<u>5/15</u>	<u>10-10-10</u>	<u>300 lb/A</u>	<u>broadcast</u>	Postplant:	<u>weekly</u>	<u>13-0-44</u>	<u>50 lb/A</u>	<u>3 weeks</u>	Microplant:	<u>6/15</u>	<u>Saluber</u>	<u>125 lb/A</u>	<u>thru drip, foliar</u>
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	<u>5/15</u>	<u>10-10-10</u>	<u>300 lb/A</u>	<u>broadcast</u>																					
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Thank you for using agronomic services to manage nutrients and safeguard environmental quality. — Steve Troxler, Commissioner of Agriculture

Standard Paper Form

Form AD-4 (May 2010)

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NCDA&CS Agronomic Division Plant/Waste/Solution/Media Section
 Mailing Address: 1040 Mail Service Center, Raleigh NC 27699-1040
 Physical Address (UPS/FedEx): 4300 Reedy Creek Road, Raleigh NC 27607
 Phone: (919) 733-2655 Web Address: www.ncagr.gov/agronomi

SAMPLE TYPE <i>(circle designation(s) / instructions on back)</i> Predictive Diagnostic Research Out of State		FOR OFFICE USE ONLY REPORT # _____ DATE REC'D _____ INITIAL _____	
SAMPLE INFORMATION FARM ID _____ SAMPLER BY <input type="checkbox"/> Grower <input type="checkbox"/> NCDA&CS Agronomist <input type="checkbox"/> Advisor <input type="checkbox"/> Coop. Ext. Agent SAMPLE DATE _____ COUNTY (where collected) _____ NUMBER OF SAMPLES _____		PAYMENT FEE TOTAL _____ AMT PAID _____ METHOD OF PAYMENT <input type="checkbox"/> CASH <input type="checkbox"/> CHECK (payable to NCDA&CS) <input type="checkbox"/> MONEY ORDER <input type="checkbox"/> ESCROW (provide account name below)	
GROWER INFORMATION (please print) LAST NAME _____ FIRST NAME _____ ADDRESS _____ CITY _____ STATE _____ PHONE (____) ____-____ E-MAIL ADDRESS _____ <input type="checkbox"/> Do Not notify me when report is available.		CONSULTANT/OTHER RECIPIENT LAST NAME _____ FIRST NAME _____ ADDRESS _____ CITY _____ STATE _____ PHONE (____) ____-____ E-MAIL ADDRESS _____ <input type="checkbox"/> Do Not notify me when report is available.	

Note the date in the upper left corner. If the form is several years old, don't use it. Go online and get a current form.

"Predictive" if fine tuning fertilizer program or looking for hidden deficiency;
 "Diagnostic" if problem samples with "good" and "bad" examples

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SAMPLE TYPE <i>(circle designation(s) / instructions on back)</i> Predictive Diagnostic Research Out of State		FOR OFFICE USE ONLY REPORT # _____ DATE REC'D _____ INITIAL _____	
SAMPLE INFORMATION FARM ID A-1 SAMPLER BY Joe <input checked="" type="checkbox"/> Grower <input type="checkbox"/> NCDA&CS Agronomist <input type="checkbox"/> Advisor <input type="checkbox"/> Coop. Ext. Agent SAMPLE DATE July 25 COUNTY (where collected) Wake NUMBER OF SAMPLES 3		PAYMENT FEE TOTAL \$17 AMT PAID _____ METHOD OF PAYMENT <input type="checkbox"/> CASH <input type="checkbox"/> CHECK (payable to NCDA&CS) <input checked="" type="checkbox"/> MONEY ORDER <input checked="" type="checkbox"/> ESCROW (provide account name below) Farmer's Produce	
GROWER INFORMATION (please print) LAST NAME Farmer FIRST NAME Joe ADDRESS 4 Backwoods Rd. CITY Rolesville STATE NC ZIP 27571 PHONE (919) 834-0000 E-MAIL ADDRESS <input checked="" type="checkbox"/> Do Not notify me when report is available. joe@ruralNC.net		CONSULTANT/OTHER RECIPIENT LAST NAME Stevens FIRST NAME Martin ADDRESS 233 Essex Lane CITY Rocky Mount STATE NC ZIP 27571 PHONE (252) 972-0000 E-MAIL ADDRESS <input type="checkbox"/> Do Not notify me when report is available. mstevens@RAGroup.com	

All three boxes need to be filled out. Farm ID can be left blank. If your e-mail address is already registered with NCDA&CS, then you don't have to fill it out again.

This box may be left blank, unless you want a crop consultant, extension agent or Regional Agronomist to have a copy as well.

Growth Stages = "S" seedling, "E" early, "B" bloom, "F" fruiting, "M" mature; Week = of "B" or "F" to better determine sufficiency ranges; Plant Part = "M" most recently matured leaf, "T" top of plant, "W" whole plant, "E" ear leaf, "H" harvest leaf, "P" petiole; Plant Position = "U" upper – most crops, "M" middle, "L" lower

only with diagnostic will description be necessary

six character name that means something to grower

SAMPLE ID	CROP NAME	GROWTH STAGE	WEEK	PLANT PART	PLANT POSITION	CORRESPONDING SAMPLE ID SOIL	SOLUTION	WASTE	PLANT APPEARANCE
BAD	Trellis Tomato	B		M	U	BADT			yellow/stunted
GOOD	Trellis Tomato	B		M	U	GOODT			healthy
FIELD2	Cotton	E	3	M	U				

common name sufficient, variety helpful, but not needed

most likely used with problem samples, keeps information together at lab

detailed information about when crop planted and conditions since crop has been in the ground, i.e., diseases, insects, irrigation, pesticides applied etc...

information about fertilizer applied or being applied, plus other products applied, i.e., lime, waste, wood ash, cotton trash, etc...

