

Fertilizer Guide

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APPLES

Observations of annual growth, size and color of leaves and fruit are helpful in determining fertilizer needs. In addition, leaf analysis indicates which elements are present in adequate, deficient, or excessive amounts. Soil analysis is useful in predicting the need for lime applications.

Suspect a nutrient deficiency if the cause of poor tree performance is not primarily due to: lack of pruning, poor pollination, disease, winter injury, deep cultivation, insects, physical injury, limited moisture, rodents, poor weather, and/or poor soil drainage.

Nitrogen (N)

Apply N according to terminal growth. Young trees should grow 18-30 inches annually. One and two-year-old trees can be injured if N is applied in a band around the tree. These rates are based on 108-218 trees/A.

Tree Age	Apply N (lb/tree)
1	None to 1/8
2	1/4
3-5	1/4-1/3
6-7	1/3-1/2

The overall vigor of the tree is the best indication of nitrogen status. N concentration should be interpreted with an assessment of tree vigor. Above-normal N and high vigor indicate over fertilization of N. Below-normal N and low vigor indicate a need for additional nitrogen. Above-normal N and low vigor suggests another growth limiting factor. Below-normal N and high vigor can occur on trees with little or no crop.

Leaf Analysis Guide - N Application based on % Leaf N in August*

Golden Delicious	Nonspur Delicious, others	Newtown	
1.6	1.6	1.5	(deficiency)
1.6-1.8	1.6-2.0	1.5-2.3	(below normal)
1.8-2.0	2.0-2.3	2.3-2.6	(normal)
2.0	2.3	2.6	(above normal)

*Mature trees - in sod

Excess N produces poor quality, bitter pit, green goldens and other yellows, and late-coloring nonspur reds. Apply little or no nitrogen to orchards where trees are crowding and pruning to restrict tree size is required.

Apply N in a 2 to 3 foot band under drip line or increase 20-30% for a broadcast application. Adjust rates according to results of application in previous years. Less N is needed in clean cultivated orchards. The amount of N required ranges from none to about 2 lb/tree assuming 108-218 trees/A.

Higher density plantings with dwarf trees require less N per tree but have similar per acre requirements.

N applications should be made after leaf fall in autumn and before petal fall in spring. Early fall application can increase danger of winter freeze damage in areas in which subzero temperatures may occur.

Phosphorus (P)

% Leaf P in August		Apply Phosphorus (P ₂ O ₅) (lb/tree)
Under 0.12	(deficiency)	10 - 15
0.12 - 0.14	(below normal)	6 - 10
Over 0.14	(normal)	0

Sulfur (S)

% Leaf S in August		Apply (S) (lb/tree)
Under 0.13	(deficiency)	1
Under 0.16	(below normal)	0.5
Over 0.16	(normal)	0

Deficiencies of P and S are seldom observed in Oregon apple orchards.

Potassium (K)

K deficiency is rare in Oregon apple orchards. Since K applications tend to reduce magnesium uptake, do not apply K unless leaf analysis indicates a deficient or borderline level of K.

Leaf Analysis Guide for K Application

% leaf K in August		Apply this amount of Potash (K ₂ O) (lb/tree)
Under 0.9	(deficiency)	10-15
0.9-1.2	(below normal)	6-10
Over 1.2	(above normal)	None

Low K levels can be caused by either excessive crop loads or water stress, and do not necessarily reflect a need to initiate K fertilization programs. Even when low levels



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are due to K deficiency, K levels in the leaves often do not increase until the year following application. A single application is usually effective for 2 or more years. Preferably drill K 6-8 inches deep in root zone, or place K in a 2" wide band for each lb. K₂O per tree applied on soil surface at drip line.

Potassium source is not critical, but chloride toxicity can occur where muriate of potash (KCl) is used and subsequent rainfall or irrigation is inadequate to leach chloride out of the surface soil.

Magnesium (Mg)

Mg deficiency symptoms appear as blotchy dead areas on older leaves in late summer and fall. Where Mg is needed, broadcast 1 T/A of dolomite. Dolomite also reduces soil acidity. Vigorous, young Newtown trees often show Mg deficiency symptoms which may disappear in later years, even without application of Mg.

Leaf Analysis Guide for Mg Application

% leaf Mg in August	
Under 0.18	deficiency
0.18-0.22	below normal
Over 0.22	normal

Lime

Liming of orchard soils is most effective where the lime is mixed into the soil to as great a depth as feasible during the preparation of the land for planting. The application of lime is not suggested if the soil pH is 5.6 or higher.

If the OSU SMP Buffer Test for Lime Reads:	Apply this Amount of Lime (T/A):
Below 5.2	4-5
5.2-5.5	3-4
5.8-6.2	2-3
Over 6.2	0

The liming rate is based on dry 100-score lime. Lime should be mixed into the soil at least several weeks before planting. A lime application is effective over several years.

Boron

Do not apply B to nonbearing trees. Reduce rates by one-half or more for young bearing trees since trees are easily injured by excessive B.

Leaf Analysis Guide for B Application

ppm B in leaves		Apply B* (lb/tree)
Under 20	deficiency	0.10-0.15
20-30	below normal	0.10
30-80	normal	0.10**
80-100	above normal	None
Over 100	excess	None

* Most commercial products are about 20% B (0.10 lb B fertilizer = 0.02 lb. actual B)

**Maintenance application every 3 years.

A spray application may give more rapid recovery than soil application. One preventive spray per year has been as effective as periodic soil applications. Spray at rate of 8 lb sodium pentaborate/A. Spray twice if deficiency has occurred; fall application (before leaves drop) plus prebloom application (3-4 days before blossoms open) or prebloom application plus first cover spray.

Zinc (Zn)

Deficiency symptoms are helpful in diagnosing the need for Zn. Shoots have a tuft or rosette of comparatively larger leaves at the tip with smaller, narrow, sometimes chlorotic leaves below. If several elements are deficient, symptoms may not be clearly recognized. If leaf Zn levels in August are below 15 ppm, a deficiency may be more likely to occur the following spring.

Dormant sprays: Apply Zn sulfate at rate of 15 lb Zn (40 lb of 36% Zn sulfate crystals or 13 gal liquid Zn sulfate)/A. The dormant application should be made as late as possible in dormant season before any visible green appears. (Caution: Be sure all crystals of Zn have dissolved before spraying.) Proprietary foliar nutrient sprays containing Zn may be used in summer. Follow recommendations on the label.

Apply after harvest when leaves are still green and active. Apply 10 lb Zn (25 lb 36% crystals or 8 gal liquid)/A. For nonbearing trees apply Zn sulfate spray, using approximately 0.5 lb Zn (1.5 lb 36% crystals or 0.5 gal liquid)/100 gal. of spray to nonbearing trees as soon as deficiency is recognized. Foliage should be thoroughly wetted. A spray of Zn chelate at 2-3 lb/100 gal 10-14 days following petal fall may be substituted for dormant Zn sulfate spray. In severe cases, a second spray may be required.

For More Information

Benson, N.R., C.G. Woodbridge, and R.D. Bartram, *Nutrient Disorders in Tree Fruits*, Pacific Northwest Extension publication PNW 121 (Pullman, Washington, 1983), 25¢.

Stevens, R.G. and R. B. Tukey (eds). *Tree Fruit Nutrition 1983 Shortcourse Proceedings*. Washington State University.

Tissue values are based on methods used in the OSU Dept. of Horticulture Plant Analysis Laboratory. Revised N recommendations are based on N tissue analysis groupings from Plant Analysis Laboratory data. Other recommendations are based on Extension experience and grower observation of fertilizer response.

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