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SUFFICIENT SOIL AND TISSUE NUTRIENT LEVELS FOR SOYBEANS

Producers use soil testing to inform them of how much of the 16 essential nutrients are in their soils. Most soil test results provide information about the amount of the major [Phosphorus (P) and Potassium (K)] and secondary [Sulfur (S), Calcium (Ca), and Magnesium (Mg)] macronutrients that a soil sample contains, but likely do not provide information about the amount of micronutrients in the sample unless the submitting producer requests that and pays an additional testing fee.

Knowing just how much of a particular nutrient is in the soil is of value, but knowing the amount of each nutrient in the soil or tissue in relation to its sufficiency for optimum soybean yield is the most valuable information.

If nutrient deficiency symptoms appear in growing soybean plants, tissue testing is a verified way of determining the level of a particular nutrient in the plant in order to discern if in fact a particular nutrient is deficient in the plant exhibiting symptoms. This will allow the affected producer to take remedial measures either in the present crop or plan for remedial measures that will prevent recurrence of a deficiency in subsequent crops.

The information in the below table is a compilation of soil and tissue sufficiency levels of each nutrient that are deemed necessary to produce a soybean crop. These data are gleaned from myriad sources which each have some if not all of the information shown in the table. Thus, the table values may not exactly match those in specific sources, but rather are a reasonable "putting together" of information from those myriad sources.

As stated above, having a soil sample tested for some micronutrient levels may be more expensive than the standard soil test offered by most labs. This additional cost will vary among labs, and should be determined from each lab's website before submitting samples for more than their standard analysis. Remember that soil pH level is critical for the availability of several micronutrients. A graph (Fig. 1) depicting the relative availability of micronutrients by soil pH can be found here.

For a complete treatment of soil sampling for nutrient analysis, click here. A link to the MSU Soil Testing Lab is included. For a complete treatment of soybean tissue sampling and analyses for determining nutrient deficiencies, click here.

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Soil and tissue sufficiency levels for soybean essential nutrients (soil levels in lb/acre are approximate amounts in top 6 in. of soil). Tests for soil micronutrients are not as precise as those for soil pH, P, and K.

		Tissue levels	
Nutrient/Element	**Soil level[a]**	**Critical level**	**Sufficiency range**
Phosphorus (P)	40-60 ppm; 80-120 lb/acre	0.25%	0.26-0.60%
Potassium (K)	130-175 ppm; 260-350 lb/acre	1.70%	1.71-2.50%
Sulfur (S)	>10 ppm; >20 lb/acre	0.20%	0.21-0.60%
Calcium (Ca)	>400 ppm; >800 lb/acre	0.79%	0.80-1.40%
Magnesium (Mg)	>30 ppm; >60 lb/acre	0.25%	0.26-0.70%
Manganese (Mn)	>40 ppm; >80 lb/acre	20 ppm	21-100 ppm
Boron (B)	NA	20 ppm	21-60 ppm
Copper (Cu)	>1 ppm; >2 lb/acre	9 ppm	10-30 ppm
Molybdenum (Mo)[b]	---	0.9 ppm	1.0-5.0 ppm
Zinc (Zn)	4-8 ppm; 8-16 lb/acre	20 ppm	21-60 ppm
Iron (Fe)[b]	---	50 ppm	51-300 ppm
Chlorine	Not established		

[a]1 ppm = ~2 lb/acre in top 6 in. of soil.

[b]Soil tests for iron and molybdenum are considered to be of little value in predicting supply of these nutrients in soil.

NA = data not available.