MONTY'S PLANT & SOIL PRODUCTS®

Trusted Advisors. Proven Solutions.

Micronutrient Essentials for Better Corn Yields

Micronutrients, Plant Health, and Higher ROI

Micronutrients are essential to plant growth and yield, even in small amounts. Deficiencies in elements like iron, zinc, and boron can limit performance, reduce nutrient uptake, and impact overall crop health.

Recognizing and addressing these deficiencies early is key to maximizing productivity. Monty's has solutions designed to support micronutrient availability and uptake, helping growers correct imbalances and drive stronger, more resilient crops.

Healthier crops mean higher yields!

Nitrogen

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	Micro
1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer

Nitrogen Deficiency in Corn

Nitrogen is a compound of vitamins, amino acids and energy systems within the plant, which form its proteins. Thus, N is directly responsible for increasing protein content in plants.

Lack of N and Chlorophyll means the plant will not utilize sunlight as an energy source to carry on essential functions such as nutrient uptake.

Nitrogen is necessary for chlorophyll molecules, is involved in photosynthesis.

Nitrate NO_3 is very mobile in the soil and moves with soil water to root surfaces where plants can absorb it.

Adequate N is important for water-use efficiency within a plant.

Nitrogen (N)

- Essential for plant growth
- Nitrogen is essential in photosynthesis
- Directly responsible for creating protein content
- Nitrogen increases bushels of corn per inch of available water
  - N plays a crucial role in ear and kernel development.
  - N moves to the ear from other plant tissues even prior to silking
  - Nitrogen-intense process of kernel embryo formation *(Ciampitti and Vyn, 2010)*.
  - Continued ear growth and yield accumulation from R1 to R6 is closely associated with N content in the above-ground plant tissues.
  - N uptake during the ear-fill period can minimize the remobilization of N from vegetative to reproductive tissues.
  - This means that the plant does not have to cannibalize the leaves to provide N for kernel development when it can take up N from the soil during this period.
  - This allows the plant to retain more green leaf area in late summer and early fall, which increases the duration of photosynthesis, carbohydrate production and grain yield.

Nitrogen (N)

- **NH_4^+** depress uptake of **K**, **Ca**, and **Mg**
- **NO_3^-** depress uptake of **P**, **S** and **Cl**
- **NH_4^+** lowers pH may increase **P**, **Fe** and **Mn**
- **NO_3^-** reduction in tissue requires **Mo**
- Excess **N** can be offset by **K**

Phosphorus

Role in plant development

7 **N** Nitrogen	15 **P** Phosphorus	19 **K** Potassium		Macro
12 **Mg** Magnesium	16 **S** Sulfur	20 **Ca** Calcium		Secondary
5 **B** Boron	17 **Cl** Chlorine	25 **Mn** Manganese	26 **Fe** Iron	
28 **Ni** Nickel	29 **Cu** Copper	30 **Zn** Zinc	42 **Mo** Molybdenum	Micro
1 **H** Hydrogen	6 **C** Carbon	8 **O** Oxygen		Non-Fertilizer

Phosphorus Deficiency in Corn

The highest levels of P in young plants are found in tissue at the growing point. As crops mature, most P moves into seeds, fruit, or both.

Phosphorus is noted especially for its role in capturing and converting the sun’s energy into useful plant compounds.

Research associates specific growth factors with P, stimulated root development, increased stalk and stem strength, and improved flower formation and seed production.

Under P deficiency, some crops, such as corn, tend to show abnormal discoloration.

Phosphorus promotes root development and early seedling growth.

Phosphorus (P)

- Plants absorb most of their P as their primary orthophosphate (H_2PO_4)
- Plays a role in photosynthesis, respiration, energy storage and transfer, cell division and enlargement, and several other processes in the living plant
- Improves the quality of fruit, vegetable, and grain crops
- Helps roots and seedlings develop more rapidly
- Hastens maturity

Phosphorus (P)

- **N:P** ratio **10:1** often optimum
- **Calcium** increases **Phosphorus** uptake across membranes
- **Magnesium** is activator of many **Phosphorus** enzymes
- **Aluminum** reduces available **Phosphorus**
- **Iron** accompanies **Phosphorus** uptake
- **Zinc** uptake is suppressed by **Phosphorus**

Potassium

Role in plant development

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12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
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Postassium Deficiency in Corn

Potassium enhances many enzyme actions aiding in photosynthesis and food formation. It builds cellulose and helps translocate sugars and starches. Potassium is vital to producing grains rich is starch.

