

## Why plants need nutrients

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### Primary nutrients: N, P, K

**Nitrogen** atoms are needed to make amino acids and proteins (including enzymes) and other important biological molecules. Nitrogen promotes green, leafy growth and the formation of stems. Crops with high nitrogen demands include grasses and leafy vegetables such as lettuce, spinach and cabbage. The atmosphere contains a large reservoir of nitrogen, but most plants cannot use it. Pea, beans, clover and other legumes have root nodules which contain symbiotic bacteria able to fix nitrogen gas. They supply their own nitrogen fertiliser, and enrich soil nitrogen if the roots are left in the soil after cropping.

**Phosphorus** is especially needed for seed germination and for healthy root growth. Phosphorus atoms are needed to make important biological molecules such as ATP, DNA, RNA and phospholipids. The phosphorus compound ATP is needed for the transfer of energy carried by sunlight to energy stored in compounds in plants during photosynthesis. It acts as the immediate source of energy in all cells. Young plants forming their root systems need good supplies of phosphorus. Root crops such as carrot, parsnip, turnip, swede and fruit and seed crops especially need adequate phosphorus.

**Potassium** promotes flowering, fruiting and general hardiness including disease resistance. It is needed to control both water uptake through roots and its loss from plants through the stomata in leaves. It is also needed in photosynthesis and respiration. Sufficient potassium in the soil is essential for the efficient plant use of nitrogen. As it is involved in sugar and starch production, it is especially needed by vegetables and fruits like carrot, parsnip, potato, tomato and apple.



**Figure** Healthy plants need nutrients. These are often grouped according to the quantities needed:

- primary nutrients;
- secondary nutrients;
- micronutrients.

Each has key roles in the chemical reactions that happen in plants.

### Secondary nutrients: Ca, Mg, S

**Calcium** helps control transport of other nutrients into the plant. It is involved also in some enzyme processes. Calcium pectate, found in the middle lamella, glues cells walls together. **Magnesium** is needed for healthy leaves. Magnesium atoms are needed to make chlorophyll (the key to photosynthesis). It is also needed in the production of ATP. Magnesium pectate, found in the middle lamella, glues cells walls together. **Sulfur** atoms are needed to make some amino acids and vitamins.

### Micronutrients: B, Cu, Fe, Mn, Mo, Zn

**Boron** is required for healthy plant cell formation. It is important for flowering. **Copper** is important for photosynthesis and in many enzyme processes. **Iron** is important in cytochromes and as a cofactor in chlorophyll synthesis, therefore affecting photosynthesis and some enzyme processes. **Manganese** activates important enzymes in chlorophyll formation and is necessary for building chloroplasts. It is a cofactor for enzymes in respiration. **Molybdenum** is required for some enzyme processes leading to the synthesis of amino acids using nitrates. **Zinc** activates many enzymes. It also has a key role in DNA transcription (the reading of the genetic code).