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Hydroponics as an Advanced Technique for Strawberry Production

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Introduction

Strawberry is widely distributed soft fruits in the whole world due to its genotypic diversity, broad range of environmental adaptations, and highly heterozygous nature. Despite being a native of temperate climates, there are types that can be grown in tropical and subtropical climates. Strawberry (Fragaria × ananassa Duch.) belongs to family *Rosaceae* and genus Fragaria. Strawberry is a monoecious octaploid (2n = 56) . A well drained loamy soil with enough organic matter is ideal for strawberry production having pH range from 5.7 to 6.5 i.e. acidic in nature. Light soils and high levels of organic matter are beneficial for runner's development. The most accessible growing medium for plants is typically soil. However, soils do have some major constraints on growth and development, such as the presence of disease-causing organisms, nematodes, unfavourable soil compaction, unfavourable soil response, poor drainage, and deterioration owing to erosive processes.

Furthermore, the soil is not available for crop growth in metropolitan areas, and in some regions, a lack of fertile cultivable arable lands is a serious issue as a result of their unfavourable topographical or geographical circumstances. Plants grown hydroponically have their roots submerged in fertilizer solution while growing in a soil-free environment.. This technology helps manage the production system for efficient natural resource use and the reduction of malnutrition in addition to addressing the issue of climate change.

It was discovered that this technology saved 90% of the water and reduced the amount of agricultural area needed by at least 75%. Furthermore, numerous hydroponics researchers have shown a sizable profit as well as food that is microbe-free. Strawberry is a high- value crop, so the use of new technologies in modern agriculture related such as polyhouse, low tunnels, plastic films, shading screens and plastic mulch is increasing to obtain higher productivity and quality of fruits.

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Definition

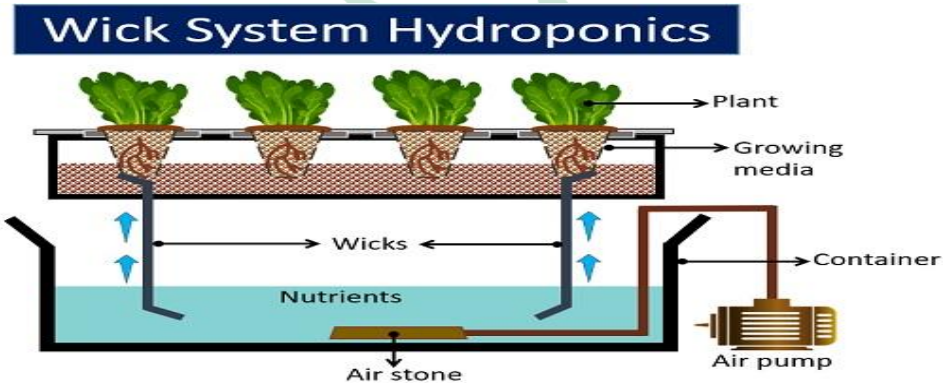
The art and science of soilless crop cultivation are known as hydroponics. It is a technology of growing plants in a nutrient solution with or without containing artificial medium (Sand, Vermiculite, Perlite, Gravel, etc.) to provide mechanical support. The word hydroponics was coined by William Gericke in the early 1930's. The area where environmental stress is a major issue, this strategy is highly helpful. In a hydroponic system, crops can be grown all year long and are regarded as off-season. The technologies of hydroponics and aeroponics are extremely important in the production of commercial food in the twenty-first century. Natural media is useful in this technology for growing plants. Plant roots are contained within a conduit that is connected to a reservoir of nutritional solution or suspended above the reservoir. Due to its effective resource management and high-quality food output, hydroponic farming is currently becoming more and more popular worldwide.

History of Hydroponics

The Greek words "hydro" meaning water and "ponos" meaning labor are the origin of the name "hydroponics." This phrase was first used in 1929 by Dr. Gericke, a professor from California who was developing what had previously been a lab technique into a practical way to cultivate plants. During World War II, the U.S. Army used hydroponic culture to grow fresh food for troops stationed on barren Pacific islands. Commercially successful farms existed in America, Europe, Africa, and Asia by the 1950s.

Types of Hydroponics Systems in Solution Culture

- **The wick system{-** This is a passive system which means there are not any moving parts.A wick is used to pull the nutrient solution from the reservoir into the growing media. Some of the most well-liked products are coconut fiber, perlite, vermiculite, and pro-mix can use as a growing medium.



