Research – Hydroponics

Hydroponics is the technique of growing plants using water – based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite.

Hydroponic production systems are used by small farmers, hobbyist and commercial enterprise.

Also Grow the Medical Plants.

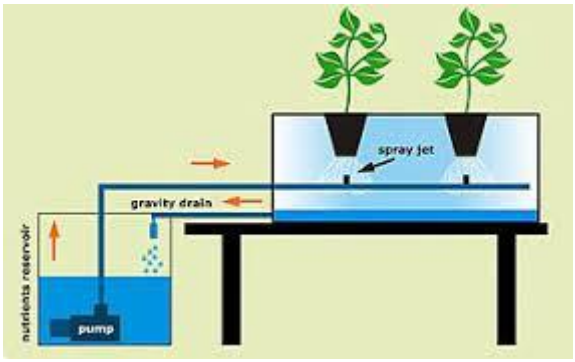
➔ What is hydroponics?

Hydroponics is the cultivation of plants without using soil. Hydroponic flowers, herbs, and vegetables are planted in inert growing media and supplied with nutrient-rich solutions, oxygen, and water. This system fosters rapid growth, stronger yields, and superior quality.

Hydroponic farming

[Water is having Full of nutrient]

Process of Hydroponics.



➔ What the Main Reason behind the Usage of Hydroponics?

There is an array of reasons to use hydroponics to grow fresh produce, from the health of our bodies to the health of the environment. Hydroponics eliminates soil and soil-borne pests and disease, so there is no need to use large amounts of pesticides.

➔ Types of Hydroponics :-

➔ **Hydroponics is an increasingly popular method of growing plants that uses a nutrient-rich solution with a water base, which means that soil isn't used at all in a hydroponics system.** Instead, the roots of the plants are supported by such substances as peat moss, clay pellets, perlite, and Rockwool. When you're looking to create or use a hydroponic system to grow plants, there are hundreds of variations of hydroponic systems available for you to use. However, there are only six types of hydroponic systems under which all variations are situated.

➔ Each type of hydroponic system works in a different way, which means that all six hydroponic systems have their own distinct pros and cons for you to consider. When you're getting ready to use a hydroponic system for growing plants, you should know how each system works to fully understand how to use the one that you select. The following offers an extensive and thorough look at the six types of hydroponic systems, which should make it easier for you to determine which system is right for you.

The Basics of Hydroponic Systems

URL: https://youtu.be/V0BrgBF9IQM

If you create the right hydroponic system and keep the water free from impurities with the sensors mentioned in the Water Treatment of Hydroponic Systems article, the growth rate can be up to 30 present faster than soil-based planting methods. There are six separate types of hydroponic systems that you can use, which include the following:

1. Wick System
2. Water Culture
3. Ebb and Flow
4. Drip
5. N.F.T. (Nutrient Film Technology)
6. Aeroponic systems

1. Weak System

The wick system is easily the simplest type of hydroponic system that you can use to grow plants, which means that it can be used by practically anyone. The wick system is notable for not using aerators, pumps, or electricity. In fact, it's the only hydroponic system that doesn't require the use of electricity. With the majority of wick systems, the plants are placed directly within an absorbent substance like perlite or vermiculite. Nylon wicks are positioned around the plants before being sent straight down into the nutrient solution.

If you're thinking about using a wick hydroponic system to grow plants, the simple nature of this system means that the plants are unable to obtain a significant amount of nutrients. As such, the system is ideal for small garden plants and herbs. Any plant that doesn't require a substantial amount of water will grow well in this specific system. While this system is fantastic for smaller plants, you'll want to avoid growing plants like peppers and tomatoes. These plants are considered to be heavy-feeding plants, which mean that they require more nutrients than the wick system will be able to provide. Another negative aspect of this growing system is that water and nutrients aren't

absorbed evenly, which could lead to the build-up of toxic mineral salts. When you use this system, make sure that you flush any extra nutrients with fresh water every 1-2 weeks.