Potassium is known as the “quality nutrient” because of its important effects on factors such as size, shape, color, taste, self life, fiber and other quality-related measurements.

Plants deficient in K are less resistant to drought, extreme temperatures and other stresses. Plants lacking K are also more susceptible to pests, diseases and nematode attacks.

Potassium maintains turgor and reduces water loss and wilting

In many high-yielding crops, the K content in the plant is comparable to the Nitrogen (N) content.

Potassium is absorbed by plants in the Ionic form, indicated as K

Ample K can increase root growth and improve drought tolerance

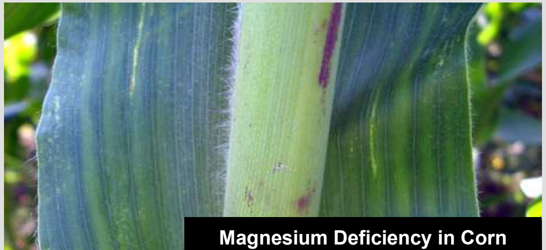
Potassium (K)

- Has a great impact on crop quality, kernel weight, kernels per ear, improved oil and protein content.
- Influences water-use efficiency and improves drought-tolerance.
- Essential for protein-synthesis.
- Is involved in the activation of more than 60 enzyme systems (which regulate the rates of major plant growth reactions).
- Helps the plant overcome the effects of diseases.

Magnesium

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	Micro
1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer



Magnesium Deficiency in Corn

Magnesium is mobile within the plant and moves easily from older to younger tissue.

When Mg deficiencies occur, the lower (older) leaves are affected first.

Magnesium acts as a Phosphorus carrier in plants, and is required for better root formation and thus for better nutrient and water efficiency in plants.

Plants require Mg to capture the sun's energy for growth and production through photosynthesis.

The most common source of Mg is dolomitic limestone, which provides both Calcium and Mg, while neutralizing soil acidity.

Magnesium (Mg)

- Involved in photosynthesis.
- Affects seed development.
- Aids in phosphate metabolism, plant respiration.
- The activation of many enzyme systems.

Sulfur

Role in plant development

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Sulfur Deficiency in Corn

Sulfur is also important in photosynthesis and for winter crop hardiness.

Sulfur aids in seed production.

Sulfur is present in several Organic compounds that give the characteristics odors to garlic, mustard and onion.

Sulfur appears in every living cell and is required for synthesis of certain amino acids(Cysteine and methionine) and proteins.

Although Sulfur isn't a constituent of chlorophyll, it's still vital in chlorophyll formation.

Leguminous plants need Sulfur for efficient Nitrogen fixation.

Sulfur (S)

- Constituents of 2 of the 21 amino acids which form proteins.
- Helps to develop enzymes and vitamins.
- Aids in seed production.
- Promotes nodulation for N fixation by legumes.
- Is present in organic compounds.
- Helps to avoid thin-stemmed and spindly plants.

Sulfur (S)

- **Sulfur** synergy with **Nitrogen**, with foliar ratio 1:15, 1:14 grasses, 1:17 legumes.
- **Sulfur** competes with **Boron**, **Moly**, **Iron.**

Calcium

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
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Calcium Deficiency in Corn

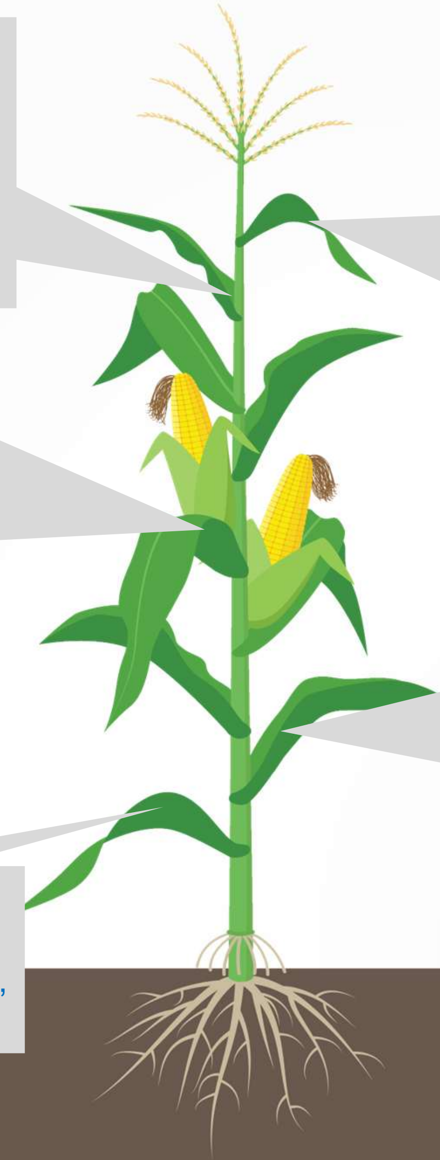
Calcium is an essential plant nutrient. It has many roles: Participates in metabolic processes of other nutrients uptake. Promotes proper plant cell elongation.

