

METABOLIC ADAPTATION STUDIES RELATED TO  
TOMATO SALT TOLERANCE

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## APPROVAL SHEET

### METABOLIC ADAPTATION STUDIES RELATED TO TOMATO SALT TOLERANCE

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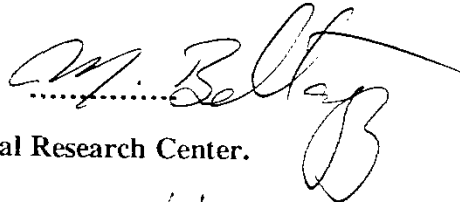
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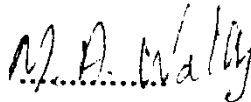
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ABSTRACT

This study was performed at Hort. Dept., Ain Shams Univ.  
and Dept. of Vegetable Crops, Univ. of California-Davis.

This work was set up in three experimental studies to  
investigate the metabolic adaptation of salt tolerance in  
tomato as follows:

1-Ethylene ( $C_2H_4$ ) as an indicator of salt tolerance in  
tomato:

Four genotypes, two salt tolerant (512 and Edkawy) and two  
salt sensitive (Ts and T<sub>1</sub>) were germinated and grown in agar

alone or combined with synthetic sea salt (150mM), 1-aminocyclopropane -1-carboxylic acid (ACC) and or cobalt ( $\text{Co}^{2+}$ ) ion. The results showed that the addition of salt (150mM) to the media resulted in: 1-At germination stage, reduced  $\text{C}_2\text{H}_4$  emanation and germination% and increased the time for 50% germination (T50) and germination rate index (GRI) compared to control (0mM sea salt) in all genotypes. Adding ACC (5  $\mu\text{M}$ ) to saline media significantly increased  $\text{C}_2\text{H}_4$  emanation and germination % in all genotypes and decreased T50 compared to salt alone. 2-At hypocotyl stage: A- hypocotyl growth decreased insignificantly in salt tolerant genotypes and significantly in salt sensitives. The addition of ACC (salt + ACC) further reduced hypocotyl lengths, whereas  $\text{Co}^{2+}$  (100 $\mu\text{M}$ ) increased the net hypocotyl lengths. B-salt tolerant genotypes had greater root growth under salt treatment. Salt tolerant genotypes produced more  $\text{C}_2\text{H}_4$  than salt sensitive genotypes at both the germination and hypocotyl stages under saline and nonsaline conditions. The data suggest that  $\text{C}_2\text{H}_4$  might be used as a biochemical marker for screening tomato genotypes for salt tolerance.

2-The contribution of roots to salt tolerance:

Hypocotyls with or without roots (1.5cm) were grown in water, salt, ACC and AOA or in selected treatment combinations, the results indicated that excising roots from tomato seedlings significantly increased hypocotyl growth and  $\text{C}_2\text{H}_4$  production compared to intact seedlings (with roots) under saline conditions. The results further indicate that

the excised hypocotyls were more tolerant to higher  $C_2H_4$  than were hypocotyls with roots. The combined results indicate that the roots play an important role in mediating salt tolerance in all the genotypes examined.

3-The role of gibberellic acid (GA<sub>3</sub>) in the adaptation to salt stress:

Hypocotyls with or without roots were grown in water, salt (150mM), GA<sub>3</sub>, ACC and Co<sup>2+</sup> and in combinations. Results emphasised that GA<sub>3</sub> counteracts the adverse effects of salinity on growth, and could play a role in the adaptation to salt stress by promoting growth and antagonizing the inhibitory action of  $C_2H_4$  on hypocotyl growth. Among all treatments the best growth of excised hypocotyls was obtained with treatments of 150 mM salt + 100  $\mu$ M GA<sub>3</sub> + 50  $\mu$ M Co<sup>2+</sup>, followed by 150 mM salt + 100  $\mu$ M GA<sub>3</sub>.

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#### IV

##### Abbreviations

|                               |                                        |
|-------------------------------|----------------------------------------|
| ABA                           | Absciscic acid.                        |
| ACC                           | 1-aminocyclopropane-1-carboxylic acid. |
| AOA                           | Aminooxyacetic acid.                   |
| AVG                           | aminoethoxyvinylglycine.               |
| C <sub>2</sub> H <sub>4</sub> | Ethylene.                              |
| Co <sup>2+</sup>              | Cobalt (chloride form).                |
| EFE                           | Ethylene-forming enzyme.               |
| GAs                           | Gibberellic acid.                      |
| GRI                           | Germination rate index.                |
| IAA                           | Indole -3- acetic acid.                |
| T50                           | Time for 50% seed germination.         |
| CK                            | Cytokinin                              |

## **INTRODUCTION**