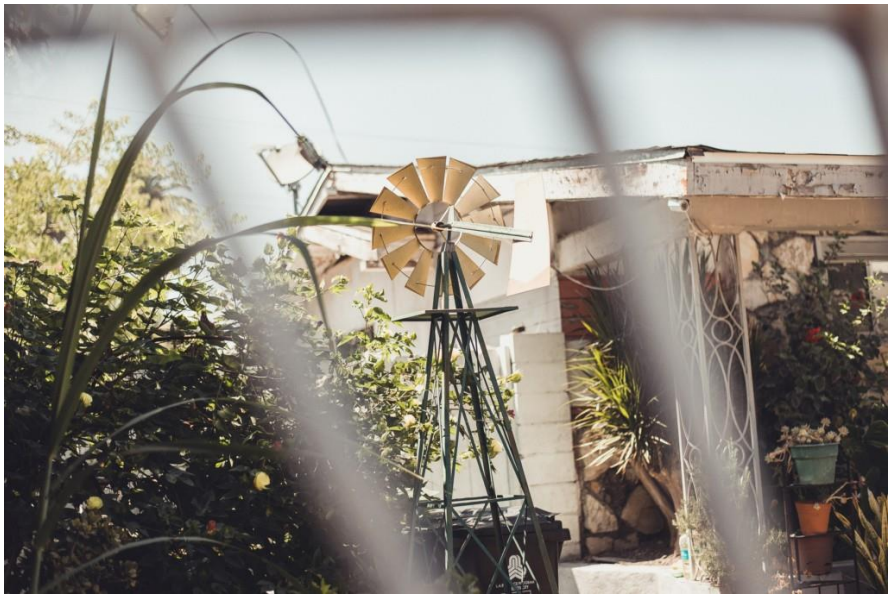
2. Water Culture System

A water culture system is another highly simplistic type of hydroponic system that places the roots of the plant directly into the nutrient solution.

The oxygen that the plants need to survive is sent into the water by a diffuser or air stone. When you use this system, keep in mind that the plants should be secured into their proper position with net pots.

The ***best aspect*** of the water culture system is that the plant roots are placed directly into the nutrient system, which means that the nutrients can be easily absorbed by the plants. Because of the direct access to nutrients and oxygen, plants that are grown with the water culture method will grow very quickly. The best aspects of the water culture system are that it's very easy to make and works well with any kind of plant. Even large plants with sizable foot systems will grow quickly with this method. The only potential issue with this hydroponic system is the development of root diseases, which is caused by dirty growing conditions.

3. Ebb and Flow (Flood and Drain)



The ebb and flow system is another popular hydroponic system that's mainly used among home gardeners. With this type of system, the plants are positioned in a spacious grow bed that's packed with a grow medium like Rockwool or perlite. Once the plants are carefully planted, the grow bed will be flooded with a nutrient-rich solution until the water reaches a couple inches below the top layer of the grow medium, which ensures that the solution doesn't overflow.

The water pump that floods the grow bed is outfitted with a timer that will switch the pump off after a certain amount of time. When this occurs, the water will be drained from the grow bed and sent back into the pump. The ebb and flow system has been found to be effective at growing nearly all types of plants, which includes certain root vegetables like carrots and radishes. However, it's recommended that you don't use particularly large plants with this system. Because of how much space these plants will require, you may not be able to fit enough of the grow medium and nutrient solution into the grow bed with larger plants. The *main issue* with the ebb and flow system is that the pump controller can malfunction, which halts operation until the pump is fixed or replaced.

4. Drip System

A **drip system** is an easy-to-use hydroponic system that can be quickly altered **for different types of plants, which makes this a great system for any grower who plans to make regular changes.** The nutrient solution that's used with a drip system is pumped into a tube that sends the solution straight to the plant base. At the end of each tube is a drip emitter that controls how much solution is placed into the plant. You can adjust the flow to meet the needs of each individual plant.

