Southern Idaho Fertilizer Guide

Irrigated Alfalfa

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inoculation at planting, diseases, insects, water deficits, nutrient deficiencies or toxicities, or other soil physical or chemical conditions that reduce the effectiveness of the Rhizobium inoculant. Poor inoculation results from not using inoculant, using inoculant that has lost its viability (expired shelf life), or using Rhizobium inoculant strains that are not effective. Poor inoculation, nodulation, or Rhyzobial effectiveness is indicated when alfalfa protein is low (less than 18%) when cut at the early bloom stage. Healthy Rhizobium nodules should be pink when cut open if they are effectively fixing atmospheric N.

If nodulation or Rhyzobial effectiveness is limited by pests, water deficits, or soil conditions such as salinity, sodicity, nutrient deficiencies, or soil compaction, then attempts should be made to correct the problem through appropriate management practices. For more information on proper inoculation of alfalfa, refer to CIS 838

Alfalfa is sometimes used to scavenge nutrients from soils receiving excessive animal manure or other biological waste applications. An alfalfa crop yielding 6 tons per acre can remove up to 360 lb of N per acre. However, excessive nitrogen uptake can increase the forage nitrate toxicity hazard for dairy and beef cattle. In addition, animal manure applications can promote grass and weed growth, which in turn can also increase the potential for nitrate toxicity if the population of the noxious weed Kochia increases.

Producers sometimes plant a companion crop when establishing alfalfa in order to increase the productivity of the first cutting. However, this practice is not recommended because the alfalfa stand typically is reduced by competition from the companion crop. If growers plant alfalfa with a companion crop, both crops compete for the available N. Under these conditions, N rates of 30 to 40 lb per acre are suggested if available soil N does not exceed 60 to 80 lb per acre.

Phosphorus

Adequate P availability is important for maintaining plant health, winterhardiness, and optimum root, stem, and leaf growth. Since phosphorus is relatively immobile in soil, P fertilizer should be incorporated into the soil prior to planting to raise soil P concentrations to optimum levels for early plant growth. The phosphorus recommendations presented in Table 1 are based on the soil test P concentration and free lime content in the top foot of soil, and the yield potential. Significant amounts of free lime in the soil will make less phosphorus available to plants as it precipitates soil solution P.

Table 1. Recommended P fertilization rates for irrigated alfalfa based on soil test P and free lime content.

Soil test P[1]	Free Lime Content (%)			
(0 to 12 inch)	0	4	8	12
ppm P	----------P_2O_5 (lb/acre)----------			
0	300	340	380	420
3	250	290	330	370
6	200	240	280	320
9	150	190	230	270
12	100	140	180	220
15	50	90	130	170
18	0	40	80	120
21	0	0	30	70

[1]$NaHCO_3$ extraction

NOTE: Add 10 lb P_2O_5 per acre for each 1 ton per acre increase in yield goal above 6 tons per acre.

As the stand ages and plant density decreases, the ability of the alfalfa root system to take up P diminishes due to decreased soil P concentrations and root activity. Under these conditions, smaller P rates applied more frequently may increase P uptake efficiency.

Effective sources of P for alfalfa include fthrough-0.0i 303 P

Potassium

Alfalfa has a high K requirement. A crop of 8 tons per acre will remove about 480 lb of K_2O per acre. Most Idaho soils and surface irrigation waters are naturally high in K. However, K deficiencies can develop in intensively cropped fields, particularly those fields cropped to alfalfa for many years. Sandy soils are generally more prone to developing K deficiencies than silt loam or clay soils and therefore have a higher probability of responding to K fertilization.

Potassium movement in soils is limited, although it is more mobile than P. Like phosphorus, potassium fertilizer recommendations are based on calibrated relationships between soil test concentrations in the top foot of soil and yield response (Table 2). Soil test K should generally be in the range of 160 to 200 ppm for optimum alfalfa yield. Potassium fertilizer should also be incorporated during seedbed preparation prior to establishment, or broadcast in the fall or early spring on established stands. Potassium chloride (0-

effective. Commonly used forms of B include boric acid, Borax, and sodium borate.

Zinc, Mn, and Fe deficiencies can be corrected by applying 5 to 10 lb per acre of the required nutrient using Zn, Mn, or Fe sulfates or other soluble forms. Molybdenum availability is generally adequate in the alkaline soils that are prevalent in the irrigated areas of southern Idaho.

Table 3. Adequate soil test micronutrient concentrations for alfalfa.

Nutrient	Adequate concentration (ppm)[1]
Boron	> 0.5
Zinc	> 1.0
Manganese	> 1.0
Iron	> 5.0

[1]DTPA extractable zinc, manganese, and iron

Table 4. Sufficiency ranges for alfalfa stem tissue sampled at early bloom.

Nutrient	Sufficiency range
	------%------
Nitrogen	3.00-5.00
Phosphorus	0.25-0.75
Potassium	2.50-4.00
Calcium	0.50-3.00
Magnesium	0.30-1.00
Sulfur	0.25-0.50
	----ppm---
Boron	30-80
Zinc	20-70
Manganese	30-100
Iron	30-150
Copper	5-25
Molybdenum	1-5

Tissue Testing

Plant tissue testing provides an effective means of evaluating the nutrient status of an established alfalfa stand. Samples should be collected from about 20 to 30 plants at early bloom in representative areas of the field that are free from water stress or obvious pest problems. The top six inches of the stem should be sampled and sent immediately to a soil testing lab for analysis. Sufficiency ranges for the various nutrients are presented in Table 4. Nutrient concentrations below these ranges indicate a need for supplemental fertilization.

When nutrient deficiencies are identified during the growing season, the deficiencies can often be corrected by injecting water-soluble fertilizers through the sprinkler system. Liquid forms of N, P, K, S, and micronutrients are commonly available in Idaho and should be selected on the basis of cost relative to dry fertilizers and ease of application. If alfalfa is furrow irrigated, foliar sprays can be used to correct micronutrient deficiencies but avoid foliar applications of N, P, K, and S at high rates that can cause foliar burning.

For Further Reading

You may order this and other publications about fertilizers and crops in southern Idaho from the University of Idaho Cooperative Extension offices in your county or Ag Publications, P.O. Box 442240, University of Idaho, Moscow, ID 83844-2240, phone (208) 885-7982, fax (208) 885-7982, email *agpub@uidaho.edu*, or *http://info.ag.uidaho.edu* on the internet.

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