Calcium helps in protecting the plant against heat stress – and improves stomata function and participates in induction of heat shock proteins.

Calcium is an essential part of plant cell wall. It forms calcium pectate compounds which give stability to cell walls and bind cells together. Participates in enzymatic and hormonal processes.

Calcium helps in protecting the plant against diseases - numerous fungi and bacteria that secret enzymes which impair plant cell wall. Stronger Cell walls, induced by calcium, can avoid the invasion.

Calcium affects fruit quality. Calcium has a role in the regulation of the stomata, regulating transpiration.



Calcium (Ca)

- Stimulates leaf and root development
- Strengthens plant structure (cell walls)
- Activates several plant enzyme systems
- Improves root growth conditions
- Improves Nutrient Absorption – N, P, K
- Helps maintain favorable soil pH, improving soil structure and water penetration
- Serves as a messenger in signaling growth development, and stress response

Calcium (Ca)

- **Calcium** uptake is reduced by **NH_4^+**, **Mg**, **K** and **Na.**
- Foliar ratios **Ca:Mg** 2:1 and **K:Ca** 4:1.
- **NO_3** increase **Calcium** uptake (possibly forming organic **Cacium** chelates).
- **Phosphorus** promotes Ca uptake below pH 7.0.
- **Calcium** binds with **Aluminum** and **Iron** hydroxides in pH<5.0.
- **Boron** and **Calcium** have synergy effect together.

Boron

Role in plant development

7 N Nitrogen | 15 P Phosphorus | 19 K Potassium — Macro

12 Mg Magnesium | 16 S Sulfur | 20 Ca Calcium — Secondary

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1 H Hydrogen | 6 C Carbon | 8 O Oxygen — Non-Fertilizer

Boron Deficiency in Corn

Boron improves seed set under stressful conditions.

Although required in small amounts, Boron is a component of all cell walls in the plant.

Boron deficiencies are more pronounced during drought periods, when root activity is restricted.

The line between deficiency and toxicity is narrower than other essential nutrients. Farmers should apply at proper rate and with proper placement.

Corn most effectively uses Boron when it’s applied through broadcast soil applications. However, foliar application is becoming common place in High Yielding Corn.

Boron (B)

- Is essential for germination of pollen grains
- Good levels of Boron help extend pollination periods longer
- Is for seed and cell wall formation
- Is associated with sugar translocation and protein formation
- Helps to avoid stunted growth
- Is one of the most important micronutrients affecting membrane stability
- Supports the structural and functional integrity of plant cell membranes.
- Boron-deficiency symptoms first appear at the growing points.

Boron (B)

- **Boron** needed for **Phosphorus** utilization and uptake
- High **Potassium** decreases **Boron** plant content
- **Boron** and **Calcium** synergy, **Ca:B** tissue ratios range from 50:1 to 500:1

Chlorine

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	Micro
1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer

Chloride Deficiency in Wheat

Stomata regulate the release of moisture from plants so they can minimize water loss during stressful periods. Chloride is key in stomatal regulation.

Chloride supports the transport of nutrients such as Calcium, Magnesium and Potassium within a plant.

Chloride is involved in the chemical breakdown of water in the presence of sunlight and activates several enzyme systems.

Chloride plays an important role in plants as they acclimate to changing water availability (or make osmotic adjustments)

Chlorine (Cl)

- High **Chlorine** competes for **NO_3^-** uptake
- Muriate of potash contains 47% Chlorine and is detrimental to soil health and kills microbial activity
- It's active in energy reactions in the plant.
- Most Cl- in soils comes from salt trapped in parent materials
- Classified as a micronutrient, Cl- is required by all plants in small quantities.