These systems can be as small or large as you want them to be. They can also be circulating or non-circulating systems. A circulating system will drip almost constantly. Any extra nutrients will be sent back into the tank that holds the nutrient solution. Since you can readily alter the size and flow rate of this hydroponic system, it can be used to grow practically any plant. If you decide to use a circulating system, the main problem that you'll run into is that you'll need to consistently maintain the fluctuating nutrient and pH levels that occur when the solution is recirculate.

5. N.F.T (Nutrient Film Technology)

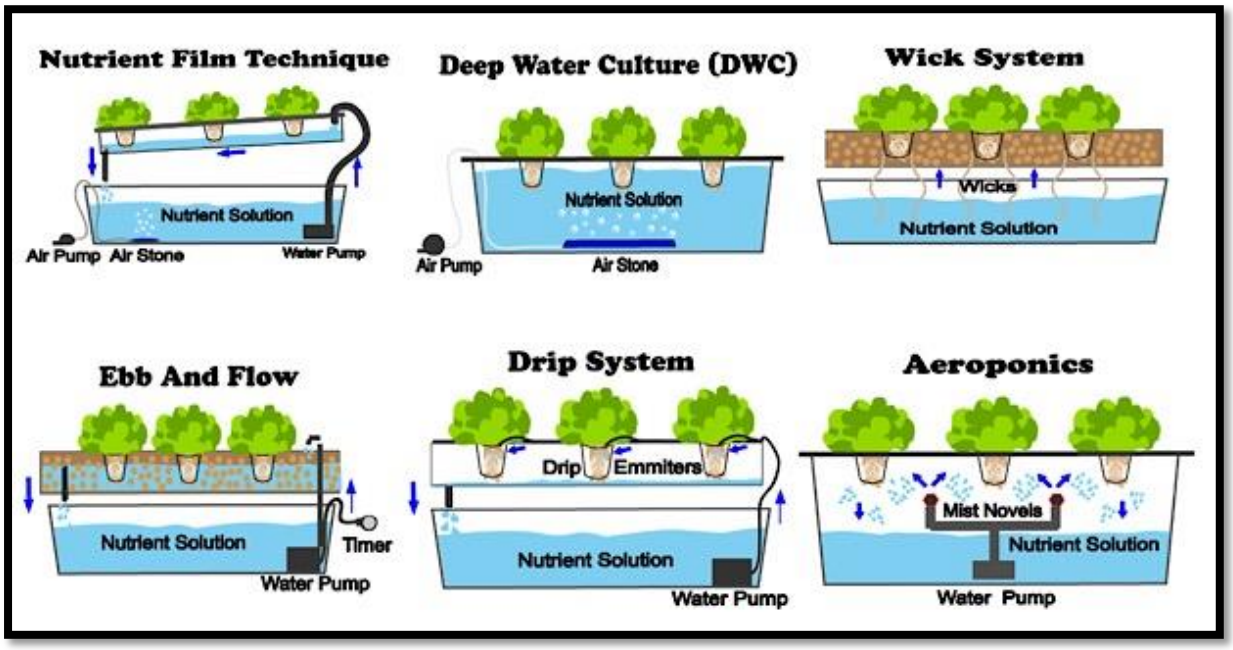
The N.F.T. system has a simple design but is widely used because of how well it scales to a variety of different applications. When you use one of these systems, the nutrient solution is placed into a large reservoir. From here, the solution is pumped into sloped channels that allow the excess nutrients to flow back into the reservoir. When the nutrient solution is sent into the channel, it flows down the slope and over the roots of each plant to provide the right amount of nutrients.

It's ***highly recommended*** that you use net pots with this type of hydroponic system. In most cases, the N.F.T. system won't make use of a growing medium. Since the channels that are used with this system are relatively small, it's recommended that you pair them with plants that have smaller roots. Even though this system can't readily accommodate larger plants, it does scale well, which means that you can alter it to allow for the growth of a large number of plants at the same time. Since it scales well, this system is commonly used by commercial growers alongside home growers.

