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E: ISSN NO.: 2455-0817 *Remarking An Analisation*

Aeroponics: A Soilless Cultivation System

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Abstract

Aeroponics is a practice in which plants are grown and nourished by suspending their root structures in air and regularly spraying them with a nutrient and water mist solution. It is a soiless culture, because the plants can thrive when their roots are constantly or periodically exposed to a nutrient-rich mist.Aeroponics offers an efficient means to grow plants, including fruits and vegetables, without potting and re-potting them to replenish their access to nutrient-rich soil. The approach is mainly employed in indoor vertical farms, which are increasingly common in cities – cutting down on the environmental costs of getting food from field to plate. And because aeroponics systems are fully enclosed, there is no nutrient runoff to foul nearby waterways. Rather than treating pest and disease with harsh chemicals, the growing equipment can simply be sterilized as needed. In practice, aeroponics systems are primarily used for the same applications as hydroponics systems, including leafy greens, culinary herbs, marijuana, strawberries, tomatoes, and cucumbers. One exception is root crops, which are impractical in a hydroponic system, but well-suited to aeroponics, as the roots have plenty of room to grow and are easily accessible for harvesting.

Keywords: Aeroponics, Soilless Culture, Hydroponics.

Introduction

Soil is the essential growing medium for plants which contain all nutrients and minerals required for its growth. It also provides anchorage and base for plant development. Sometimes presence of disease pathogens, infertility, drought, degradation all these factor acts as a negative motive for plant growth. Crop growing in field requires very large land, labour and water which can be a limiting factor in some conditions. Under such unfavourable conditions soilless culture of plants may be taken as an option for example Hydroponics, aeroponics and aquaponics.

Hydroponics is technique of growing plants without soil but providing them nutrient medium solution contaiinig all essential nutrients and minerals required for plant growth. Singh *et. al*.(2012) opined that hydroponics is the technique of growing plants in soil less condition with the root immersed in nutrient solution. Hydroponics involves continuous flow of water which is limited to area having water scarcity. Therefore a more advanced technique of waterless as well as soil less culture was originated known as aeroponics. Aeroponics is the process of growing plants in an air or mist environment without the use of soil or an aggregate medium (known as geoponics). The word "aeroponic" is derived from the Greek meanings of *aer* (air) and *ponos* (labour). Aeroponic culture differs from conventional hydroponics, aquaponics, and in-vitro (plant tissue culture) growing. Unlike hydroponics, which uses a liquid nutrient solution as growing medium and essential minerals to sustain plant growth; or aquaponics which uses water and fish waste, aeroponics is conducted without a growing medium (Stoner *et. al*. 1998).

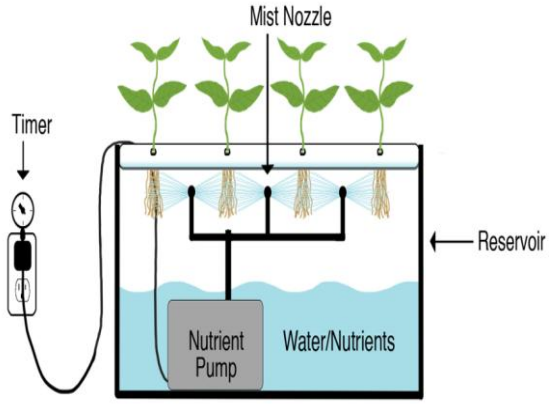
Aim of the Study

Aeroponics technique has the crucial benefits. Faster and healthier growth since it has enough oxygen (in the root region) . This will increase the cycle period with about 45 – 70%. Automated system, no dirt produced, no herbicide or pesticide needed. There is also scientific proof of increase flavonoids in vegetables. The main objectives of the aeroponics are it makes farming easier to manage, eliminate waste of vegetables during harvest caused by pathogens (algae and mold), Increase speed of plant growth which increases frequency of harvest as well as profit. (Growth increases between 45% and 70% in certain cases), increased profit allows for re investment and expansion, Substantial expansions

creates more jobs and raises the Nigerian standard of living. Eliminate seasonal dependency due to controlled climate within the green house. This increases profit due to lack of certain vegetable availability in the market within certain seasons, Aeroponics reduces cost of maintenance requirements such as fertilizer, chemicals, insect fumigation , soil, staff and more, Aeroponics drastically reduces the amount of water required due to the recycled water structure put in place. Aeroponics can be applied on a small, medium and industrial large scale.

