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# Auto Hydroponic Growth Chamber for Precision Agriculture

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**ABSTRACT:** Hydroponics is a method of growing plants without soil, by supplying mineral nutrient solutions in water. By using this technique a farmer can cultivate one or more field simultaneously. In this paper we have designed an indoor agriculture unit and have grown some plants in which nutrition management is done automatically by using various sensors and micro controller unit.

**KEYWORDS:** Plant growth without soil, Automated indoor maintenance, Sensors, Water Solution

## I. INTRODUCTION

The aim of this work is to style and construct an enclosed automatic hydroponic system that doesn't rely on the surface climate. The designed system is capable to grow common variety of crops which will be used as a food supply within homes while not the requirement of huge area. A microcontroller was operating as a brain of the system, that communicates with different types of sensors to regulate all the system parameters and to reduce the human intervention. The designed system is capable of maintaining healthy growing parameters for the plants with negligible input from the user. The practicality of the general system was confirmed by evaluating the response from individual system parts and observance them. This technique offers period of time notifications to alert the hydroponic system user once the conditions don't seem to be favourable. So, the user will monitor many parameters while not exploitation laboratory instruments, which can enable to regulate the whole system remotely. Moreover, the system additionally provides a large vary of knowledge, that can be essential for plant researchers and provides a larger understanding of however the key parameters of hydroponic system correlate with plant growth. The projected platform is used each for quantitatively optimizing the setup of the indoor farming and for automating a number of the foremost labour intensive maintenance activities. Moreover, such a observance system may doubtless be used for high-level higher cognitive process, once enough knowledge are going to be collected.

## II. RELATED WORK

The earliest written work on growing plants without soil was the 1627 book forest Sylvarum or 'A Natural History' by Francis Bacon, printed one year after his death. Water culture became a well-liked analysis technique at that time. In 1699 John Woodward printed his water culture experiments with *Mentha spicata*. By 1842, a listing of 9 parts believed to be essential for plant growth had been compiled, and also the discoveries of German botanists Julius von Sachs and Wilhelm Knop, within the years 1859–1875, resulted in an exceedingly development of the technique of soilless cultivation. Growth of terrestrial plants without soil in mineral nutrient answers was referred to as solution culture. It quickly became a regular analysis and teaching technique and remains wide used.

### III. METHODOLOGY

The system Consists of four sections viz., Light source unit, Temperature and humidity unit, Water Concentration unit, Alarm unit. Arduino UNO is used as Microcontroller which regulates various sensors in the circuit. For wireless communication HC-05 is a Bluetooth Module is used. 16X2 LCD is used as display unit.

Grow light for indoor plant allows to cultivate wide variety of plants at any climate during any season. They are substitute natural sunlight, which simulate photosynthesis. We particularly choose LED instead of fluorescent, incandescent or HID lamps for cost cutting measures and low heating structure.

Temperature and humidity unit maintains the optimum temperature and humidity levels. Temperature controls the rate of plant growth. Enzymes which are responsible for chemical processes that helps in plant growth will perform better only under certain temperature range. This optimum range varies slightly for different stages of growth. (22-28 degree C). Above and below this range, enzyme activity starts to deteriorate and as a result chemical processes slow down or stopped. The temperature of the plant environment should be kept at optimum levels for fast and successful maturation of crops. The ideal water temperature for hydroponics is between 18 and 26 degree Celsius. From this temperature, plant can able to take desired nutrient from the water. The Ph level of water solution must be maintained between 5.5 and 6.

Relative humidity is the percentage of amount of moisture the air could possibly hold. The relative humidity of the air influences the transpiration rate of plants. High Humidity of the air causes less water to transpire from the plants, which causes less transport of nutrients from roots to leaves. Relative Humidity should be between 50 to 70 %.

### IV. EXPERIMENTAL RESULTS

Figures shows the results of plants grown in the chamber by the method of auto hydroponic agriculture and also shows the auto monitoring system output which is measured by sensors. Fig. 2 show the data's like (a) temperature and humidity in air(b) shows the temperature and humidity in air, temperature in water, water level, pH in water and turbidity in water

