

## Fertilizer Guidelines for Alfalfa

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### Alfalfa Phosphorus Guidelines

The Olsen test for soil P. We use and recommend the Olsen test, a bicarbonate extraction.

- The threshold we use is 18 ppm, which converts to about 40 lbs/acre in the 0-6" depth
- If the soil test is 8 ppm or less, apply 6-10 pounds of phosphorus (P<sub>2</sub>O<sub>5</sub>) per acre for each ton of alfalfa hay
- If the soil test is > 8 and < 18 ppm, apply 4-8 pounds of phosphorus (P<sub>2</sub>O<sub>5</sub>) per acre for each ton of alfalfa
- If the soil test is > 18 ppm, apply 2-4 pounds of phosphorus (P<sub>2</sub>O<sub>5</sub>) per acre for each ton of alfalfa - especially if the soil test pH is > 8.2, the calcium level is > 400 ppm, and the soil texture is silt loam or silty clay loam
- If the soil test is > 24 ppm, apply 1-2 pounds of phosphorus (P<sub>2</sub>O<sub>5</sub>) per acre for each ton of alfalfa if the soil test pH is > 8.2, the calcium level is > 400 ppm, and the soil texture is silt loam or silty clay loam

### Estimating alfalfa yield

0.20 to 0.25 tons of alfalfa production for each inch of water use. Estimate the water use based on location, experience, and weather. Assume approximately 1/4" of water use per day under hot/dry conditions. This means 3.5-4.0 inches every two weeks in mid summer. This means that the crop is producing 0.8 to 1.0 tons of dry matter every two weeks in mid-summer.

### Applying Nitrogen to Alfalfa

1. If stand is more than 50% grass
2. If roots do not have nodules - take a look
3. If small test plot shows a positive response to N, apply 10-15 pounds of Nitrogen per acre for each ton of alfalfa

Apply 20-25 pounds of Nitrogen per acre for each ton of grass

If the pasture is at least 50% alfalfa, do not apply nitrogen; if the pasture is more than 50% grass, apply nitrogen. The total nitrogen application can be split into 3 applications, starting in early spring (or late winter) and completed not later than June 20th. To determine the actual amount of "material" needed, divide the nutrient requirement by the % nutrient in the fertilizer and multiply by 100. For instance, if the % N is 40% and you want to apply 100 lbs of N/acre, you need to apply (100 lbs/acre divided by 40) x 100% = 250 lbs of "material".

**Potassium/Potash for Alfalfa:**

Soil test K	Apply K <sub>2</sub> O pounds/acre
< 100 ppm	80-100 pounds
100-150 ppm	50-80 pounds
150-200 ppm	20-50 pounds
200-250 ppm	10-20 pounds
> 250 ppm	not necessary

**Threshold rates for micronutrients -Recommended Rates for Correcting Micronutrient Deficiencies**

Boron	1.0 ppm	If < 1.0 ppm, apply 1-2 lbs/acre
Copper	0.2 ppm	If < 0.2 ppm, apply 2 lbs/acre
Iron	5.0 ppm	If < 5.0 ppm, apply 0.25-0.5 lbs/acre
Manganese	1.0 ppm	If < 1.0 ppm, apply 10-20 lbs/acre
Zinc	0.5 ppm	If < 0.5 ppm, apply 5-10 lbs/acre

**Recommended Rates for Correcting Micronutrient Deficiencies**

Nutrient	Materials	Foliar Spray	Soil Applications
Zinc	Zinc Sulfate (ZnSO <sub>4</sub> )	1/4 to 1/2% solutions or 1 to 2 lbs. of zinc sulfate in 50 gallons water, plus 1 cup household detergent.	<ul style="list-style-type: none"> <li>• Non-Sandy Soils</li> <li>• 10 lbs. zinc per acre.</li> <li>• Plow down or band</li> <li>• Sandy Soils</li> <li>• 3 to 5 lbs. zinc per acre. Apply as above.</li> </ul>
Iron	Iron Sulfate	10 lbs. in 50 gallons at 15-30 gallons per acre (2-1/2%) (use 1/2% if hand sprayed)	
	Iron Chelate	4 lbs. in 50 gallons at 15-30 gallons per acre (use 1/4% if hand sprayed)	Not recommended
Manganese	Manganese Sulfate (MnSO <sub>4</sub> - H <sub>2</sub> O)	0.2% solution of manganese sulfate	4.5 to 6.5 lbs. manganese sulfate per acre
Copper	Copper Sulfate (CuSO <sub>4</sub> ~5H <sub>2</sub> O)	0.1% solution of copper sulfate	4 to 6 lbs. copper sulfate per acre

Boron	Borax	2 oz. Borax in 50 gallons of water to make 1/4% solution. Add 1 cup household detergent per 50 gallons.	20 to 25 lbs. of Borax per acre or 2.5 to 3 lbs. of Boron per acre; reduce rate by 2 for sandy soils. <b>Critical Test Levels Table</b>
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If you elect to apply micronutrients, the most efficient source is a chelating agent, EDTA, which is 7-13% copper, 5-14% iron, 5-12% manganese, and 6-14% zinc. HEEDTA is the next best source.

Element or Soil Characteristic	Normal Soil Test Range	Critical Soil Test Level*
Nitrate-N	0 - 30 lbs/a	
Phosphorus (Olsen)	0 - 40 ppm	18.0 ppm
Potassium	0 - 500 ppm	250.0 ppm
Calcium	0 - 1000 ppm	400.0 ppm
Magnesium	0 - 100 ppm	40.0 ppm
Sulfate-S	0 - 50 ppm	10 .0 ppm
Zinc	0 - 15 ppm	0.5 ppm
Manganese	0 - 10 ppm	1.0 ppm
Copper	0 - 1 ppm	0.2 ppm
Iron	0 - 10 ppm	2.5 ppm
Boron	0 - 10 ppm	1.0 ppm
Molybdenum	0 - 2 ppm	0.1 ppm
Chloride	0 - 50 ppm	
pH	0 - 9	
Organic matter	0 - 4%	
Electrical conductivity	0 - 4 mmhos/cm	
Cation exchange capacity	0 - 20 meq/100 g	
Sodium	0 - 10	

\*The level of a nutrient below which crop yield, quality or performance is unsatisfactory.

**Normal Concentrations of Essential Elements in Forage plants and Visual Deficiency Symptoms** (source: UNOCAL Solution Sheet, vol. 2(12), 1986)

Element	Concentration in Dry Tissue	Deficiency Symptoms
Nitrogen	2.5-6.0%	Older leaves yellow-green, reduced shoot growth

Potassium	1.0-4.0%	Interveinal yellowing, especially on older leaves, leaf tips and margins scorched
Phosphorus	0.2-0.6%	Older leaves dark green first, then appear purple or reddish
Calcium	0.2-1.0%	Deficiency rare, new leaves reddish-brown and stunted
Magnesium	0.2-0.5%	Interveinal chlorosis, striped appearance, cherry red margins
Sulfur	0.2-0.6%	Yellowing of older leaves
Iron	50-500 ppm	Interveinal yellowing of new leaves
Manganese	Very small amounts	Rare, similar to iron deficiency
Copper	Very small amounts	Never a problem
Zinc	Very small amounts	Rare, growth stunted, thin and shriveled leaves, appears desiccated
Boron	Very small amounts	Rare, chlorotic, stunted growth
Molybdenum	Very small amounts	Rare, older leaves, pale green
Chlorine	Very small amounts	Never a problem