Manganese

Role in plant development

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12 **Mg** Magnesium	16 **S** Sulfur	20 **Ca** Calcium		Secondary
5 **B** Boron	17 **Cl** Chlorine	25 **Mn** Manganese	26 **Fe** Iron	
28 **Ni** Nickel	29 **Cu** Copper	30 **Zn** Zinc	42 **Mo** Molybdenum	Micro
1 **H** Hydrogen	6 **C** Carbon	8 **O** Oxygen		Non-Fertilizer

Manganese Deficiency in Corn

Manganese plays a vital role in photosynthesis by adding in chlorophyll synthesis.

Soybeans and Wheat in particular require more Mn than many crops.

Manganese is very immobile in plants, so deficiency symptoms appear first on younger leaves, with yellowing between the veins. Sometimes a series of brownish-black specks appear.

Although Mn deficiencies are often associated with high soil ph, they may result from an imbalance with other nutrients such as Calcium (Ca), Magnesium (Mg), and Iron (Fe).

Manganese deficiencies are most common in high organic matter soils and in those soils with naturally low Mn content and neutral to alkaline pH.

Manganese (Mn)

- Plays a direct role in photosynthesis by aiding the plant's chlorophyll synthesis
- Accelerates germination and maturity while increasing the availability of Phosphorus and Calcium
- Deficiency symptoms appear on younger leaves
- Deficiencies may result from an imbalance with other nutrients such as Ca, Mg, and Fe
- Manganese (Mn) functions primarily as part of enzyme systems in plants. It activates several important metabolic reactions and plays a direct role in photosynthesis.
- Manganese accelerates germination and maturity while increasing the availability of phosphorus (P) and calcium (Ca).

Manganese (Mn)

- **Manganese** uptake increased by **NH_4^+**
- **Phosphorus** increases **Manganese** uptake
- **Magnesium** competes with **Manganese**
- **Iron** and **Manganese** competitive both for uptake and activity in plant
- High **pH** suppresses uptake

Iron

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	Micro
1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer

Iron Deficiency in Corn

Iron deficiencies may be caused by imbalance with other metals Copper (Cu), Manganese (Mn), and Molybdenum (Mo).

Plants deficient in Fe will often display a pale green color (chlorosis), with sharp distinction between green veins and yellow interveinal tissues.

Most Fe fertilizer sources work best applied as foliar sprays.

Iron (Fe) is a catalyst to chlorophyll formation.

Iron (Fe) acts as an oxygen carrier in the nodules of legume roots.

Iron (Fe)

- Iron acts as catalyst to chlorophyll formation
- Iron acts as an oxygen carrier
- Iron helps with certain respiratory enzyme systems
- Iron helps with Nodulation development in Soybeans
- Iron is a component of many enzymes associated with energy transfer, nitrogen reduction and fixation, and lignin formation.

Molybdenum

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	Micro
1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer

Molybdenum Deficiency in Corn

Molybdenum-deficiency symptoms show up as a general yellowing and stunting of the plant. A Mo deficiency can also cause marginal scorching and cupping or rolling of leaves.

Several materials supply Mo and can be mixed with nitrogen (N), phosphorus (P) and potassium (K) fertilizers applied as foliar sprays or used as a seed treatment. Seed treatment is the most common way of correcting Mo deficiency because of the very small amounts of the nutrient required.

Excessive Mo is toxic, especially to grazing animals.

Plants take up Moly as the MoO4- anionic form containing Molybdenum and Oxygen. It is vital for Nitrogen metabolism. Converting nitrates into amino acids and enabling Nitrogen Fixation in Legumes.

Molybdenum becomes more available as soil pH goes up, the opposite of most other micronutrients.

Molybdenum (Mo)

- Moly is vital for the process of symbiotic nitrogen (N) fixation by rhizobia bacteria in legume root nodules
- Moly is needed to convert inorganic P to organic forms in the plant
- Moly is required for the synthesis and activity of enzymes
- Moly enhances soybean ability to handle stress tolerance
- Moly increases overall plant biomass, nodule count, and root length, which can lead to higher yields
- Molybdenum (Mo) is a trace element found in the soil

Molybdenum (Mo)

- **Sulfates** inhibits **Moly** uptake
- **Phosphate** increases **Moly**
- **Copper** competes with **Moly**

Ni Nickel

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	
				Micro
1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer


Nickel Deficiency in Pecans

No Nickel (Ni) deficiencies have been observed under crop-growing conditions, but in crop research settings, Ag Scientists have reproduced deficiency symptoms such as chlorosis of young leaves and dead meristematic tissue.