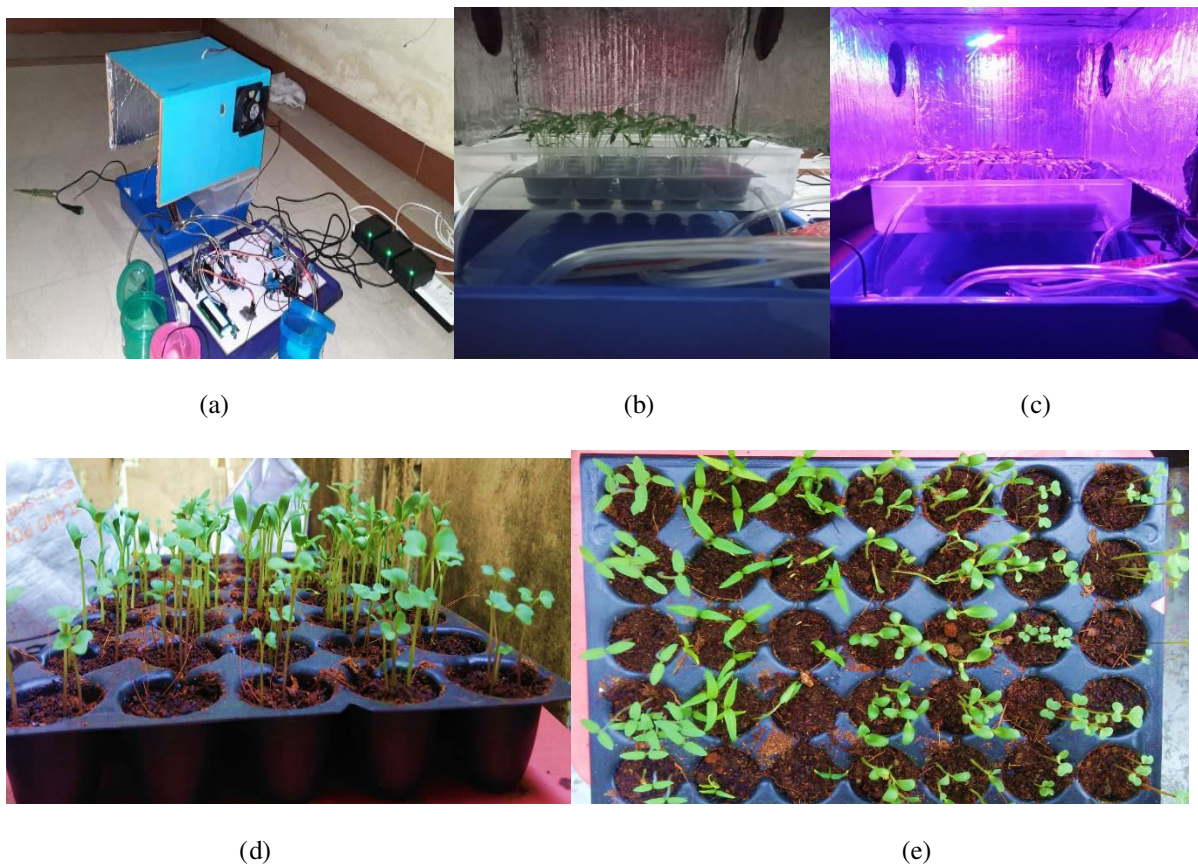


Fig. 1: (a) Overall model (b) Light OFF state (c) Light ON state (d) Combination of plants (e) Plants at top view

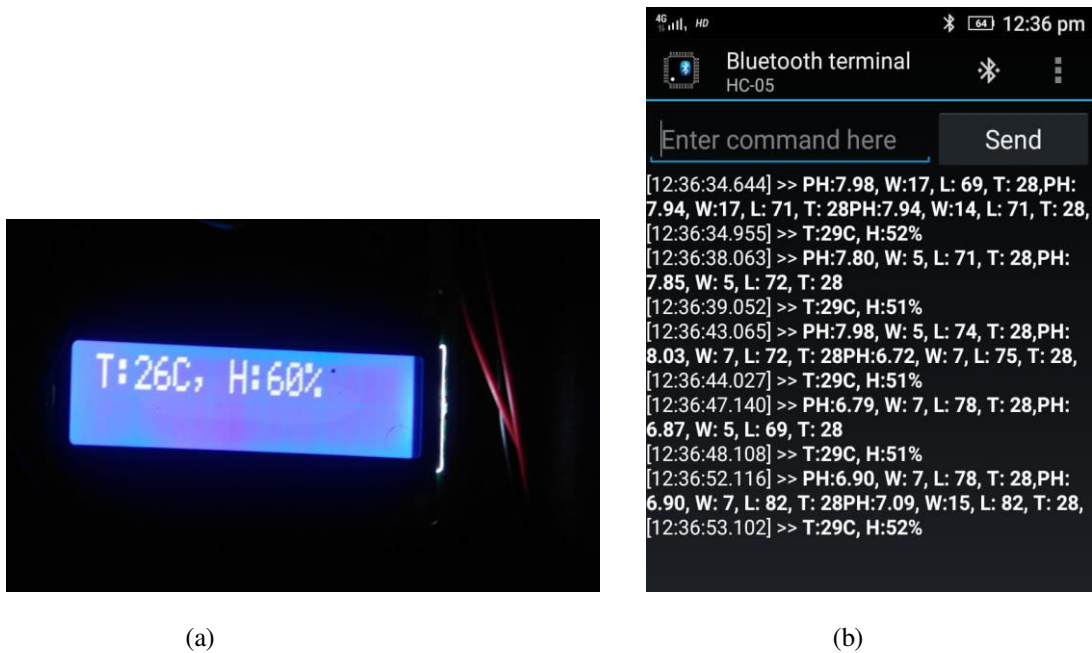


Fig. 2: Fig. 1: (a) LCD display output (b) Wireless device output

## V. CONCLUSION

The concept of this hydroponic system is to maintain and control the environmental conditions and the efficient supply of nutrition & water for healthy Plant Growth. In this paper, We designed a cost effective automated hydroponic system using Bluetooth platform. The parameters of the system such as suitable temperature, light wavelength, pH, and the required amount of water for the system were studied and calculated. This automated hydroponic system can provide an in-house vegetation solution for the Technology world and its cost will be significantly less if the materials are locally made. Therefore, anyone who stays even in cities or urban but wishes to do an indoor agriculture can adopt this method to fulfil their local requirements of Fresh and Leafy Vegetables

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