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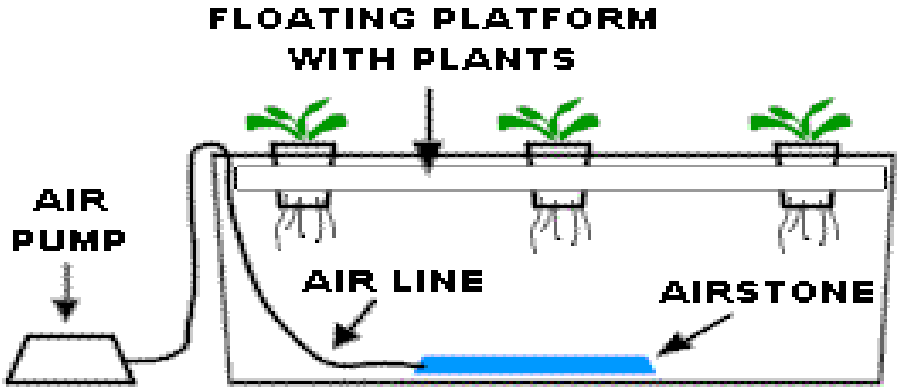
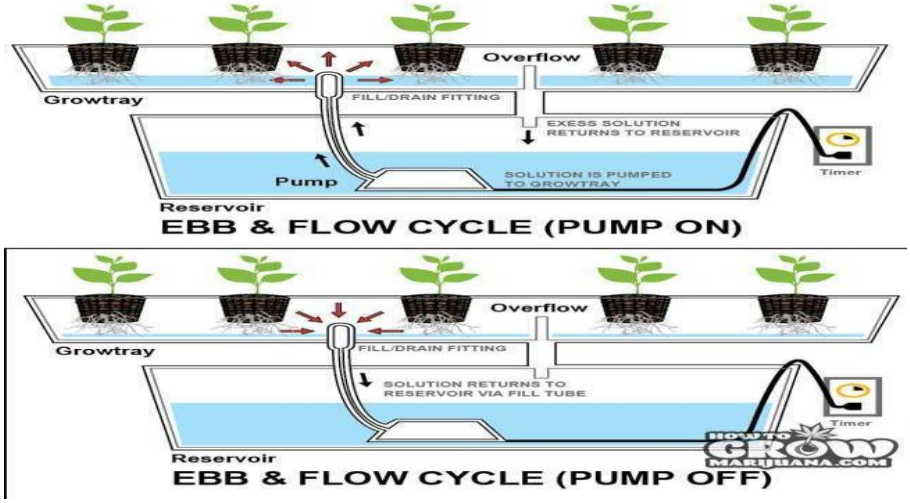
- **The Water Culture System-**The water culture system is the simplest and typically made of styrofoam, the platform that holds the plants floats on the nutrient solution. An air pump delivers air to the air stone, which causes the nutrient solution to bubble and provides oxygen to the plant's roots.



- **The Ebb and Flow System (Flood And Drain)-** The ebb and flow systemworks with the nutrient solution and temporarily floods the grow before being drained back into the reservoir. Typically, a submersible pump that is linked to a timer is used for this action. Depending on the size and type of the plants, the temperature, humidity,and the type of growing medium being used, the timer is set to turn on multiple times daily. A variety of growing mediums are filled in trays with grow rocks, gravel, or granular rockwool. Individual pots filled with the growing medium are popular because they make it simple to move plants around or even move them into or out of a system.



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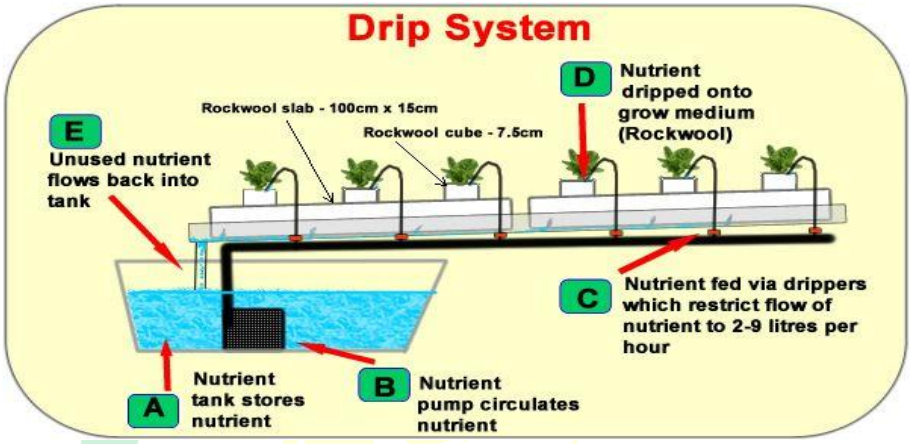
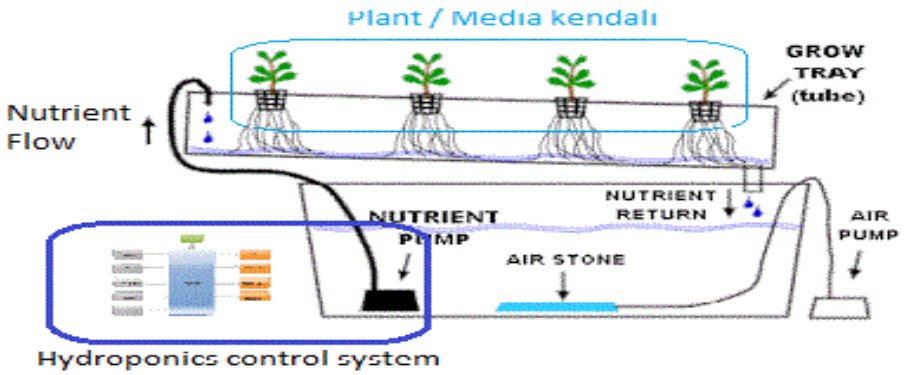
- **Drip Systems-** The hydroponic system that is probably utilized the most around the world is the drip system. Simple submersible pump operation is controlled by a timer. A small drip line drips the nutrient solution onto the base of each plant as the timer activates the pump. In the recovery system the excess nutrient solution that runoff is collected back into the reservoir for reuse. The no recovery does not collect the runoff. It can easily be designed in many ways from small to large systems.



