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Biology 102 Lab 7: Plant Nutrition and Soil

Plants, just like humans, require nutrients to thrive. Macronutrients and micronutrients are elements that contribute to the growth and development of plants. Soil composition, including both organic (about 5% of soil—decomposing plant matter) and inorganic (about 45% of soil—coarse fragments like rock and fine fragments like sand, silt, and clay) components, has a crucial role in determining the availability of these nutrients to plants. Interestingly, the other 50% of soil is made up water and air. Because plants need air in their roots, aerated soil allows them to access that air, so they can metabolize. This is why overwatering can kill plants: the water fills the air pores, smothering the root's access to air. So, all told, good soil is critical for plant growth.

Macronutrients are nutrients that plants require for their growth and development. The primary macronutrients include nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), sulfur (S), and magnesium (Mg). Each of these nutrients plays a distinct role in various physiological processes within the plant. Macronutrients are needed in large quantities, and are absorbed by a plant's roots. If a soil is missing macronutrients, the plants will struggle to grow. Micronutrients are essential nutrients required by plants in smaller quantities (hence the name *micronutrients*) but are equally important for their growth and development. Some common micronutrients include iron (Fe), chlorine (Cl), boron (B), manganese (Mn), zinc (Zn), copper (Cu), and nickel (Ni). Nutrients can be mobile or immobile; mobile nutrients like nitrogen, phosphorus, and potassium move freely as needed by the plant while immobile nutrients like iron, calcium, and zinc

cannot move through the plant as easily.

All these nutrients are found in soil, which is why soil composition is so important. Soil composition refers to the physical and chemical properties of soil, including both organic and inorganic components. Organic matter in soil includes decomposed plants and animals, while inorganic components comprise mineral particles, water, and air. Organic matter improves soil structure, water retention, and nutrient holding capacity. It also serves as a reservoir of nutrients, releasing them gradually as organic matter decomposes. Inorganic components, like the aforementioned clay, silt, and sand, affect soil texture, drainage, and aeration. Clay soils tend to retain water and nutrients but may suffer from poor drainage, while sandy soils drain quickly but may lack nutrient retention capacity.

Organic matter comes from decomposing plants and animals, and one member of the ecosystem that helps with decomposition are earthworms. Earth worms eat food scraps and other waste and produce nutrient rich soil. Earthworms are often used in compost bins to speed up and improve the composting process.

Altogether, soil is important for plant growth. It's made up of both organic and inorganic materials, and contains macronutrients and micronutrients. Good soil allows the plant roots to breathe so they can metabolize, and it provides the necessary nutrients for growth. If a soil is lacking nutrients, fertilizer can be added, but it's better to use a natural fertilizer (like compost) or plant plants that will help the soil (like nitrogen fixers). What plant belongs in what soil depends on the plant, so it's good to know and understand not only your plants, but also your soil. When potting house plants, it's easy to find a variety of soils, and even to create your own by mixing different components.