CHEMICAL STUDIES ON PHOTOSYNTHETIC EFFICIENCY OF C3 AND C4 CROPS UNDER CLIMATE CHANGE CONDITIONS

By

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THESIS
Submitted in Partial Fulfillment of the Requirements for the Degree

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APPROVAL SHEET

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ABSTRACT

Recently, one of the most important environmental challenges that face plant production is the phenomenon of climate change that results mainly from the increases in temperature and elevation of CO_2 concentrations in air. This investigation was conducted to detect the effect of temperature increase alone and in combination with CO_2 concentration increase on growth, productivity and biochemical constituents of wheat (C3 crop) and maize (C4 crop).

The results show a negative impact on the efficiency of photosynthesis in wheat (C3) and a decreases in number of leaves / plant and percentage of carbohydrates while the amounts of glycine and serine amino acids were increased. glycine and serine amino acids levels were used as a new method to detect the photorespiration activity level .

Obtained results from the effect of climate change on maize (C4) revealed no change in number of leaves and an increase in carbohydrates percentage and a sharp reduction in malic acid. Malic acid level in maize leaves was used in this investigation as a new indicator to recognize the activity level of Hatch-Slack pathway in maize (C4 plant) under climate change conditions. Climate change heat stress (+ 4-5°C) is detrimental to Hatch-Slack pathway activity in mesophyll, but without noticeable decline impact on Calvin pathway activity in bundle-sheath.

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LIST OF ABBREVIATIONS

AOS:	**Activated Oxygen Species**
AR4:	**Fourth Assessment Report.**
ARC:	**Agriculture Research Center**
ATP:	**Adenosine TriPhosphate**
°C:	**Degree Celsius**
CAM:	**Crassulacean Acid Metabolism**
CH_4:	**Methane**
CLAC:	**Central Laboratory for Agricultural Climate**
CO_2:	**Carbon dioxide**
CO_2-eq:	**Carbon dioxide equivalent**
FACE:	**Free-Air Concentration Enrichment**
FAO:	**Food and Agriculture Organization**
FCRI:	**Field Crops Research Institute**
GDP:	**Gross Domestic Product**
GHG:	**Greenhouse Gas**
Gt:	**Giga ton**
HPLC:	**High Performance Liquid Chromatography**
HSPs	**Heat Shock Proteins**
IPCC:	**Intergovernmental Panel on Climate Change**
LSD:	**Least Significant Difference**
NADPH:	**Nicotinamide adenine dinucleotide phosphate (Reduced).**
N_2O:	**Nitrous oxide**

OAA:	**Oxalo Acetic Acid**
O_2:	**Oxygen**
PCK:	**Phosphoenolpyruvate carboxykinase**
PEP:	**Phospho Enol Pyrovate**
PEPC:	**Phosphor Enolpyruvate Carboxylase**
PGA:	**Phospho Glyceric Acid**
PPDK:	**Pyruvate phosphate dikinase**
Q10:	**Temperature–coefficient**
ROS	**Reactive Oxygen Species**
Rubisco:	**Ribulose-1,5-bisphosphate carboxylase / oxygenase**
RuBP:	**Ribulose-1,5-bisphosphate**