Techniques of Aeroponics

Techniques of growing plants without soil were first developed in 1920s by botanists who used primitive aeroponics to study plant root structure, aeroponics has long been used as research tool in root physiology. (Gopinath *et, al*. 2017). Carter (1942) studied the air culture of growing the plants in water vapour to the roots structure. In 1944, L.J. Klotz was the first to discover vapour misted citrus plants to study the disease of citrus and avocado roots. Fifteen year after studies of Carter (1942) and Went(1957) name process of growing plant in air as “aeroponics”. Aeroponic system has been successfully applied in several horticulture and ornamental crops. Many countries are growing vegetables, fruits, ornamental as well as medicinal plants by the aeroponic system of plant production. The multiplication rate of potato tubers have been increased at the rate of 1:13 in aeroponic system over a five month period with weekly harvest (Farran and Mingo 2006).



Composition of Aeroponic System Mist Solution

In aeroponic system plant are nurtured by spraying mist of particular droplet size at regular interval and utilised by the roots through osmosis. Aeroponics create the possibilities of growing the plants by saving water and nutrient solution, making plant soil borne disease minimal and obtaining maximum yield. Water in the form of mist is supplied containing primary nutrients such as potassium, nitrogen, phosphorus and secondary nutrients like calcium, magnesium, and sulphur, micronutrients like iron, zinc, molybdenum,manganese, boron, copper, cobalt and chlorine. Roots consume nutrients in the form of cations and anions and the pH of the solutions is changing due to these ions, but the optimal pH ranges from 5.8 to 6.3.(Gopinath *et. al.* 2014)

Crop That Can Be Grown in Aeroponic system

Crops like potato, yams, lettuce, leafy vegetables, utrica diocia and many other medicinal plants can be grown in the aerponic system of cultivation. minitubers of potato and yam are harvested and has a high yield as compared to other culture system (Maroya *et. al*., 2014, Mateus-Rodriguez *et. al*., 2012).

Demsar *et. al.*,(2004) studied the effect of light dependent application on the growth and yield of aeroponically grown lettuce. It was also found that effect of elevated root zone CO2 and air temperature observed on photosynthetic gas exchange, nitrate uptake and total reduced nitogen content in aeroponically grown lettuce plant(Luo*et. al.*. 2009).

Comparative study between the phytochemicals and antioxidant activity was conduted by Chandra *et. al.*,(2014) were done in the leafy vegetable herbs(basil, parsley and red kale) and fruit crops(bell pepper, cherry, tomato, cucumber and squash), the result showed increase antioxidant activity in aeroponically grown crops as compared to those grown in soil(Komosa *et. al,*. 2014,). Total phenolics, flavonoids, vitamin C and biomass production was high in aeroponically grown crops (Bohme*et. al.*2014).

Advantages and disadvantages of Aeroponic System

As recent researches proved that there are many benefits of aeroponically grown crops as compared to other methods. When focussed upon the advantsged of the aeroponic system it is noticeable that aeroponic system requires less fertiliser, less water, reduces disease damageand most cost effective. Value addition of different nutrients and its intake by root can be increased by this culture system. This system requires very less space and has faster and healthier growth and gives more yield as compared to other cropping system. So, this system of agriculture can be promoted for the production in areas with less fertile soil and water scarce areas.

Conclusion

Aeroponic system is more cost effective but has disadvantage of having more expensive for large scale production of crops. The variety of the crops grown is also limited as compared to cultivation in soil. The maintenance of these aeroponic farms is very expensive.

Furture Prospects

Aeroponic system of culture offers a potential method of utilizing minimum space and improving production and reduces cost as compared to conventional method or other soil less method of crop production. This method includes no pesticides and high yield. Commercial production of potato yubers are progressively developing in countries like Korea , Peru China and India (Kang *et. al.*. 1996, Kim *et. al.*1999,Lungaho *et. al.*. 2010) This methodology have been vigorously tested in other countries around the world and incorporated in the agricultural system foe the sustainable development. so there is a need of developing such alternative methods of cultivation to fulfil the food needs of increasing population and limiting land and space for agriculture.

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