GROWING CONDITIONS		PROBLEM SAMPLE COMMENTS	FERTILIZER HISTORY				
Date	Material		Date	Material	Rate	Comments	
Planting date: <u>May 15</u>		<u>BAD: The yellowing is marginal with some scorching --- tends to be on the older leaves; good fruit load; have harvested one time</u>	Preplant:	<u>5/15</u>	<u>10-10-10</u>	<u>300 lb/A</u>	<u>broadcast</u>
How long have symptoms been present? <u>5 days</u>	Are plants infected with disease? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Postplant:	<u>weekly</u>	<u>13-0-44</u>	<u>50 lb/A</u>	<u>3 weeks thru drip</u>
Are plants infested with insects? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Environmental conditions in last three weeks: Rainfall: Below normal <input type="checkbox"/> Normal <input checked="" type="checkbox"/> Above normal <input type="checkbox"/> Temperature: Below normal <input type="checkbox"/> Normal <input checked="" type="checkbox"/> Above normal <input type="checkbox"/>		Micronutrient:	<u>6/15</u>	<u>Solubor</u>	<u>1.25 lb/A</u>	<u>foliar</u>
IRRIGATION (AMOUNT): <u>0.5"/day</u> TYPE: <u>drip</u>	FUNGICIDES USED: _____ DATE: _____		Other:	_____	_____	_____	_____

space for additional information about the crop, growing conditions, tillage, growth stage etc...

Standard Plant Analysis Report

NCDA&CS Agronomic Division Phone: (919)733-2655 Web site: www.ncagr.gov/agronomi/		Report: P00062															
 <h3 style="margin: 0;">Plant Analysis Report</h3>		Grower: Farmer, Joe c/o Nash Farms 8046 Red Hills Rd Rocky Mount, NC 27807	Copies to:														
Received: 07/08/2008 Completed: 07/11/2008 Links to Helpful Information		Farm: Nash County															
Sample Information	Laboratory Results																
Sample ID: 01	N%	P%	K%	Ca%	Mg%	Zn%	Fe ppm	Mn ppm	Zn ppm	Cu ppm	B ppm	Mu ppm	Cl%	Ni%	Ni ppm	Cd ppm	Pb ppm
	5.63	0.46	2.41	1.16	0.39	0.32	141	10.1	40.8	15.4	43.7			0.01			
Crop: Soybeans	Interpretation Indexes																
Plant Appearance: Chlorotic	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	N/S	N/K	Fe/Mn	Nitrate N	
	77	67	65	66	58	57	59	16-D	63	60	63			17.0	3.34	14.0	
	DRIS Interpretation: Most limiting Least limiting																
Recommendations: Manganese (Mn) concentration is deficient in your soybean sample. Deficient Mn causes interveinal yellowing in the young leaves. Poor Mn status could be due to low soil Mn index or high soil pH (manganese availability limited). A foliar application of 0.5 lb Mn/acre applied according to label directions will provide a quick temporary response. You will receive additional information upon which to base long term corrective action upon completion of the corresponding soil test report. Michelle Meeks, Agronomist Completed: 7/10/2008																	

Standard Plant Analysis Report

Division phone #
& Web address

Grower (client) Name
& Address

Report #

NCDA&CS Agronomic Division Phone: (919)733-2655 Web site: www.ncagr.gov/agronomi/		Report: P00062	
 <h3 style="margin: 0;">Plant Analysis Report</h3>		Grower: Farmer, Joe c/o Nash Farms 8046 Red Hills Rd Rocky Mount, NC 27807	Copies to:
Received: 07/08/2008 Completed: 07/11/2008 Links to Helpful Information		Farm: Nash County	

Date sample
was received

Very useful!

County where sample
was collected

Standard Plant Analysis Report

Sample Information
<i>Sample ID:</i> 01
<i>Crop:</i> Soybeans
<i>Plant Appearance:</i> Chlorotic

good detail

This section contains identifying information provided by the client.

Standard Plant Analysis Report

Actual nutrient concentrations in percentage of dry matter (N, P, K, Ca, Mg & S) and part per million – ppm (Fe, Mn, Zn, Cu & B)

Laboratory Results														Ratios		Petiole (ppm)	
N%	P%	K%	Ca%	Mg%	S%	Fe ppm	Mn ppm	Zn ppm	Cu ppm	B ppm	Mo ppm	Cl%	Na%	Ni ppm	Cd ppm	Pb ppm	
5.63	0.46	2.41	1.16	0.39	0.32	141	10.1	40.8	15.4	11.7			0.01				
N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	N:S		N:K	Fe:Mn	Nitrate N	
27	67	65	66	58	57	59	16-D	62	60	63		17.6	2.34	14.0			

Interpretation Indexes:

- 50 to 74 = nutrient level is sufficient
- < 50 = low nutrients may reduce yield
- > 74 = excess nutrients may be toxic