Nickel (Ni) deficiency has been observed in some nursery plants and tree crops. Affected trees develop mouse-ear, a condition marked by small, curled leaves and stunted growth.

Nickel (Ni) is a component of urease enzyme and is, therefore, necessary for the conversion of urea to ammonia (NH3) in plant tissue, making it important in plant nitrogen (N) metabolism.

Nickel (Ni)

- Nickel is important in plant N metabolism
- It is a component of the urease enzyme.
- Without the presence of Ni, urea conversion is impossible.
- It is required in very small amounts, with the critical level appearing to be about 1.1 ppm.

Copper

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	Micro
1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer


Copper Deficiency in Corn

Copper is the most immobile of the micronutrients.

Many vegetable crops show Cu hunger, with leaves that lose turgor and develop a bluish-green shade before becoming chlorotic and curling.

Copper is necessary to chlorophyll formation in plants and catalyzes several other plant reactions.

Other metals in the soil, such as iron, manganese and aluminum, affect the availability of Cu for plant growth,

Organic soils are the most vulnerable to Cu deficiency; heavy, clay-type soils are vulnerable.

Copper (Cu)

- Enzyme regulation and production.
- Enzyme regulation and production.
- Promotes production of grain
- Copper (Cu) activates enzymes and catalyzes reactions in several plant-growth processes.
- Copper is closely linked to Vitamin A production, and it helps ensure successful protein synthesis.

Zinc

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
12 Mg Magnesium	16 S Sulfur	20 Ca Calcium		Secondary
5 B Boron	17 Cl Chlorine	25 Mn Manganese	26 Fe Iron	
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	Micro
1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer

Zinc Deficiency in Corn

Protein synthesis and growth regulation require Zn. Reduced hormone production due to a Zn-deficient plant will cause the shortening of internodes and stunted leaf growth.

Zinc aids synthesis of plant-growth substances and enzyme systems, and is essential for promoting certain metabolic reactions, which are particularity critical in the early growth stages.

Zinc is less mobile within the plant, so deficiency symptoms first appear on the younger leaves.

As soil pH increases, zinc availability decreases.

Zinc (Zn)

Zinc plays a critical role in the following systems of a corn plant:

- Zinc plays a major role in photosynthesis and DNA transcription
- Aids in the synthesis (production) of growth hormones and proteins.
- Is needed in the production of chlorophyll and carbohydrate metabolism.
- Adequate Zinc levels promote more robust and faster early root growth, added to in-furrow planters for quicker response
- Is essential for the transportation of calcium throughout the corn plant.
- Is necessary for cell elongation, the increase in leaf and node size along with grain formation.

Zinc (Zn)

- Zinc was one of the first micronutrients recognized as essential for plants and the one most commonly limiting yields.
- Although Zinc is required only in small amounts, high yields are impossible without it.

Cobalt

Role in plant development

7 N Nitrogen	15 P Phosphorus	19 K Potassium		Macro
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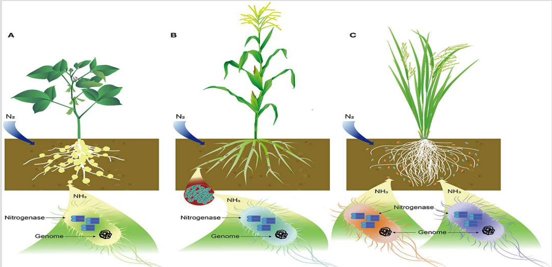
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	42 Mo Molybdenum	
1 H Hydrogen	6 C Carbon	8 O Oxygen	27 Co Cobalt	



Cobalt is a crucial beneficial micronutrient for Corn Production

Cobalt specifically enhances plant health, promotes growth, and improves stress tolerance – particularly under drought conditions.

Cobalt application, often through foliar feeds or in-furrow treatments, can result in increased grain size and overall plant weight.

Cobalt acts as a "timekeeper" for plant development, regulating ethylene production to delay senescence (aging), allowing for longer grain filling and increased yield potential

Cobalt may be applied in-furrow as well as foliar applied especially in the V4-V6 stages or even at V8 stage in small amounts.

Cobalt is vital for nitrogen-fixing bacteria and other beneficial microbes in the root zone, supporting the nutrient supply to the plant.

