



جامعة الإمارات العربية المتحدة  
United Arab Emirates University

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**Master Thesis Defense**

Entitled

SCREENING, MOLECULAR CLONING AND FUNCTIONAL ANALYSIS OF SALT OVERLY SENSITIVE (SOS) PATHWAY GENES FROM NATIVE PLANTS OF THE UNITED ARAB EMIRATES

by

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Abstract

Salinity is one of the major abiotic stresses that lead to extreme reduction in crop yield worldwide. Increased soil and water salinity is a major issue in agriculture. Some plants however have adapted to grow in high saline conditions, i.e. halophytes. Unfortunately, most crops are glycophytes and cannot tolerate high salinity. Understanding the differences in genes structure between halophytes and glycophytes could provide insights into developing transgenic crops that can thrive in salinity conditions. The SOS pathway is a key mechanistic cascade controlling cellular ion homeostasis during salinity stress. In this study, the SOS pathway genes (SOS1, SOS2, SOS3) have been isolated from the halophytes: *Avicennia marina*, *Prosopis cineraria*, and *Panicum turgidum* using degenerate primers and RACE. The structure analysis of the SOS pathway genes isolated from these plants showed similarities to the SOS pathway genes from *Arabidopsis thaliana*. Yet, each gene isolated from these plants has its unique structure that may give insights into developing new crops via genetic engineering, including gene editing. In this study, to investigate the function of the *sos1* gene isolated from *Avicennia marina*, *sos1-1* mutant and wild type *Arabidopsis thaliana* were transformed with wildtype *AmSOS1* and its constitutive form *AmSOS1Δ946*. The preliminary analysis of transgenic T2 lines showed that *AmSOS1* was able to rescue the salt sensitive phenotype of the mutants. This indicates that *AmSOS1* was expressed in the transgenic *Arabidopsis thaliana* and functions similarly to *AtSOS1*. Hence proves that the isolated *AmSOS1* is indeed an ortholog of *AtSOS1*. In addition, both *AmSOS1* and the constitutive form *AmSOS1Δ946* were able to increase the salt tolerance in wild type *Arabidopsis thaliana*. However, *AmSOS1Δ946* displayed stronger effect than the wild type *AmSOS1*.

**Keywords:** SOS pathway genes, SOS1, SOS2, SOS3, Salt tolerance, *Avicennia marina*, *Prosopis cineraria*, *Panicum turgidum*,