



## Timing of Nutrients for Maximum Efficiency

# FACT SHEET

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Timing: Early Season	
Critical Elements	Key Physiological/Comments
Nitrogen (N)	<p>Early shoot and vegetative growth, overall flower bud development and vigor, "Breaking" dormancy, pre-bloom, flowering and early crop growth for perennial crops.</p> <p>For fast growing annuals, N is especially critical shortly after planting or transplanting for early growth and vigor. Early nitrogen applications aid in the absorption or utilization of secondary and micronutrients.</p>
Zinc (Zn) Manganese (Mn) Iron (Fe) Copper (Cu) Boron (B) Calcium (Ca)	<p>Calcium and the transition series metals (Zn, Mn, Fe, Cu) are most easily absorbed and translocated by young leaves of plants that have not yet developed heavy waxy cuticles on their surface.</p> <p><b>Zn</b> promotes the formation of natural growth hormones (auxins) that function in cell elongation processes, and helps to strengthen internodes and expand leaves.</p> <p><b>Mn</b> aids in chlorophyll syntheses and this is essential for production of carbohydrates (sugar).</p> <p><b>Fe</b> is also required for photosynthesis and is also used in plant respiration and improves flowering and set. Movement of Fe is inhibited by cold, wet weather.</p> <p><b>Cu</b> is critical to photosynthesis and aids in the development of pigments and the translocation of sugars in the plant.</p> <p><b>Boron</b> can aid the absorption and translocation of Ca and is required for cell division and differentiation. For shoot and root tip (meristem) growth, flower and bud formation, pollen tube growth and pollen viability, and fruit set.</p> <p><b>Ca</b> is fundamental to cell wall integrity, and structure. Thus, Ca plays a key role in crop firmness and resistance to cellular breakdown disorders.</p>

**Timing: Early-Mid Season  
4-6 Weeks Post-Bloom**

<b>Critical Elements</b>	<b>Key Physiological/Comments</b>
Potassium (K)	<p>As rapid growth commences, fruit or crop becomes a "sink" for K; increasing amounts become necessary to form carbohydrates-sugars and starches.</p> <p>K is also required for continual protein synthesis, proper maintenance of water relationships, and the production of certain organic acids that regulate the pH of the cell.</p> <p>K is a crop maturation element, tends to increase leaf and fruit size, promote root growth, favorably effect fruit color and quality (if not our to balance with Ca).</p> <p>K can lead to increase disease and insect resistance in most crops.</p>

**Timing: Early-Mid Season  
6+ Weeks Post-Bloom**

<b>Critical Elements</b>	<b>Key Physiological/Comments</b>
Calcium (Ca) Magnesium (Mg)	<p>Although Ca is not regarded as being "mobile" during applications at this time or later, its application form here to harvest is essential for quality enhancement, eg.</p> <p>Reduction in bitter pit, corkspot and alfalfa greening in apples and pears, respectively; tip burn in lettuce and other leafy vegetables, black heart in celery, increased firmness in all crops and overall "finish".</p> <p>Mg is a mobile element and is essential for chlorophyll synthesis and nitrogen metabolism, Mg also contributes to earlier growth, uniformity, sugar formation, seed development, winter hardiness and disease resistance.</p> <p>Mg also tends to decrease leaf and fruit drop and assist the maturing process.</p>

## Timing: Season-Long

### Critical Elements

### Key Physiological/Comments

Phosphorus (P)

Adequate phosphorus levels must be monitored during the entire growing season.

Phosphorus is the premier maturation element, is fundamental to energy transfer in plant cells, and basic to the formation of nucleic acids (RNA and DNA).

Phosphorus promotes root growth, flower and seed development.

Work in Idaho has shown potatoes will require 0.3 lbs/ac P to bulk an additional 700 lbs potatoes per day during the last 30 days of the growing season.