

## Aeroponics: Growing in the mist

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### Aeroponics: Growing in the mist

We grew up in an era where farming without soil was considered insurmountable. The soil was a compulsory base for agriculture. Traditional farming always earned trust from agriculture by considering soil as divine. This era slowly began to grow using the brains of scientists and technology. Now man stands in a generation where we grew plants from tiny parts of plants using tissue culture, water being the only medium we cultivated loads of vegetables and aquaculture. Currently, our science is mainly focused on creating a breakthrough using mist, YES it's Aeroponics. We have obtained successful research results from growing plants in the air without an aggregate medium. AEROPONICS is derived from Greek words *aer* meaning 'air' and *ponos* meaning 'labour'. The basic method of aeroponic culture is by growing plants in a closed or semi-closed volume along with intermittent spraying of nutrient-rich water or high-pressure mist containing nutrients. It was an advanced form of hydroponics and other systems.

Different types of aeroponic systems are at one's fingertips nowadays.

- **Low-pressure units**

In this system, plants are hung above a reservoir of nutrient solution or inside a pipe connected to a reservoir. It is the most commonly used because of its low cost and easy availability. These are usually suitable for benchtop farming. They lack the property of purifying the nutrient solution.

- **High-pressure units**

This system pumps mist through high-pressure pumps. They are used in the cultivation of high-value crops and include purification of nutrients solution along with pressurized nutrient supply. These are costly, advanced, and used in commercial production.

- **Ultrasonic fogger aeroponics**

This system is also known as fogponics. It consists of an ultrasonic fogger to atomize water into super small water droplets.

- **Commercial systems**

These consist of high-pressure device hardware and biological systems. The high-pressure devices, are used for the cultivation of high-value crops and include effluent control systems, disease prevention, pathogen resistance features, precision timing, and nutrient solution pressurization.

- In air culture, there is the least contact between the plant support structure and plant as a result maximum supply of air reaches the dangling roots. The roots free from hindrances surrounding roots and stem allows for successful long-term cultivation. Without the presence of obstacles, there will be easy root expansion, disease-free conditions, and absorption of more nutrients. This can also be an advantage of aeroponics as the presence of more air can prevent pathogen growth. As in the case of traditional or hydroponic culture, the support system may be a causeway to infection of diseases. Commercially plants density increases because of this advantage and the use of hardware accommodates expanding roots. Aeroponics use foggers, sprays, and other equipment to produce minute water droplets which is a major step in their increased productivity. As the size of a droplet decreases the availability of oxygen in it increases. Aeroponics often combined with hydroponics may act as an emergency crop saver if the root systems are delicate.
- In the year 1983, a company named GTi introduced the world's first aeroponic device which later on became the genesis rooting system. Again in 1985, they put forward the second-generation aeroponic system called the genesis growing system.
- The research field has always being strengthened with the introduction of air culture. The study of the root zone gas composition and its effect on growth was done with the help of aeroponics. This also led to the research of aero-hydroponics to prove the importance of oxygen in root formation. Researchers have also regarded it as a simple and effective technique to find out the resistant genes against various diseases like root rot and blight. It also proved a better source of research in infections in roots compared to soil culture infections.

- The development of roots undergrowth is being examined using this research tool. Aeroponics is used in water stress conditions as it perfectly fits in control of root system moisture. It is used in the production of crops which have minimal water stress condition to cultivate in drought and other affected areas. Research results state that root system morphology and better than hydroponics in the case of normal root formation.
- NASA provides funds to researchers focusing on aeroponic technology and its development. It must be done to increase the effectiveness and decrease its maintenance issues. They have introduced a high-pressure hydro-atomized mist of 5-50 mm microdroplets to sustain long-term air culture. In aeroponics, there is a fixed interval of nutrient supply which also helps in the assessment of nutrient uptake in regular intervals. The study involved the calculation of influx and efflux concentrations which indicate nutrient uptake rate.
- The cloning field also experienced greater enhancements by this air culture. The stem cuttings which was prone to infections during traditional methods were free from all those by using aeroponics. Aeroponics promoted easy, hygienic growth of roots because the roots are not supported by any infected medium. In tissue culture technology the procedure was completed quickly using aeroponics. Leaf loss, wilting, transplant shock were considered a barrier while using hydroponics now removed by air culture.
- Aeroponics did not survive on earth alone it has reached space due to its positive response. It was proved for the first time by the aeroponic lettuce culture. This research was done to obtain an alternative for the different gravitational environment that was against plant growth. Water handling, minimal water use, minimization of weight were those obstacles that led to this research. On earth, the heavyweight equipment was considered bigger trouble while carrying to space. AIS / inflatable low-mass aeroponic system was an important introduction in the case of earth and space food production.
- Present-day research in this field includes contemporary aeroponics led by NASA, aeroponic bio-pharming, GM crops, and the list goes on. Aeroponics is highly dependable on technology which is disadvantageous to common farmers. Large-scale commercialization has not yet reached excellence because small and marginal farmers are not used to this high technical knowledge. The outcome of this can be a benefit only when the whole farming community is capable of using it whether in the case of finance or technology.

