

Fertilizers & Soils

Fertilizers and soil amendments are essential in modern agriculture to improve soil fertility, promote plant growth, and enhance crop yields. These products can be broadly categorized into two types: fertilizers (which provide essential nutrients directly to plants) and soil amendments (which improve soil structure, water retention, or overall soil health). Below is a list of the common types of fertilizers and soil amendments, along with their main active ingredients.

1. Chemical (Synthetic) Fertilizers

These are industrially manufactured fertilizers designed to provide nutrients in precise quantities to plants.

Nitrogen Fertilizers (Provide nitrogen, which is essential for plant growth and chlorophyll production)

Urea (45-46% nitrogen)

Ammonium nitrate (33-34% nitrogen)

Ammonium sulfate (21% nitrogen)

Calcium nitrate (15.5% nitrogen)

Anhydrous ammonia (82-90% nitrogen)

Phosphorus Fertilizers (Provide phosphorus, crucial for energy transfer, root development, and flowering)

Monoammonium phosphate (MAP) (11-52% phosphorus)

Diammonium phosphate (DAP) (18-46% phosphorus)

Superphosphate (16-20% phosphorus)

Triple superphosphate (46% phosphorus)

Ammonium polyphosphate (varies)

Potassium Fertilizers (Provide potassium, important for water regulation, disease resistance, and fruit quality)

Potassium chloride (KCl) (60-62% potassium)

Potassium sulfate (K_2SO_4) (50% potassium)

Potassium nitrate (KNO_3) (44-46% potassium)

Muriate of potash (60-62% potassium)

Micronutrient Fertilizers (Provide trace elements needed in small amounts for healthy plant growth)

Iron sulfate ($FeSO_4$)

Zinc sulfate ($ZnSO_4$)

Copper sulfate ($CuSO_4$)

Manganese sulfate ($MnSO_4$)

Boron (borax, boric acid)

Molybdenum (ammonium molybdate)

2. Organic Fertilizers

These fertilizers are derived from natural sources and typically contain a mix of macro and micronutrients.

Animal Manures (Cow, horse, chicken, sheep, etc.)

Main nutrients: Nitrogen (N), Phosphorus (P), Potassium (K), and trace elements.

Manures also improve soil structure and microbial life.

Compost (Decomposed organic material from plant and animal waste)

Contains N, P, K, micronutrients, and organic matter that enhances soil health and water retention.

Blood Meal (Dehydrated blood from animals, usually cattle)

Main nutrient: High in nitrogen (around 12-15%).

Bone Meal (Ground animal bones, typically from cattle)

Main nutrient: High in phosphorus (14-20%) and calcium.

Fish Emulsion (Liquid fertilizer made from fish processing byproducts)

Main nutrients: Nitrogen, phosphorus, potassium, and micronutrients (around 5-1-1 N-P-K).

Fish Meal (Dried and ground fish or fish byproducts)

Main nutrients: Nitrogen (6-9%), phosphorus, potassium, and micronutrients.

Seaweed (Kelp) Fertilizers (Harvested from marine algae)

Main nutrients: Potassium, trace elements (iron, iodine, magnesium), and plant growth hormones.

Alfalfa Meal (Ground alfalfa hay or pellets)

Main nutrients: Nitrogen, phosphorus, potassium, and trace minerals.

Worm Castings (Vermicompost) (Decomposed organic material processed by earthworms)

Contains N, P, K, and a wide range of beneficial microbes and enzymes.

3. Soil Amendments

These are materials added to soil to improve its physical properties, such as structure, porosity, water-holding capacity, or microbial activity.

Lime (Calcium carbonate) (Used to raise soil pH)

Main ingredient: Calcium carbonate (CaCO_3).

Gypsum (Calcium sulfate) (Used to improve soil structure and reduce salinity)

Main ingredient: Calcium sulfate (CaSO_4).

Sulfur (Used to lower soil pH)

Main ingredient: Elemental sulfur (S).

Peat Moss (Decomposed plant material, often from bogs)

Main ingredient: Organic matter (no specific nutrient concentration, but improves water retention and soil structure).

Coco Coir (Fibrous material from the coconut husk)

Main ingredient: Organic matter, high in lignin and cellulose, used to improve soil aeration and water retention.

Perlite (Volcanic glass, often expanded by heat)

Main ingredient: Silica (SiO_2).

Used to improve soil aeration and drainage.

Vermiculite (A mineral that expands when heated)

Main ingredient: Magnesium aluminum silicate.

Used to improve water retention, soil aeration, and root growth.

Biochar (Charcoal made from organic materials via pyrolysis)

Main ingredients: Carbon (C), with small amounts of nutrients depending on the source material.

Improves soil fertility, water retention, and microbial life.

Dolomitic Lime (A type of lime containing magnesium)

Main ingredients: Calcium carbonate (CaCO_3) and magnesium carbonate (MgCO_3).

Used to raise soil pH and provide calcium and magnesium.

Compost (As mentioned above, also considered a soil amendment)

Improves soil texture, adds nutrients, and supports beneficial microbes.

Sand (Primarily used to improve soil drainage and aeration)

Main ingredient: Silica (SiO_2).

Clay (Used to improve water retention and structure in sandy soils)

Main ingredients: Various minerals such as kaolinite, montmorillonite, and illite.

4. Slow-Release Fertilizers

These fertilizers release nutrients over time, providing longer-term nourishment for plants.

Sulfur-coated Urea (A slow-release nitrogen source)

Main ingredients: Urea (45-46%) coated with sulfur.

Polymer-coated Fertilizers (Nutrient release is controlled by the polymer coating)

Main ingredients: Varies depending on the fertilizer core (e.g., urea, ammonium nitrate) and the polymer coating.

5. Liquid Fertilizers

These fertilizers are typically water-soluble and applied directly to plants or through irrigation systems.

Liquid Seaweed Extract (Concentrated liquid from seaweed)

Main ingredients: Potassium, micronutrients, and plant growth hormones.

Chelated Micronutrients (Chelated forms of essential micronutrients for plants)

Main ingredients: Chelated iron (Fe), zinc (Zn), manganese (Mn), copper (Cu), and other micronutrients.

Fish Hydrolysate (A liquid form of fish-based fertilizer)

Main ingredients: Nitrogen, phosphorus, potassium, and micronutrients.

Summary of Key Ingredients in Fertilizers and Soil Amendments:

Nitrogen (N)

Phosphorus (P)

Potassium (K)

Calcium (Ca)

Magnesium (Mg)

Sulfur (S)

Micronutrients: Iron (Fe), Zinc (Zn), Copper (Cu), Manganese (Mn), Boron (B), Molybdenum (Mo)

Organic matter (humus, compost, manures)

pH modifiers: Lime, sulfur

Silica (SiO₂): In perlite, sand

Carbon (C): In biochar, organic matter

These various ingredients work together to provide the necessary nutrients and improve soil properties for optimal plant growth. The choice of fertilizer or amendment depends on the specific soil conditions, crop needs, and the desired outcome in agriculture.