

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

By

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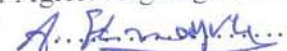
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ABSTRACT

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 CO₂ concentrations in air. This investigation was conducted to detect the effect of temperature increase alone and in combination with CO₂ 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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ABBREVIATIONS

AOS:	Activated Oxygen Species
AR4:	Fourth Assessment Report.
ARC:	Agriculture Research Center
ATP:	Adenosine TriPhosphate
°C:	Degree Celsius
CAM:	Crassulacean Acid Metabolism
CH₄:	Methane
CLAC:	Central Laboratory for Agricultural Climate
CO₂:	Carbon dioxide
CO₂-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).
N₂O:	Nitrous oxide

OAA:	Oxalo Acetic Acid
O₂:	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