6. Aeroponic Systems

Aeroponic systems are easy-to-understand but somewhat difficult to build. With this type of system, the plants that you wish to grow will be suspended in air. A couple of mist nozzles are positioned below the plants. These nozzles will spray the nutrient solution onto the roots of each plant, which has proven to be a very effective hydroponic method. The mist nozzles are connected directly to the water pump. When the pressure increases in the pump, the solution is sprayed with any excess falling down into the reservoir below.

As long as you use the right dimensions for the reservoir, you can grow nearly all types of plants in an aeroponic system. However, the reservoir will need to be very deep if you plan on growing larger plants. Otherwise, mist nozzles may not be able to reach all of the roots. Since plants with an aeroponic system are suspended in air, they get all the oxygen that they need. This system also uses less water than any other hydroponic system, which is great for efficiency. However, there are a *couple of issues* with this system. For one, they can be costly to build. The nozzles that spray the nutrients might also become clogged from time to time, which can be frustrating to clean



➔ Advantages.

1. **Hydroponics is the cultivation of plants in water, according to the definition. It is a branch of hydro culture and a useful method of growing plants without the usage of soil.**
2. **Roots absorb nutrients from the water and meet their growth requirements using this method.**
3. **Additionally, by using this method, plants can be grown in liquid, sand, or gravel by simply adding nutrients.**
4. **Following are some of the advantages of using hydroponics:**
    1. **Higher yield.**
    2. **Controlled level of nutrition.**
    3. **Plants are healthier, and they mature faster.**
    4. **Weeds can be easily eliminated.**
    5. **Susceptibility to pests and diseases is negligible.**
    6. **Automation is possible.**
    7. **Water present in the system can be reused, which facilitates water conservation.**
    8. **Ease of harvesting.**
    9. **Crops produced are fitter for consumption.**
    10. **Small production space can be optimised effectively.**

The Right Nutrients for Your Hydroponics Garden

Your plants need nutrients in order to grow, thrive, and survive. Just as each plant's makeup is different, the nutrients that those plants require are also unique.

If you have a hydroponic system, you don't use soil to deliver nutrients. You deliver all of the plants' nutrients through the solution. Your plants will only get those vitamins and minerals that you actively give to them. That means you need to choose the right solutions for the right plants at the right growth stage.

The Basics of Hydroponic Nutrients

The Hydroponic Way

In a traditional growing system, the soil helps to provide additional nutrients to the plants. Quality soil can be a useful growing medium because it provides your plants with the nutrients it needs in a natural way.

However, with a soil system, you have to worry about pests, soil-borne diseases, weather changes, and a loss of growth control. Hydroponic systems are easier, cleaner, eco-friendlier, and a better solution for most growers. Learn more about the benefits of hydroponic systems here.

With a hydroponic system, you completely control your plants' nutrient intake. This control also ensures that there aren't any diseases, pesticides, chemicals, or other problems with your plant's growing medium. The water and nutrient solutions you provide are pure and direct.

But this also means you have to provide *everything* that you want your plants to eat. If you don't give it to them, they won't get those nutrients.

You need a strong selection of nutrient solutions on-hand to provide your plants with the appropriate vitamins and minerals.

There are two types of nutrients you should use in a hydroponic system: base nutrients and additives.

Base Nutrients

Base nutrients are the main meal for your plants. These are solutions that provide a range of multiple vitamins as a complete diet for your plants.

There are different base nutrients for different types of plants. There are also different bases based on the stage of plant development, like the vegetative/growth stage versus the blooming stage.

Ideally, one base solution would provide all of the nutrients your plants need daily. However, in some cases, your plants need a little extra TLC. That's where the additives come in.

Additives

Think about when you get sick. When you have a cold, you need a little extra vitamin C to boost your immune system. When you have a cough, you drink hot tea to soothe your throat.

You may supplement things to your diet even if you aren't sick. For example, you might add salmon to your diet to make your skin glow.

