



Hydroponic and Organic Plant Production Systems: Is there any Overlap?

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A question we frequently hear is whether a growing system can be both hydroponic and organic. The answer can be complicated and depends upon how certain terms are defined, as well as preconceived ideas on the part of the individuals involved in the discussion.

What does “Hydroponic” mean?

The literal definition of hydroponic is “working water”. The confusion in defining hydroponic and organic growing systems begins when many people apply the term “hydroponic” to any production system that does not contain soil. Still others use the term when referring to systems that contain only (or mainly) a water solution. Usually the only medium, or solid matter, used in this type of system is for starting seeds. For the purposes of this article, a hydroponic growing system will be defined as one where fertilizer ingredients are in a solution in the root environment of the plants, and any solid media in the plant root environment will not significantly interact with the fertilizer in the water of the system.

What exactly is organic?

Beginning with the implementation of the National Organic Program (NOP), the term organic has usually referred to a plant production system that meets the numerous requirements and restrictions of the NOP. Although one might think this implies that determining whether or not a system is organic would be simple, in fact it is not. Some individuals may not fully understand non-traditional growing systems and may therefore conclude that because a system is non-traditional, it is non-organic. For example a growing system in a greenhouse may not be thought to be organic because it is not in the traditional field setting. For the purposes of this article, we will be referring to an organic production system that is certifiable under the guidelines of the National Organic Program. However, we will not define the certification program itself or its particulars.

Can a production system be both hydroponic and organic?

If a production system meets the definitions of both a hydroponic and an organic system, then it is a hydroponic organic production system. It goes without saying that an organic system is not usually a hydroponic system and that a hydroponic system is not usually an organic system. The question, however, is whether there can be any overlap between a hydroponic system and an organic system. The answer to that question takes some background and definition.

A closer look at hydroponics systems.

Although there is a wide range of working definitions for hydroponic growing systems, a fairly restrictive hydroponic model will be described here. Most people would accept the growing system outlined here as being hydroponic. In a hydroponic growing system, the water in the system is the sole source of the dissolved minerals and other ingredients that are fed to the plant through the roots. The Plants in the system absorb the nutrients they need for growth from the water available in the root environment. Generally speaking, a hydroponic growing system will not contain any medium that interacts nutrients and minerals present in the system's water solution.

Soil is not used in a hydroponic system. It usually interacts with the water it contains, and an equilibrium of soluble components is established between those dissolved in the water and the same components attached to soil particles. The fertilizer components are not attached to the soil particles.

Other media are not used in a hydroponic system. Many other media including organic and mineral media will interact with the fertilizer ingredients in a solution. Organic media might include peat, sawdust, bark, rice hulls, corn-cobs, straw, peanut shells, and coco core. Some mineral media, such as vermiculite, have a high interaction when in contact with fertilizer ingredients in a water solution.

There are mineral ingredients that virtually do not interact with fertilizer ingredients in a system's solution and can be present in the plant rooting volume of a hydroponic system. Common media in this category include perlite, and rockwool. Any interaction between these media and the fertilizer solution is absent or minimal.

A Closer look at organic systems

An organic system, including a certifiable organic system, will include an environment where micro-organisms can live and make otherwise unavailable plant nutrients water soluble and thus available to the plants. This is an important and basic component of any fully organic system or any system that has an organic component operating within it. The media (or at least a portion of the media) and the fertilizers used in the plant production system are the food and energy sources for the micro organisms living and operating within that system.

Usually the microorganisms are active in the media surrounding the roots of the plants in the organic production system. This is consistent with traditional or usual plant production systems utilizing soil as the growing medium, which also harbors micro organisms that interact and provide nutrients to the plants.

The Hydroponic and organic system overlap

When the microbial activity in a growing system is lodged in a physically separate location from the plant root environment and the nutrients are delivered to the plant roots via solution, a system that is both hydroponic and certifiably organic can and has been developed. One such system is the commercial system illustrated in the accompanying pictures, which is operating in the northeastern part of the United States. It has been certified as organic under the NOP, and the produce growing in system are being sold as certified organic produce.

This particular system is a nutrient film technique (NFT) hydroponic system that uses only NOP-approved materials. The insoluble components are located and operate in an environment separate from the plant root environment. The digestion system bears similarities to systems used in fish waste digestion and some "aquaponic" systems.

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ever many similarities to what some growers and experimenters have been working with and using for several years. Plant growth and production in the system is comparable to that in a traditional soluble fertilizer NFT system. This is because the system is working optimally.

During the development process of this system, experimental systems leading to the final version produced many crops that grew much more slowly. A system that produces slower plant growth is not providing all the necessary nutrients at sufficient frequency for optimal plant growth. Until the systems were fine tuned, crop growth could be inconsistent.

The NFT hydroponic organic production system

The herbs and lettuce in the accompanying pictures are growing in NFT channels. The only medium utilized in the system is a small plug of soil less material used to keep the seed or seeds from floating away during germination. The plug is placed into the production channels, but it plays no other role than to stabilize the seed. The channels are continuously fed a solution of fertilizer ingredients that were produced in an organic digestion system. The digestion system, the source of nutrient solution that is circulated through the growing channels, uses a shredded solid that provides surface area for growth and activity of the micro-organisms. Fertilizer ingredients are periodically added to the digestion system, where they are processed by the micro organisms. The effluent from the digester is fed into the recirculating NFT feed system to provide nutrition through the roots of the plant.

The size of the digester must be in correct proportion to the production system needs to provide adequate nutrients for the plants to achieve optimal growth. However the system cannot be oversized relative to the systems needs. If the nutrients produced by the digestive system are not used by the plants, they need to be disposed of in some other way to ensure the ongoing health of the micro-organisms. This creates an un-wanted issue for the grower. Proper sizing of the system is important for optimum operation and the survival of the microbial population.

Why Hydroponic and Organic?

NFT systems have a nutrient solution reservoir from which the solution is continually pumped through the channels and back to the reservoir. The plant roots are in an environment where their only source of nutrients is solution pumped through the channels. This makes the system hydroponic in its function. However, because the NOP-approved nutrients are made soluble by organic micro-organisms in a digester system attached to the growing system, the system is also organic. But why go organic at all? Why don't we see produce marketed as hydroponic organic produce?

Here is the reason: among the general population, there is more familiarity with the term "organic", and all its perceived benefits, than with the term "hydroponic." As a result, the term hydroponic gives no marketing benefit and may in some instances backfire by raising questions or negative responses to the produce. Organic produce is perceived as more desirable, and therefore, more valuable than hydroponic or hydroponic organic produce. Growers using a hydroponic organic production system will market their produce as being organic because that will command a premium price in most markets.

Why grow with an NFT organic system at all? The hydroponic NFT system is capable of more rapid plant growth and produce production than most media based, traditional growing systems. The system described here gives both the rapid growth of a hydroponic NFT system and organic produce that commands the high price in the market.