

# Nitrogen Fertilization in Hydroponics

It is a common mistake in hydroponic gardening to assume that the chemical forms of nitrogen that can be used in hydroponics are the same that can be used in regular soil gardening. Don't get me wrong, plants in soil and plants in hydroponic media use the exact same chemical forms of nitrogen as nutrients, what changes dramatically from hydroponics to soil gardening is the environment in which the plant is.

Let us talk about the available forms of nitrogen first. Plants absorb nitrogen either as  $\text{NO}_3^-$  (nitrate) or  $\text{NH}_4^+$  (ammonium) ions. Both of these ions supply nitrogen to the plant but they have dramatic differences inside the plant's metabolic pathways. Nitrate is absorbed by the plant slowly and provides the materials needed for the synthesis of amino acids and other structures while ammonia is absorbed rapidly and causes immediate plant toxicity if present in highly enough concentrations.

This is the main difference between soil and hydroponic gardening. In hydroponics, most of the nitrogen must be supplied as  $\text{NO}_3^-$  because the hydroponic media allows ammonium ions to become toxic exceedingly fast. For example, hydroponic plants can withstand concentrations of nitrogen (as nitrate) up to about 250 ppm while concentrations of nitrogen as ammonium are only withstood up until about 30 ppm. This is the reason why urea cannot be used as a nutrient salt in hydroponic gardening to supply all the nitrogen needed by the plants.

So if plants in soil and hydroponic media assimilate the same nutrients, why can plants in soil be fed nitrogen as ammonium but hydroponic plants cannot? The answer is quite simple. Bacteria present within the soil are able to efficiently convert ammonium ions into nitrate ions, effectively reducing the amount of ammonium the plant "sees". In fact, plants in soil also absorb nitrate, the only difference is that there

are bacteria that can convert ammonium to nitrate, reason why nitrogen can be supplied as ammonium to plants present in soil.

So next time you are searching for a nitrogen nutrient for your hydroponic plants, remember to search for nitrate salts as more than 90% of your total nitrogen source. The most important salts for providing nitrogen as nitrate in hydroponic gardening are potassium nitrate and calcium nitrate. This is important to remember, as using ammonium salts to provide your plant's nitrogen will ultimately kill them in hydroponic media ! (below, an image showing the effects of ammonium fertilizer in hydroponic plants)



---

## Rooting Cuttings Naturally

When gardening, it is sometimes most convenient not to start a plant from seed but to start it from a cutting from another plant. Most of the time, the science of starting cuttings involves the use of root growth hormones and other chemicals which can prove hard to get in some regions of the world and sometimes are not desirable because of their conflicts with some organic food regulations.

Luckily, there are ways to root and get cuttings up to a good start without the use of any root hormones. In order for us to do this, we should first understand the problem and how to solve it.

When a part of a plant is cut, and this part has no root system, the ability of the cutting to get nutrients from its surroundings becomes minimal. The idea is to maintain the plant's food requirements as low as possible until it develops a healthy root system that can take up nutrients and grow a

healthy new plant.

The first step is to place the cutting inside some growing media (remember to cover the cut wound with candle wax in order to prevent possible fungal infections) (either potting soil in soil gardening or perlite, rice husk/ sand in hydroponic gardening) and to place it somewhere where light is scarce. When diminishing the amount of light that reaches the cutting, we slow down photosynthetic processes and therefore the nutrient needs of the plant. The media should be watered daily so that the new root system can be developed.

In order to supply nutrients for the plant, a suitable foliar spray should be applied. A 1/10 strength Hoagland's solution can be used effectively or a suitable organic foliar spray can be used if the desire to achieve organic food certifications is present. Plants are able to feed through their leaves in some way so the application of nutrients on the leaves or "foliar feeding" is a good technique when starting cuttings whose root systems have not developed.

After 3 or 4 days of this process, the plant should be ready for its reintroduction into normal growing conditions. If you are a hydroponic gardener, start applying a one third strength hydroponic solution on the plant's growing media. In any case, the plant should be brought into light in increasing intervals, first day one hour, second day 2 hours, third day 4 hours, fourth day 8 hours and fifth day left outside.

This whole process should provide an adequate environment and growth for the new cutting's root system with the final gradual adaptation providing enough time for the leaves to readjust to normal lighting conditions. I hope this guide proves useful and all of you enjoy new cutting in your organic or hydroponic gardens.

—



---

# An Organic, Natural Insecticide for your Garden

Few people have been able to experience the joy of gardening without encountering the nasty problem of insects. Every year, many gardens suffer from the amazing attacks of these small creatures that turn beautiful plant spaces into infested focuses of insect populations.

Up until now, most chemical solutions have acted on insects quiet effectively. In fact, some insecticides are good at removing more than 99.99% of insect populations with a few applications. Chemical insecticides are most of the time harmful for humans but sometimes they can even be safe for us. The main problem with synthetic insecticides is that they affect beneficial insect populations much more dramatically than they do harmful insect populations. The main problem with this is that is effectively diminishes the amount of insects that can predate bad insects and pollinate plants.

Organic (in the sense of natural) insecticides are sometimes good but they are never as effective as available synthetic solutions. In the few studies done about this issue, (mainly dealing with cabbage) all of them have found synthetic solutions much better at controlling insect pests. However, garlic based insecticides have proven effective at controlling insects if not completely removing them from the garden (they also prove almost non fatal to beneficial insect populations).

In order to control your insect populations easily, you can manufacture an insecticide with garlic, vegetable oil and water. Cut 3 cloves of garlic into small pieces and place them in a jar with 200 mL (about a cup) of vegetable oil for two nights (this ensures that the organic non polar molecules present inside garlic are extracted efficiently). Next, mix this with 2/3 of a gallon of water . Agitate strongly before

each use. Then your insecticide is ready to be spread on your garden.

Hopefully, if spread adequately over every inch of the plant (including the underside of leaves), the insecticide should prove efficient against most types of bad insects. It also proves effective in being resistant to rain so your plants should remain protected for a prolonged amount of time. Bear in mind that soap or detergents should not be added to improve surface tension properties because this increases the capacity of rain to remove the insecticide effectively.



—