Plants work in the same way. If they are deficient, sick, or need an extra boost, additives can help fill in supplemental nutrients.

5 Key Nutrients

All plants basically need the same 5 key nutrients: nitrogen, phosphorous, potassium, calcium, and magnesium. The difference is that some plants and growth stages require more of one nutrient than another.

Nitrogen

Nitrogen is used for basic stalk and leaf growth in plants. Nitrogen is a major component in chlorophyll, which is the component that allows plants to turn sunlight into energy during photosynthesis. Nitrogen also helps build amino acids that create plant proteins. Without nitrogen, your plants wouldn't have a stem structure and wouldn't be the ability to photosynthesize their food.

Phosphorous

Phosphorous is the key component of your plants' root systems and seed creation. It's part of protein synthesis, so it builds the tissues of your plants like flowers, buds, and roots. It also helps your plants defend against pests and disease. When phosphorous is low, flowers and seeds are often absent or weak. Learn more about the importance of phosphorous in plants here.

Potassium

Potassium regulates the plants intake of CO2 during the photosynthesis process. Without CO2, the photosynthesis process doesn't work. Potassium also helps regulate your plant's water levels and activate growth enzymes. When potassium levels are low, plant growth slows because they can't take in CO2 or water appropriately.

Calcium

Calcium is a key part of the cell wall of the plant. A durable cell wall strengthens and develops tissues at a faster rate. Calcium can also neutralize cell acids, which allows for greater water and nutrient penetration. A lack of calcium leads to a breakdown of the cell structure, causing a withered, browned look.

Magnesium

Magnesium increases the plant's intake of phosphorous, which assists with the photosynthesis process. Magnesium is also a building block of chlorophyll, the key growth component that makes your plants green. Without magnesium, your plants start to lose their colour and slow their growth.

Your plants need all five of these nutrients. However, different plants and situations call for different solutions.

Keep in mind that you want a moderate level of these nutrients. Too little and your plants don't have the building blocks they need to survive. Too much and it will suffocate your plant.

How to Choose Base Nutrients

N-P-K Ratio

When choosing base nutrients, you want to look at the N-P-K ratio first. You'll see this on the packaging as three numbers separated by dashes, like 6-5-5. This represents the percentage of nitrogen (N), phosphorous (P), and potassium (K) in the solution.

Most base nutrients will have a balanced N-P-K ratio where all the numbers are the same. For example, it might say 5-5-5, which means it is made up of 5% of each nutrient. This is a good general base for plants.

If your plants need more protein and stronger stalks and leaves, you'll want a higher nitrogen ratio, like 20-6-6.

If you want to improve your plant's flowering and seeds, like during the blooming phase, you want a strong phosphorous count like 6-20-6.

If you're looking to strengthen the roots, like during a plant transplant, you want high phosphorous and potassium counts, like 6-20-20.

You also want to choose whether you want your nutrient solutions to be organic or synthetic.

Organic VS Synthetic

In general, organic solutions are a better option. These are made from plant or animal by-products, like fish emulsion (high nitrogen) and bone meal (high phosphorous).

However, some organic solutions have small particles that clog pumps, tubes, and misters. Thus, synthetic nutrients are often a common choice because they won't clog hydroponic systems. Synthetic solutions are often filled with nitrates, sulphates, phosphates, and man-made chemicals, though.

Ultimately, organic and synthetic have the same volume of nutrients in them. Synthetic nutrients are pre-broken down, though, so they have a faster release. Organic nutrients are a slower release, but they introduce fewer chemicals (and chemicals impact growth and taste).

Forms

Solutions come in a variety of forms, like powder, granular, and liquid. You want to make sure the nutrient base you pick will work with your hydroponic system. For example, if you use a spray and mist system, you'll want a liquid solution.

You'll also want to take budget into account as well. Keep in mind that your plants will need continuous nutrients. When you start them on one nutrient plan, you want to try to keep them on it with consistency, unless they become deficient or react poorly. Thus, keep your on-going budget in mind when choosing your solution.