



Thesis Abstract

Role of Root Signals in Rice (*Oryza sativa* L.) Responses to Salinity Stress

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Salinity is a major problem affecting productivity of agricultural crops. Rice is sensitive to salt stress, particularly during early seedling stage and reproduction. This study aims to determine the short- and long-term responses of two contrasting rice genotypes and to examine the role of root signals in mediating such responses.

Three experiments were conducted using salt-sensitive (IR 29) and tolerant (IR 651) genotypes. These genotypes were subjected to salt stress of 12 dS m⁻¹ starting 14 days after germination. Physiological responses were monitored from 0.5 hour to 12 days of salinization by measuring gas exchange parameters, leaf water potential, and abscisic acid (ABA) concentrations in roots and shoots at different intervals.

Salinity adversely affected growth and gas exchange characteristics and caused reduction in leaf water potential as well as progressive increase in ABA concentrations in roots and shoots in both genotypes. The sensitive genotype showed greater reduction in all parameters and higher ABA concentration compared to IR 651 with prolonged stress.

Few mechanisms seem to underlie the tolerance phenotype of IR 651 such as efficient control of Na⁺ transport from roots to the shoots, maintenance of higher K⁺ uptake, greater capacity to sequester salt into roots and dilution of salt concentration in plant tissue through vigorous growth. Additionally, this genotype tends to close its stomata shortly after salinization, which could prevent early influx of salt and help in acclimation. The early stomatal responses observed before noticeable reduction in leaf water potential suggested a possible signaling mechanism. The fact that higher ABA levels were detected in roots of the tolerant genotype suggested that this hormone might be involved in signaling the early responses and may also be involved in the induction of genes essential for adaptation to salt stress.