1999 NUTRIENT SURVEY OF WHEAT

Lloyd Murdock and Dottie Call
Department of Agronomy

This study was initiated to see if there is any particular nutrient that is deficient in wheat in Kentucky.

Since soil tests are not highly reliable for secondary and micro nutrients, plant concentration of these nutrients in the plant are a more reliable indicator of any of these nutrient problems. Sampling as late as possible (just prior to flowering) improves the chances of a better test.

Areas in each field approximately 150 ft by 450 ft were chosen for intensive soil and plant sampling. Soil samples were taken from the areas at least 60 days after fertilization. Sampling depth was 0 to 6 inches for fields that had been tilled and 0 to 4 inches for fields that were no-till planted to wheat. Samples were also taken at the 12 to 18 inch depth on half of fields to look at nutrient concentrations in the lower part of the soil profile.

The plants were sampled at initial heading just prior to flowering. The flag leaf was taken on 100 to 150 plants in the sample area. The leaves were dried and ground soon after collection.

RESULTS AND DISCUSSION:

The plant nutrient concentrations are found in Table 2 and the soil test results are in Table 3.

Below is the sufficiency range for the plant nutrient concentration for wheat flag leaf at
head emergence.

TABLE 1. GENERAL TOTAL NUTRIENT SUFFICIENCY RANGES FOR SELECTED CROPS IN THE SOUTH AT OR NEAR REPRODUCTIVE GROWTH (TAKEN FROM NUMEROUS PUBLISHED SOURCES).

Nutrient	N	P	K	S	Ca	Mg	Fe	Mn	Zn	Cu	B
Concentration	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm

Wheat (flag leaf)	3.0	0.25	1.5	0.20	0.30	0.16	25	20	16	6	6
	to	to	to	to	to	to	to	to	to	to	to
	4.5	0.5	3.0	0.5	1.0	1.0	300	475	70	25	20

This is the sufficiency range which means there is absolutely no problem with the amount of nutrients in the plant. One can be a little below these concentrations and not have a problem.

There is a critical range at which one might become concerned that the nutrient might actually be reducing yields.

The concentrations in Table 2 show absolutely no problem on any field for N, P, K, Ca, S, Fe, Mn. All of the samples are in or very near to the sufficiency range. Sulfur, which is sometimes suspected of being deficient by some agronomists, is very high. This indicates that all these fields have a good supply of sulfur. Although a sulfur soil test is not a very reliable test, when more than 20 lb/ac of S is in the soil it is considered sufficient. All of the fields had more than this in the surface soil sample.

The remaining nutrients are Zn, Cu and B.

Only one sample had less than 16 ppm of Zn (Mashburn in Caldwell Co.). The 12 ppm is not critically low but indicates that it is on the low side but is probably not reducing yields. The soil test results from this site show a high pH and a very high P content. Both of these will reduce Zn availability. The Zn soil test on this site was high and should be sufficient to supply adequate Zn to small grains and corn (which is the most sensitive crop).

About half of the sites had a Cu content below the 6 ppm. However, none were in the critically low 3 ppm so these probably do not present a problem on these soil types.

Boron (B) is the most interesting nutrient studied. Only 2 sites were above 6.0 ppm. According to Dr. Jim Woodruff of U.S. Borax, the critical concentration is probably below 3 ppm. There are some sites in this range. Even though there are some sites in this range, Dr. Woodruff points out that it is very difficult to get a response to wheat from boron and very few yield increases have been reported. It is difficult to get a yield response from B applied to the soil. Some states recommend 0.25

lb/a of B at about heading and it can be applied with a fungicide. If this is done it should be applied as test strip because response is not assured.

Future Directions

We will probably continue the nutrient survey one more year in some other counties to see if the 2000 results support the 1999 results. We may do some B trials if the farmers would like to cooperate on the project.

TABLE 2. 1999 NUTRIENT SURVEY OF WHEAT.

	Plant Nutrient Concentration										
County	N	P	K	Ca	Mg	S	B	Cu	Fe	Mn	Zn
	----------%----------						----------ppm----------				
Caldwell County											
Cotton	4.2	0.30	1.8	0.65	0.16	0.44	3.2	5.1	93	128	19
Mashburn	3.6	0.40	1.5	0.6	0.21	0.34	3.7	6.2	69	56	12
Calloway County											
Kelly	3.7	0.33	1.4	0.53	0.20	0.33	3.2	4.5	94	65	16
Furches	3.7	0.39	1.5	0.64	0.14	0.37	3.0	3.8	85	74	17
Fulton County											
Burnette (Casey)	4.6	0.41	1.6	0.85	0.25	0.44	2.8	5.9	104	44	21
Burnette (Jersey)	5.1	0.34	1.5	0.71	0.31	0.56	3.5	7.3	95	120	22
Hancock County											
Boswell	4.1	0.38	1.7	0.62	0.21	0.46	3.9	7.5	101	129	22
Myer	4.2	0.37	1.6	0.50	0.17	0.44	3.0	6.4	82	59	20

Hardin County	3.5	0.30	1.7	0.66	0.16	0.40	3.0	4.3	90	111	17
Rogers	3.6	0.39	1.7	0.43	0.12	0.29	2.3	6.3	92	67	19
Wooden											
Simpson County	3.3	0.37	1.5	0.69	0.21	0.36	6.6	6.2	74	105	26
Carter	4.2	0.40	1.5	0.71	0.20	0.43	7.6	5.1	87	124	23
Snyder											

TABLE 3. 1999 NUTRIENT SURVEY OF WHEAT

County	Sample depth (inches)	Extractable Soil Nutrients (lb/ac)						
		pH	P	K	Ca	Mg	S	Zn
Caldwell County	0-6	6.6	100	408	3740	209	32	1.3
	12-18	6.1	2	258	2600	332	54	0.2
Cotton	0-6	6.9	201	260	3310	151	26	4.9
Mashburn								
Calloway County	0-6	6.5	69	229	3210	129	66	0.8
Kelly	0-6	6.8	197	359	3430	126	44	2.5
	12-18	6.3	16	227	2350	74	18	0.0
Furches								
Fulton County	0-6	6.7	166	309	3530	206	52	5.0
Burnette (Casey)	0-4	6.2	95	279	3290	356	68	3.8
	12-18	4.8	36	245	1750	498	42	0.6
Burnette (Jersey)								
	0-6	7.0	99	257	3200	139	38	1.4
Hancock County	0-6	6.7	135	311	3740	203	48	2.3
	12-18	4.6	11	137	1000	103	86	0.5

Boswell								
Myer								
	0-4	7.0	100	264	2840	188	26	2.3
	12-18	6.3	3	178	2450	84	46	0.2
Hardin County								
	0-6	6.9	148	357	3530	187	24	1.5
Rogers								
Wooden	0-6	6.5	124	286	1570	133	28	12.0
Simpson County	0-6	5.7	184	369	1720	150	30	8.5
	12-18	5.5	6	247	2070	191	40	0.0
Carter								
Synder								