Cobalt (Co)

- Co – helps plants, including Corn, withstand environmental stress such as drought and soil compaction by moderating ethylene levels, whccih prevents premature ripening.
- Co – is essential for strengthening stalk growth and increasing leaf surface area, improving the overall structure of the Corn plant.
- Co – assists in the metabolic uptake of essential macronutrients (Nitrogen, Phosphorus, Potassium).
- Co – is vital for nitrogen-fixing bacteria and other beneficial microbes in the root zone, supporting the nutrient supply to the plant.
- Co – application of Cobalt, often through foliar feeds or in-furrow treatments, can result in increased grain size and overall plant weight.
- Co – while Cobalt is not needed in high volumes, it is an essential component for maximizing productivity, especially in high-density, high-yielding corn production.

Hydrogen

Role in plant development

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1 H Hydrogen	6 C Carbon	8 O Oxygen		Non-Fertilizer

Nearly all organic compounds also contain H atoms, which explains why plants need the H they get from water molecules through photosynthesis.

Hydrogen ions are vital in both aiding proton gradients to help drive the electron transport chain in photosynthesis and for the plant respiration.

Hydrogen is rarely a limiting nutrient.

Hydrogen is necessary for building sugars and other molecules to produce glucose for plant energy.

Known as a structural element, H is present in both the atmosphere and the growing environment.

Hydrogen is an element and can be a compound as well. As an element, H is the lightest, with one proton, one electron and usually no neutrons. Compound H forms when two H atoms share an electron pair, creating a covalent bond, which takes the form of a gas.

Hydrogen (H)

Hydrogen plays a critical role in the following systems of all plants:

- Hydrogen in soil regulates pH, unlocks nutrients (like P and micronutrients) for roots, and enhances stress tolerance against drought and salinity.
- Hydrogen ions + are crucial in the process of cation exchange, where they help break chemical bonds in the soil to release essential nutrients like Ca, Mg, and K for uptake by plant roots.
- The concentration of Hydrogen ions dictates the pH of the soil, which determines how easily plants can absorb nutrients.

Carbon

Role in plant development

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Carbon is the primary energy source and building block for plant tissues.

Converted through photosynthesis into simple sugars. Carbon helps plants build starches, carbohydrates, cellulose, lignin and protein.

Almost half of a plant's dry matter contains Carbon.

Crop residues, green manures and animal wastes can be significant sources of organic Carbon in the soil.

Carbon (C)

Carbon plays a critical role in the following systems of all plants:

- Soil Carbon, primarily in the form of Soil Organic Matter (SOM) and Soil Organic Carbon (SOC), is critical for plant growth
- Enhances soil structure, increasing nutrient availability, and improving water retention
- Serves as a nutrient reservoir that boosts microbial activity and root development
- Carbon acts as a glue for soil particles, creating stable aggregates
- Carbon reduces compaction and erosion, increases porosity, and allows roots to penetrate the soil more deeply to access nutrients and water

Oxygen

Role in plant development

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All Oxygen available to life on Earth comes from plants.

Most of the Oxygen plants take in is expelled as a byproduct. Only a very small amount is actually used by the plant for respiration.

Plants don’t absorb Oxygen form the air, but instead acquire it during the breakdown of carbon dioxide (CO2) as part of photosynthesis.

Oxygen interacts with Nitrogen (N) in a process called denitrification, and it affects other elements’ oxidation states as well.

Only the leaves and stems of a plant acquire Oxygen through photosynthesis. The roots as a plant are forced to take in Oxygen from the environment through air spaces in the soil.

Oxygen (O)

Oxygen plays a critical role in the following systems of all plants:

- Oxygen in the Soil is critical for plant growth.
- Enables root respiration, nutrient uptake, and the survival of beneficial soil microbes.
- Oxygen facilitates the conversion of sugar into energy (ATP) for active nutrient absorption and root development.
- Adequate oxygen inhibits the development of anaerobic bacteria that produce harmful toxins, such as methane or sulfides, which can kill roots.

Micronutrients, Plant Health, and Higher ROI

Micronutrients are essential to plant growth and yield, even in small amounts. Deficiencies in elements like iron, zinc, and boron can limit performance, reduce nutrient uptake, and impact overall crop health.

Recognizing and addressing these deficiencies early is key to maximizing productivity. Monty's has solutions designed to support micronutrient availability and uptake, helping growers correct imbalances and drive stronger, more resilient crops.

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