

HYDROPONICS: A VERSATILE SYSTEM OF PLANT GROWING

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Introduction: Hydroponics (water culture) is a subset of hydroculture, which is the growing of plants in a soil less medium, or an aquatic based environment. Hydroponic growing uses mineral nutrient solutions to feed the plants in water, without soil. For those of us who love growing plants these are exciting times indeed. We are no longer limited by climate or by season in the pursuit of our harmless pleasures. We can grow virtually any plant at virtually any time of the year, the only limitation is our imagination. The simple, effective hydroponics now available, coupled with modern horticultural lighting, have transformed our hobby and freed us to grow our favourite plants where and when we choose.



Advantages of hydroponics

- It is compared with soil, in temperate areas includes accurate control of the nutrition of the plant and hence better growth and yield.
- There is a constant supply of available water to the roots. Evaporation is greatly reduced and loss of water and nutrients through drainage is minimal in recirculating systems.
- There can be a reduction in labour and growing medium costs and a quicker 'turn round' time between crops in protected culture.

Disadvantages

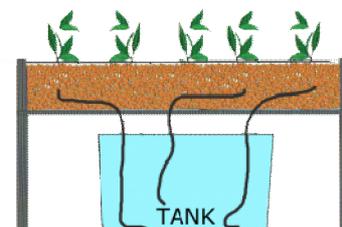
- It includes the high initial costs of construction and the controls of the more elaborate automated systems.
- Active roots require a constant supply of oxygen, but oxygen only moves slowly through water. This can be resolved by pumping air through the water that the plants are grown in, but it is usually achieved on a large scale by growing in thin films of water as created in the nutrient film technique (NFT) or a variation on the very much older aggregate culture methods.

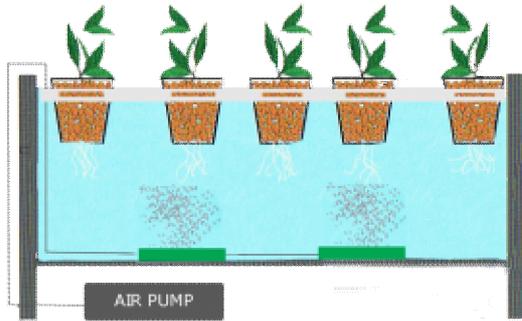
Types of Hydroponics

There are several variations of hydroponics used around the world. What most people don't realise is that there are countless methods and variations of hydroponic gardening.

A. Wick system

It is described as a passive system, by which we mean there are no moving parts. From bottom reservoir, your specific Growth Technology nutrient solutions are drawn up through a number of wicks into the growing medium.



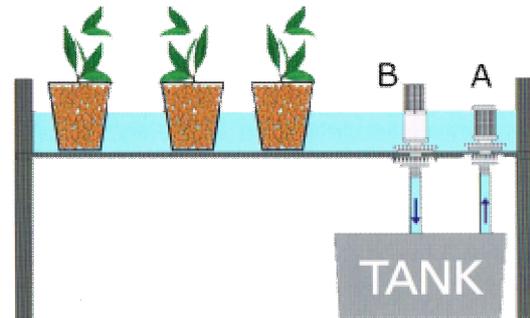


B. Water Culture

This system is an active system with moving parts. It is the simplest hydroculture technique. The roots of the plant are totally immersed in the water which contains the specific Growth Technology nutrient solutions. An air pump with help oxygenate the water and allow the roots to breath.

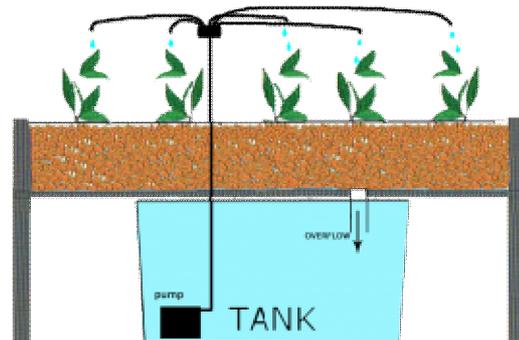
C. Ebb and Flow System (Flood and Drain)

This system works by temporarily flooding the grow tray. The nutrient solution from a reservoir surrounds the roots before draining back. This action is usually automated with a water pump on a timer.



D. Drip System

It is a widely used hydroponic method. A timer will control a water pump, which pumps water and the Growth technology nutrient solutions through a network of elevated water jets. A recovery system will collect excess nutrient solution back into the reservoir. A non-recovery drip system will avoid this allowing the pH of the reservoir not to vary. If using a recovery system, be sure to check the pH level of the reservoir regularly and adjust using either ph Up or pH down solutions on a more frequent basis.



E. Nutrient film technique (NFT)

This is a method of growing plants in a shallow stream of nutrient solution continuously circulated along plastic troughs or gullies. The method is commercially possible because of the development of relatively cheap non-phytotoxic plastics to form the troughs, pipes and tanks. There is no solid rooting medium and a mat of roots develops in the nutrient solution and in the moist atmosphere above it. Nutrient solution is lifted by a pump to feed the gullies directly or via a header tank. The ideal flow rate through the



gullies appears to be 4 litres per minute. The nutrient level is monitored with a conductivity between 6 and 6.5 is also very important.

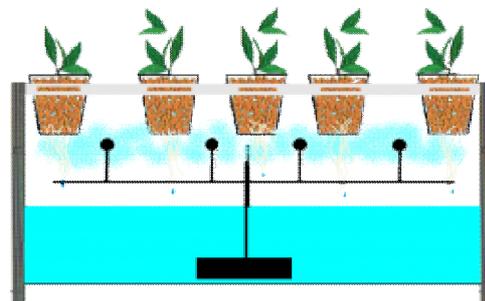
F. Aggregate culture

In aggregate culture the nutrient solution is broken up into water films by an essentially inert solid medium, such as coarse sand or gravel. These growing containers, on which the plants sit, are dripped with a complete nutrient solution at the top with the surplus running out through slits near the bottom on the opposite side. When this method was first developed the NFT systems were copied, *i.e.* the water was recirculated, but it was soon found to be difficult where the quality of water was poor and there was a risk of a build-up of water borne pathogens and trace elements. It was found that the surplus nutrient solution was most easily managed by allowing it to run to waste into the soil. However, this **open system** presents environmental problems and increasingly a **closed system** has had to be adopted. It is now becoming more usual to run the waste to a storage sump via collection gullies or pipes. Some of this can be used to irrigate outdoor crops if nearby.



G. Aeroponic System

The roots hang in the air and are misted with nutrient solution. The misting of roots is usually done every few minutes. The roots will dry out rapidly if the misting cycles are interrupted. A timer controls the nutrient pump much like other types of hydroponic systems, except the aeroponic system needs a short cycle timer that runs the pump for a few seconds every couple of minutes.



References

Adams, C.R.; Bamford, K.M. and Early, M. P. (2008). Alternatives to growing in the soil. *Principles of Horticulture* (5th edn.) pp-394-397.
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