

Fertilizers containing significant amounts of chlorine, however, should be avoided to reduce the chances of plant damage. Note that synthetic fertilizer materials are not permitted in organic production.

### Organic Fertilizers

Fish-based fertilizers (fish emulsion or fish powder) and seaweed (soluble seaweed powder or seaweed extract) are among the most common foliar feeds in organic gardening, applied either separately or in combination

Compost tea has become popular as a foliar spray material because of its nutrient content and disease-suppressive characteristics.

### Notes on Compost Teas.

Other soluble organic materials and those from which extracts are easily made include spray-dried blood, bat guano, worm castings, manure teas, humates, molasses, milk, B vitamins, and herbal extracts of plants like stinging nettle and horsetail.

- To be efficient and to avoid plant damage, very dilute solutions of nutrient formulations are suggested. Highly concentrated sprays, especially those bearing inorganic salt-based fertilizers, have the potential to "burn" plant foliage. This is especially true of chloride salts (e.g., potassium chloride).
- Spray-solution pH should remain in the near-neutral range (5.5-8.5). If pH adjustment is required, vinegar can be used to increase acidity, and baking soda to decrease it.

In addition to pH, some other qualities of spray-water should be considered:

- Cleanliness. Small, undissolved particles can quickly clog nozzles—even those well-equipped with strainers can be plugged if enough suspended matter is present.
- Chemical and disease contaminants. Some water sources are contaminated and should not be used at all for foliar feeding. If there is concern specifically about disease organisms, the water can be treated effectively with a small amount of hydrogen peroxide.
- Chlorine. Chlorination of water removes harmful bacteria, but it also can kill beneficial organisms, which may be included in some foliar sprays. Allowing water to stand in an open tank overnight generally renders chlorinated water harmless to beneficial microbial mixtures.
- Best effect is achieved when foliar sprays are finely atomized. This can be managed by increasing sprayer pressure or by using a mist blower.
- Spray when wind is minimal. This is especially important with finely atomized sprays because they drift readily.
- Absorption is increased when sprays also reach and coat the undersides of leaves. This is where most of the plant's stomates are located.
- Avoid foliar fertilization in hot weather. Absorption at high temperatures is very poor because plant stomates are closed. Some of the most effective foliar feeding is done late in the evening or in the early morning, when temperatures are right and wind is minimal.
- Absorption is further enhanced when weather conditions are humid and moist. The presence of heavy dew on the leaves facilitates foliar feeding.
- Addition of a surfactant to the solution decreases surface tension on the leaf and may increase absorption.
- Take note of possible chemical interactions among foliar fertilizers. Some materials are incompatible and should not be mixed together. They may create precipitates that tie up the nutrients and clog nozzles. Many product labels warn of incompatibilities. If there is no information, mix relative quantities of the materials and water in a jar and shake it. If there is no precipitate, there should be no problem.
- For convenience and cost savings, foliar fertilization can sometimes be combined with a pesticide application. However, timing conflicts and material incompatibilities can make combining sprays unwise. Be certain to read all product labels and do the jar test if uncertain.

## Synthetic Fertilizers

Most soluble conventional fertilizer materials can be used for foliar fertilization. Hot mix liquid and dry soluble formulations (e.g., Miracle-Gro™ products) are usually preferred, as they are designed to be dissolved in water and contain few contaminants.

## **FOLIAR FERTILIZING**

Foliar fertilization (or foliar feeding) entails the application—via spraying—of nutrients to plant leaves and stems and their absorption at those sites. Plants can absorb nutrients through their foliage but not in great quantity and sometimes not very quickly. Despite those limitations, foliar feeding is sometimes worthwhile to consider. There is general consensus, however, that foliar fertilization should not be considered a substitute for a sound soil-fertility program.

Foliar feeding has been used as a means of supplying supplemental doses of minor and major nutrients, plant hormones, stimulants, and other beneficial substances. Observed effects of foliar fertilization have included yield increases, resistance to diseases and insect pests, improved drought tolerance, and enhanced crop quality. Plant response is dependent on species, fertilizer form, concentration, and frequency of application, as well as the stage of plant growth.

The usual uses of foliar fertilizer are in trace element nutrition where the plant does not require large quantities of the nutrient in question. Since many trace element problems occur as a result of unfavorable soil conditions (for example high soil pH), foliar applications can sometimes be more effective than applying the fertilizer to the soil. Examples of nutrients which can be applied in this case are zinc, manganese, copper and molybdenum.

One issue which one also has to consider here is that some elements are only absorbed into leaf tissue very slowly. In these cases, foliar fertilizing is unlikely to be of any real use. Two important examples of this are the elements iron and phosphorus. This is something of a pity as both of these elements can become unavailable in soil through unfavourable soil conditions.

Nitrogen is also readily absorbed by leaves and foliar fertilizing can be used to supply nitrogen. Urea is the best source of nitrogen for foliar use and many commercial products use urea as their nitrogen source. To supply all of a plant's nitrogen needs through the leaves will require several applications because of the amount that a plant takes up, but foliar feeding can be a way of getting rapid absorption taking place. Should any of the spray fall onto the soil then it will behave as any other fertilizer and ultimately be absorbed by the roots.

It is a basic tenet of organic gardening that properly nourished plants will exhibit a natural resistance to insect pests and disease organisms. Some proponents of foliar feeding consider it an especially effective means of stimulating the natural defense mechanisms of plants. Studies to date are rather limited but have shown some positive results. Israeli research on corn using foliar sprays of phosphate and of trace nutrients demonstrated induced resistance to several diseases.

Given that many trace elements can become toxic if excess is applied, the use of any trace element fertilizer should be based on an accurate diagnosis of a problem rather than an application, "just in case". For foliar fertilization to work effectively, certain guidelines must be followed: