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HYDROPONICS: A SYSTEM OF SOILLESS CULTURE

*Barkha Rani, Bhawani Singh Prajapat, Rodda Chandana Devi

Dept. of Soil Science & agril. Chem. JAU Junagadh

Main author email:- aryaamaira24@gmail.com

*Corresponding Author email:- bspagro1992@gmail.com

Introduction:-

Hydroponics is part of soilless culture, growing plants in nutrient solution with or without the use of artificial medium. Simple meaning is working with water. Hydroponics in its true sense strictly means included only water or solution culture. Virtually all hydroponic system in temperate regions of the world are enclosed in greenhouse type structure to provide temperature control, reduce evaporative water loss, reduce disease and pest infestations, and protect crops against the elements of weather, such as wind and rain. Hydroponics uses less than one tenth of water used in soil cultivation. Soil-less culture mainly refers to the techniques of Hydroponics and Aeroponics. The term Hydroponics was derived from the Greek words *hydro* means water and *ponos* means labour. It is a method of growing plants using mineral nutrient solutions, without soil. Terrestrial plants can be grown with their roots in the mineral nutrient solution only or in an inert medium, such as perlite, gravel, or mineral wool. This system helps to face the challenges of climate change and also helps in production system management for efficient utilization of natural resources and mitigating malnutrition. In India, Hydroponics was introduced in year 1946 by an English scientist, W. J. Shalto Douglas and he established a laboratory in Kalimpong area, West Bengal.

Need of Hydroponics:-

Continous cultivation of crops resulted in poor soil fertility, which in turn has reduced the opportunities for natural soil fertility build up by microbes. This situation has led to poor yield and quality. In addition, conventional crop growing in soil is difficult as it involves large space, lot of labour and large volume of water and in some places like metropolitan areas, soil is not available for crop growing.

Why grow things Hydroponically?

Some hydroponic growers have found they get yields many times greater when they switch from conventional methods. Because hydroponically grown plants dip their roots directly into



nutrient-rich solutions, they get what they need much more easily than plants growing in soil, so they need much smaller root systems and can divert more energy into leaf and stem growth. With little root system we can grow more plants in the same area and get more yield from the same amount of ground (which is

particularly good news if we're growing in a smaller area like a greenhouse or on a balcony or

window-ledge inside). Hydroponic plants also grow faster. Many pests are carried in soil, so doing without it generally gives us a more hygienic growing system with fewer problems of disease. Since hydroponics is ideal for indoor planting, we can use it to grow plants all round the year.

Methods of Growing Hydroponics:-

There are various methods of growing crops hydroponically. In one popular method, we stand our plants in a plastic trough and let a nutrient solution trickle past their roots (with the help of gravity and a pump). That's called the nutrient-film technique: The nutrient is like a kind of liquid conveyor belt- it is constantly sliding past the roots delivering to them the goodness they need. Alternatively, we can grow plants with their roots supported by a nutrient-enriched medium such as rockwool, sand, or vermiculite, which acts as a sterile substitute for soil. Another method is called aeroponics and it is exemplified by a popular product called the Aero Garden. Although the name suggests we're growing plants in air, the roots are actually suspended inside a container full of extremely humid air. Effectively, the roots grow in a nutrient-rich aerosol a bit like a cloud packed full of minerals, (Sardare and Admane 2013).

Supply of nutrients to the plants:-

The frequency and volume of the nutrient solution applied depends on type of substrate used, crop, size of container, irrigation system used and prevailing climatic conditions.

- Plants should be fed daily between 6.00 and 8.00 am though water requirement will vary considerably throughout the day, and from one day to another.
- The solution should be applied to the roots, trying to avoid wetting the leaves to prevent damage and the appearance of diseases.
- It is generally recommended that apply only water to the plants once a week , in order to flush away any excess accumulation of salts
- The excess nutrient solution that is drained away from containers during daily watering can be reused in the next watering. (Treftz and Omaye, 2015).

Advantages of Hydroponic Technique:

- Through hydroponic gardening; plants can be grown anywhere as long as their growth requirements are met.
- It uses only 1/10th of water compared to traditional (soil based) gardening.
- It provides a sterile environment for plant production. This technique does not require pesticides, fertilizers and other chemicals, as there is no chance of damage due to soil-borne diseases or pests.
- Crops grow two times faster in hydroponic. It provides controlled environment, and yield is doubled leading to more production from same amount of space.
- It needs 20% of less space in comparison to soil based gardens, as plants with small roots can be grown closer to each other.
- Run-off in traditional gardening can lead to environment degradation due to high proportion of calcium, phosphorous and potassium content dissolved in it. But in hydroponic systems; water can be reused multiple times leading to water conservation with less expense incurred on it.



Plants grown through this technique are healthy and have better nutritional value. It has been proved that vitamin content is 50% more in hydroponically grown plants as compared to conventional ones.

There's no-doubt in the fact that hydroponics involves less labor. Upkeep is also minimal.

- It's simple to get complete control over nutrient balance by using solutions like Olivia's Growing Solution. (Moboko *et al.*, 2009)
- There are no soil setup and testing hassles.

Limitations of Hydroponic Gardening:

- Initial set up cost of hydroponic system is high. It requires constant supervision.
- These gardens can also become susceptible to power outage; in this case plants will dry out. If this ever happens, you have to manually water your garden.
- Water-based microorganism can be easily introduced. Technical knowledge is required for growing plants through hydroponics.

Conclusion:-Now a day's hydroponics adopted rapidly and results showed in various countries have proved that this technology has a very definite advantages over conventional methods of crop production. The commercial hydroponics industry is a successful industry and is rapidly expanding. Government intervention and university interest can propel the use of this technology.

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