# ENVIRONMENTAL CONTROL IN HYDROPONIC CULTURE

BY

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Approval sheet

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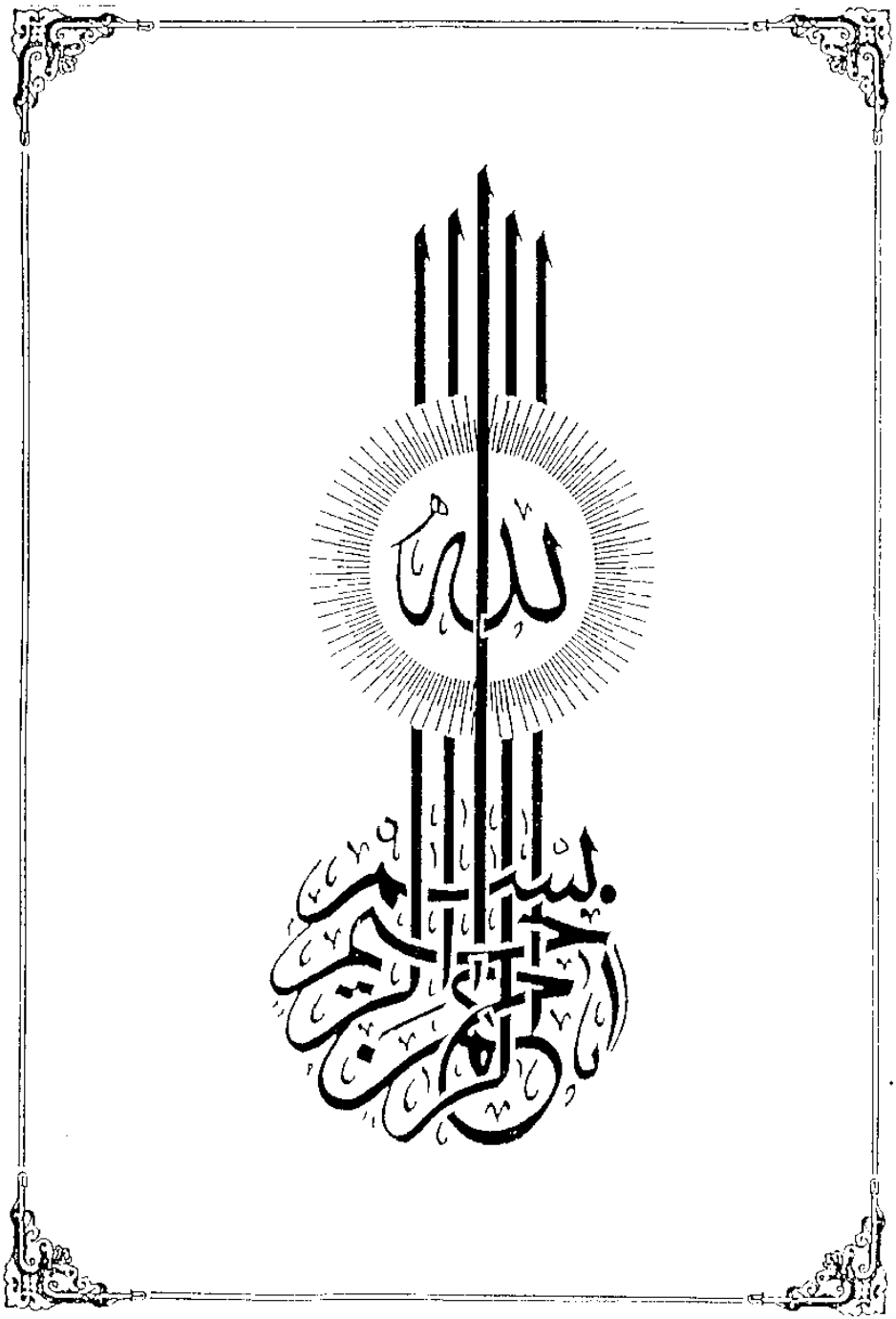

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Abstract:- In this research, environmental control was studied in hydroponic culture. System used in this study was built up in a small greenhouse that can be used in small areas and planted with tomato (Lycopersicon esculentum mill. val. Carmillo).

This environmental factors, including temperature of the solution, were investigated under three levels (from 20 to 30 °C) compared with treatment without heating (with temperature range from 17.4 to 13.8 °C day/night resp.). The effect of light intensity on tomato yield production was studies by using shading net 50 % on one treatment.

For all treatment depths of solution, water requirement and yield production depended on volume and weight of fruit according to measurments.

This study clarified that the maximum production for treatments was 33.9 t/fed. The water consumption for tomato crop was 1009.47 m³/fed/season, and the mean mass and volume of fruit were 97.19 g., and 73.4 cm³ resp., when the solution temperature was heated to 20 C with 50 % ratio of shading. This shows the importance of the solution temperature and shading through the period of experiment from 22 th Feb. to 26th May (Early summer season).

Water-utilization efficiency "EY" (kg/m³) for tomato of 33.58 kg/m³ at 20 °C solution temperature under shade was the best treatment. The economic study is discussed. It suggests that the market should be studied before using hydroponic culture.

Keywards: Environmental -Environmental control - Hydroponic - Hydroponic culture - light intensity - Nutrient solution - Tomato plant and yield - Water utilization efficiency.

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# CONTENTS

# INTRODUCTION

# 1- INTRODUCTION

The rapid increase in population and the great need for more food necessitates the improvement and better management of the agriculture system and the introduction of new systems.

Hydroponics (the practice of growing plants without soil) was known for a long time. As example, Egyptian hieroglyphic records dating back to several hundred years B.C. describe the growing of plant in water (Resh, 1981).

Nutriculture refers to the culture of plants in inert substrates such as water (hydroponics), gravel (gravelculture), sand (sandculture), rockwool, and air (aeroponic). An inert substrate is one which neither contributes nor alters plant nutrients. Soil, peat moss, and bark are examples of substrates which are both biologically and chemically active. These substrates contribute nutrients which are held on their negative exchange sites and others which are released during weathering and decomposition. In addition, microbes in soil can change the form of applied nutrients, e.g., convert ammonium to nitrate (Nelson, 1985).

The advantages of the system are providing water, nutrient elements without obstacle from the soil and the ability of environmental control, agricultural intensification with high productivity. Also, this system gets rid of herbs competition and other pests, gets rid of many problems such as: labour, and soil service.

This technology has given high production of approximately 75 ton of tomatoes per feddan, and sometimes gives quick production such as animal fodder in a rotation of only four days (Awady, 1986).

In Egypt, some vegetables such as tomato have a rarity seasons which raises it s prices over 200%. The tomato uses about 30% of the vegetables - planted area (320 000 feddan) and produces about 3 million tons. Therefore, the hydroponic culture could be one of the best solutions to overcome the rarity-seasons problem.

In this study, tomato was planted inside a new construction of greenhouse. This construction was meant to be easy and small to suit the needs of houses, hotels and other small areas to obtain fresh vegetables. The climatic conditions inside and outside the greenhouse were studied.

An adapted technique of hydroponic culture and nutrient solution circulation and control was used.

The objectives of this study were:

1- To study the effect of nutrient solution temperature on tomato growth and yield.

2- To study the effect of light intensity on tomato growth and yield.

3- To evaluate the effect of environmental conditions inside the greenhouse.

4- To evaluate the possibility of using this new technique of hydroponic culture to produce fresh vegetables in houses and other small areas.