- **N.F.T (Nutrient Flim Technique)-** The N.F.T. system (Nutrient Film Technique) is highly well-liked by home hydroponic growers as well because of its fairly simple design. The nutrient solution flows continuously in N.F.T. systems, negating the need for a submersible pump timer. The nutrient solution is pumped into the growing tray and passes over the plant roots before returning to the reservoir. This is usually no growing medium used other than air, which saves the expense of replacing the growing medium after every crop. When the supply of nutritional solution is stopped, the roots begin to dry out extremely quickly. Any time the water stops running through the system, the plants will start to wilt quickly.



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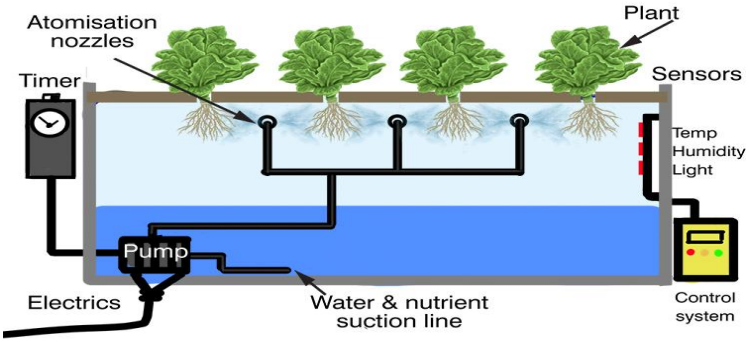
- **The Aeroponic System-** The most advanced hydroponic farming method is arguably the aeroponic system. Like conventional hydroponic systems, the nutrient pump is controlled by a timer, however, an aeroponic system requires a short cycle timer that runs the pump for a brief period every few minutes. One advantage of an aeroponic system is the fact that it frequently utilizes little or no growing media. The roots receive the most oxygen possible, which helps the plants grow more quickly.



Media Used In Hydroponics

- **Coco-Coir:** It is an excellent air-to-water ratio with great water retention.
- **Rockwool**: It is a fibrous material made from melted rock, no biodegradable, has excellent water retention, and is hazardous to health
- **Perlite**: It is a mineral that has been superheated so it expands into lightweight pebbles that are pH neutral, porous, and very absorbent.
- **Vermiculite**: It is another type of expanded mineral, vermiculite is very similar to perlite, but with a higher cation-exchange capacity, allowing it to store unused minerals for release to the plants as needed.
- **Expanded clay**: It is the most popular media, drains quickly, pH neutral, and is reusable also.

Advantages

- It can be utilized in locations where in-ground farming or gardening are impractical, such as dry desert regions or areas with a chilly climate).
- Greater control over the growing environment, pH, and nutritional content.
- Lower expenses for nutrients and water due to recycling of these resources.
- Faster growth since the root area has more oxygen accessible.
- The eradication or decrease of bacteria, fungi, and insects connected to the soil.

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- No cultivation or weeding is necessary.
- Transplant shock is lessened; crop rotation/fallowing is not required.

Disadvantages

- High initial investment
- Proper operation requires skill and knowledge.
- Highly technical
- Precision surveillance

Future Thrust

- The future of hydroponics appears more positive today than at any time over the last 50 years.
- Hydroponics is now regarded as a promising method for raising various horticulture crops
- There is a need to conduct awareness programmes and training programmes on the growing techniques of hydroponics.

Conclusion

The industry with the fastest growth potential is hydroponics, which may come to dominate food production. One of the technologies that could double a farmer's revenue is hydroponics. Hydroponics technology will be crucial in the changing food habits situation for year-round, sustainable production in urban and peri-urban regions. There is no other choice but to adopt a soil-less culture to help boost the quantity and quality of the product in order to secure food security for our nation due to growing urbanization's crowded cities without gardens.