FACT SHEET 4.3

ESSENTIAL PLANT NUTRIENTS

Believe it or not, there are 17 elements or nutrients essential for plant life. Nutrients required in greater quantities are referred to as macronutrients, while those required in smaller quantities are referred to as micronutrients. No one nutrient is more important than another, they are just required in different quantities and concentrations.

Optimal yields can only be produced when all of the nutrients are in proper supply. If one or more nutrient is lacking in the soil, crop yields will be reduced, even though an adequate amount of other nutrients are available. This can also occur if there is too much of a particular nutrient. Any nutrients not used by the plant are considered excess and can travel through stormwater runoff to nearby surface waters. Here they can reduce the quality of water and habitats through excessive aquatic plant growth and algal blooms. Nutrient balance is needed for healthy plants and successful yields.

NUTRIENT CONTENT

The nutrient content of fertilizers and other soil additives are often presented using the nutrient's elemental symbol. For example, fertilizers display Nitrogen-Phosphorus-Potassium ratios as N-P-K ratios.

WHAT ARE THE 17 NUTRIENTS ESSENTIAL FOR PLANT HEALTH?

DEVELOPING AND FOLLOWING AN ENVIRONMENTALLY SOUND NUTRIENT MANAGEMENT PROGRAM THAT CONSIDERS THE ACTUAL NEEDS OF YOUR SOILS AND PLANTS THROUGH SOIL TESTING WILL NOT ONLY RESULT IN A HEALTHY, BOUNTIFUL HARVEST, BUT WILL HELP TO MINIMIZE EXCESS NUTRIENTS FROM CONTAMINATING NEARBY SURFACE WATERS.

The 17 nutrients essential for plant health, along with their elemental symbol (e.g., the elemental symbol for nitrogen is N), are provided below:

NON MINERAL ELEMENTS	Hydrogen (H), carbon (C) and oxygen (O) are the three primary elements that plants use in the largest amounts. Plants can obtain these elements from water, air or both. As such, the soil does not need to provide these nutrients, so they are not sold as fertilizers.
PRIMARY MACRONUTRIENTS	The following three nutrients are considered primary nutrients because they are needed in larger quantities and they are most often limiting from a crop production standpoint. Generally, they are managed by the addition of fertilizers, compost or manures to soils. • Nitrogen (N) is responsible for the growth of leaves. • Phosphorous (P) promotes root development. • Potassium (K) promotes flower and fruit development.
SECONDARY MACRONUTRIENTS	Secondary macronutrients are also needed in larger quantities, but are considered secondary nutrients because they are rarely limiting, and more rarely added to soils as fertilizers compared to nitrogen, phosphorus and potassium. These include: • Calcium (Ca) improves general plant vigor and promotes growth of young roots and shoots. • Magnesium (Mg) helps regulate the uptake of other plant foods and aids in seed-making. • Sulfur (S) helps encourage vigorous plant growth.
MICRONUTRIENTS	Micronutrients are nutrients used by plants in very small amounts in proportion to macronutrients, but are still essential to plant health. These include: boron (B), chlorine (Cl), manganese (Mn), iron (Fe), nickel (Ni), copper (Cu), zinc (Zn) and molybdenum (Mo).

WATER QUALITY BENEFIT

Understanding and identifying the specific nutrients that are needed by your crops will result in healthier plants while helping to protect surface water quality from nutrient contamination.

HELPFUL LINKS

www.ag.umass.edu/vegetable/fact-sheets/vegetable-crops
www.worldcrops.org