METABOLIC ADAPTATION STUDIES RELATED TO TOMATO SALT TOLERANCE

BY

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بسم الله الرحمن الرحيم

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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 exprimental 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 (T_5 and T_1) were germinated and grown in agar

alone or combined with synthetic sea salt (150mM), 1-aminocyclopropane -1-carboxylic acid (ACC) and or cobalt (Co^{2+}) ion. The results showed that the addition of salt (150mM) to the media resulted in: 1-At germination stage, reduced C_2H_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 µM) to saline media significantly increased C_2H_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 Co^{2+} (100µM) increased the net hypocotyl lengths. B-salt tolerant genotypes had greater root growth under salt treatment. Salt tolerant genotypes produced more C_2H_4 than salt sensitive genotypes at both the germination and hypocotyl stages under saline and nonsaline conditions. The data suggest that C_2H_4 might be used as a biochemical marker for screening tomato genotypes for salt tolerance.

2-The countribution 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 C_2H_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_3) in the adaptation to salt stress:

Hypocotyls with or without roots were grown in water, salt (150mM), GA_3, ACC and Co^{2+} and in combinations. Results emphasised that GA_3 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 µM GA_3 + 50 µM Co^{2+}, followed by 150 mM salt + 100 µM GA_3.

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Abbreviations

ABA	Abscisic acid.
ACC	1-aminocyclopropane-1-carboxylic acid.
AOA	Aminooxyacetic acid.
AVG	aminoethoxyvinylglycine.
C_2H_4	Ethylene.
Co^{2+}	Cobalt (chloride form).
EFE	Ethylene-forming enzyme.
GA_3	Gibberellic acid.
GRI	Germination rate index.
IAA	Indole -3- acetic acid.
T50	Time for 50% seed germination.
CK	Cytokinin

INTRODUCTION