

## Nutrient Management Practices for Hop

Good fertility begins by taking a soil sample and getting it tested.

### How to take a soil sample.

Collect 10 to 20 soil cores to a depth of six inches and composite to make one soil sample. The soil cores should be collected from an area no bigger than five acres. Growers may find it useful to collect one sample per acre to gain a better understanding of the variability in nutrient availability. Samples should be collected at least once every four years and may be sampled every other year. It is best to collect samples at the same time of the year to evaluate changes in nutrient status over time.

### Get the soil sample tested.

Send the soil sample to a Wisconsin Department of Ag, Trade, & Consumer Protection certified soil testing lab. The UW Soil & Forage analysis lab in Marshfield is certified. Contact them at 715-387-2523 or <http://uwlab.soils.wisc.edu>

### Determining nutrient need.

Soil test results will tell you the availability of phosphorus (P) and potassium (K) as well as soil pH and organic matter content.

The minimum soil pH for hop is 6.0. If lime is required, it is best to apply it before hop is planted and incorporate it into the soil. Pelletized lime is convenient to apply. However, UW research has shown that pelletized lime must be applied at the same rates as traditional aglime to have the same efficacy.

### Phosphorus and Potassium

The soil test P and K interpretation categories and recommended rates of phosphate and potash to apply are provided in Tables 1 and 2.

Table 1. Soil test P interpretation and recommendation for P<sub>2</sub>O<sub>5</sub>. Assumes bines and leaves are not returned to the hop yard.

Soil Group	Soil Test Category				
	Very Low	Low	Optimum	High	Excessively High
----- Soil test P ppm -----					
Loamy	<10	10-15	16-20	21-30	>30
Sandy, Organic	<12	12-22	23-32	33-42	>42
----- lb P <sub>2</sub> O <sub>5</sub> /a to apply -----					
	70	60	30	15	0

Table 2. Soil test K interpretation and recommendation for K<sub>2</sub>O. Assumes bines and leaves are not returned to the hop yard.

Soil Group	Soil Test Category					
	Very Low	Low	Optimum	High	Very High	Excessively High
----- Soil test K ppm -----						
Loamy	<70	70-100	101-130	131-160	161-190	>190
Sandy, Organic	<45	45-65	66-90	91-130	--	>130
----- lb K <sub>2</sub> O/a to apply -----						
	145	130	100	50	25	0

## Nitrogen

Nitrogen (N) recommendations are based on soil organic matter content. Apply 180 lb N/a to soils with 2.0 to 9.9% organic matter and 200 lb N/a to soils with less than 2.0% organic matter. These guidelines assume bines and leaves are not returned to the hop yard. Reduce rates by 50 lb N/a if residues are returned.

Research at Oregon State University has demonstrated that about 10% of total N uptake occurs by early June. Nitrogen uptake increases rapidly in mid-June and total N uptake is almost complete by early July. Thus, it is important to have an adequate amount of N available prior to the period of rapid N uptake. On coarse-textured soils (sands and loamy sands), split apply N to reduce the potential for nitrate leaching. Initial N application should be made in April or May. The second application should be made about the time the vines meet the wire.

Oregon State University has developed guidelines for using a petiole nitrate test to determine if additional N is needed in June. Collect 40 petioles from recent fully developed leaves at eye level to composite into one sample. Petiole nitrate concentrations between 5,000 and 9,000 ppm are adequate. When using the petiole nitrate test, apply about 70% of the recommended N rate in April/May. If the petiole test indicates additional N is needed, apply the remainder of the recommended rate in June just prior to increased demand by the crop.

## **Plant tissue testing.**

Plant tissue testing can be used to help diagnose nutrient deficiencies. It is best used when comparing good and poor bines and also when coupled with soil tests from the good and poor areas. Interpretation of plant analysis should be used with caution. For most crops, nutrient concentration will vary between varieties within a field; for the same variety grown in different fields; and by maturity of the crop and/or plant part sampled (newly matured vs old leaf or leaf vs leaf plus petiole). Nutrient sufficiency ranges for interpretation of plant analysis often vary with growing regions.

In midseason, collect 30 or more newest mature leaves to make one sample and place in a paper bag. Most soil testing labs analyze plant tissue. However, it is best to contact the lab in advance to learn if they have special sample handling instructions. Table 3 provides sufficiency range interpretations for hop leaves sampled midseason.

Table 3. Sufficiency ranges for newest mature hop leaves collected midseason.

Nutrient	Sufficiency Range (%)	Nutrient	Sufficiency Range (ppm)
N	2.5 - 3.5	Zn	35 - 80
P	0.35 - 0.60	B	25 - 70
K	2.8 - 3.5	Mn	30 - 100
Ca	1.0 - 2.5	Fe	35.4 - 151
Mg	0.30 - 0.60	Cu	6 - 12
S	0.18 - 0.30		

## **Nutrient crediting.**

If organic sources of nutrients are applied such as manure, compost, or if the bines/leaves are returned to the hop yard, the amount of commercial fertilizer should be reduced to account for the nutrients applied in these other sources. Failure to properly credit organic nutrient sources could result in excess applications of N and P which in turn may have negative impacts on surface and groundwater quality.

## **Note.**

Wisconsin hop fertility recommendations have been developed using data collected by researchers at Oregon State University. Recommendations may change in the future if/when data collected in Wisconsin is available.