



### Nutrient Explanation White Paper

**NITROGEN (N):** Nitrogen (N) is a building block for amino acids and proteins and acts as a catalyst for other nutrients. Nitrogen can sometimes be tricky to harness for maximum efficiency. It doesn't stay in one form for an extended period. The most common form the plant uses, the nitrate (NO<sub>3</sub>) form, is the most susceptible to moving with water. Balancing crop demands with increased accountability makes it imperative that growers constantly evaluate nitrogen management.

Common symptoms of turfgrass nitrogen deficiency include:

- Stunted Growth
- Small Plant Size
- Lower Yields and Vigor
- Light green to yellow leaves with older leaves showing symptoms first

Nitrogen fertilizer is subject to losses due to volatilization, denitrification, and leaching. The severity of loss is often dependent on soil moisture, temperature, and the placement of nitrogen in the soil. Many liquid fertilizers contain three forms of nitrogen – urea ((NH<sub>2</sub>)<sub>2</sub>CO), ammonium (NH<sub>4</sub><sup>+</sup>) and nitrate (NO<sub>3</sub><sup>-</sup>). Most plants can utilize the ammonium and nitrate forms of nitrogen, although the biological processes in the soil work to convert nitrogen to the nitrate form. Nitrate is the most susceptible to loss through leaching.

MADBAR Outdoors uses a base product called High NRG-N™, it is an advanced technology nitrogen product containing stabilized urea, ammoniacal, and nitrate nitrogen. The proprietary Flavanol Polymer Technology used to formulate High NRG-N controls the conversion of urea to ammonium thus mitigating losses from leaching and volatilization. The result is a controlled, steady supply of nitrogen to

meet season-long turf needs while using less volume than with conventional fertilizer sources.

**Phosphorus (P):** Phosphorus (P) is involved in photosynthesis, respiration, energy storage and transfer, and many other processes in the plant. Phosphorus uptake is a continuous process during the active growth period of plants. Since phosphorus is needed at all stages of plant growth, it is imperative that the nutrient be in a plant-available form throughout the growing season.

Common symptoms of phosphorus deficiency include:

- Plants are generally stunted and darker green
- Some plants may show purpling of leaves and stems
- Leaves may curl upward
- Delayed maturity
- Poor seed set and quality

Phosphorus (P) is considered a primary crop nutrient, along with nitrogen and potassium. Most phosphate fertilizers combine, or complex, with other minerals in the soil to create compounds that are not usable to plants. This can happen in as little as 4 to 8 days. Pro-Germinator® contains both orthophosphate, which is immediately available to the plant, and long-chain polyphosphates that are protected by flavonol chelation technology resulting in season long phosphorus availability.

**POTASSIUM (K):** Potassium (K) is absorbed by plants in larger amounts than any other mineral nutrient except nitrogen. It is required for nutrient movement in the plant. Potassium is also important in the formation of sugars and starches in plants. Plants use potassium to regulate the process of opening and closing the stomatal openings of their leaves. That process influences water use efficiency and carbon dioxide use in the plant. Potassium's influence on cell turgor pressure and water relations helps plants resist the effects of drought and temperature extremes, and aids resistance to many plant diseases.

Depending on soil type, 90-98% of total soil potassium is unavailable. Feldspars and micas are clays that contain large amounts of potassium, but plants cannot use the nutrient if it is trapped between the layers of those clays. In persistently dry soils, potassium remains unavailable, as there is no water film surrounding

the soil particles. Over time, these minerals break down, and the potassium is released. However, this process is too slow to provide crops the amount of potassium needed for optimal yield.

## **MICRONUTRIENTS**

### **BORON (B):**

Boron is necessary for cell division and differentiation. It helps maintain a balance between sugar and starch, and aids in the movement of calcium. Boron is also essential for the germination of the pollen grains and pollen tubes in plants and has a direct affect on yield; no pollination, no crop.

### **COBALT (Co)**

Cobalt plays a critical role in the overall growth of plants. Cobalt is necessary for the processes of stem growth, elongating the coleoptiles, and expanding leaf discs. A cobalt deficiency will reduce or stunt plant growth and reduce seed germination.

### **COPPER (Cu)**

Copper aids in root metabolism and the utilization of proteins. Copper is essential for better stalks or stems and standability. It is also key to seed coat resiliency, disease control, test weight, and seed size.

### **IRON (Fe)**

Iron is required for the formation of chlorophyll in plant cells. It activates respiration, photosynthesis, and symbiotic nitrogen fixation. Low iron levels in the plant result in poor energy transfer from leaves to growing points or fruiting structures thus slowing growth and lowering yields.

### **MANGANESE (Mn)**

Manganese is needed for phosphorus and magnesium uptake, and aids in the utilization of nitrogen, accelerating seed germination and maturity. Because it plays a major roll in the production of chlorophyll, it directly affects the health of the crop and whether a plant reaches maturity or not.

**MOLYBDENUM (Mo)**

Molybdenum acts as a catalyst in nitrate reduction, and in nitrogen transport and utilization within the plant. Molybdenum is also associated with disease resistance in plants.

**NICKEL (Ni)**

Nickel is important in nitrogen metabolism because 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 0.1 ppm.

**ZINC (Zn)**

Zinc is necessary for chlorophyll and carbohydrate production. High yields are impossible without zinc due to its importance in growth, metabolism and photosynthesis. High soil phosphorus, soil organic matter, biological activity, irrigation, and leaching play a role in zinc availability.