MORPHOLOGICAL AND PHYSIOLOGICAL SCREENING OF RICE (*Oryza sativa* L.) FOR SALINITY TOLERANCE AT SEEDLING STAGE USING THE RICE DIVERSITY PANEL

THESIS

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ABSTRACT

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The study generally aims to screen rice (*Oryza sativa* L.) accessions under the Rice Diversity Panel tolerant to salinity at seedling stage using morphological and physiological parameters. Specifically it aims to compare the growth and physiological responses of different rice varieties to salinity stress; determine which varieties are considered tolerant or sensitive based on different parameters measured; and assess which physiological characters best contribute to salinity tolerance.

Screening method utilized for morphological scoring was based on modified Standard Evaluation System (SES) scores of visual salt injury at seedling stage developed by IRRI. This involves exposure Yoshida's solution as basal medium supplemented with sodium chloride (NaCl) to obtain a final electrical conductivity (EC) of 12 dS m^{-1}. Physiological screenings done were vigor test, biomass test, chlorophyll content determination and sodium-potassium ratio measurement.

Based on morphological screening, out of 324 rice accessions assessed, 87 (27%) were classified as highly tolerant to saline stress, where M 202, MINGHUI 63, ECIA76-S89-1, MING HUI showed the highest degree of tolerance. There were 195 (60%) accessions considered as tolerant, while 36 (11%) were moderately tolerant. Only 4 (1%) accessions were classified as susceptible and only 2 accessions (C57-5043 and WC4419) were highly susceptible.

Based on statistical analysis, among the physiological parameters used, vigor seedling growth and root biomass do not correlate with the morphological SES scores, while shoot biomass, chlorophyll content and sodium-potassium ratio correlate with the morphological result. These indicate that these physiological parameters must be considered for future studies in developing rice for salinity tolerance.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

MORPHOLOGICAL AND PHYSIOLOGICAL SCREENING OF RICE (*Oryza sativa* L.) FOR SALINITY TOLERANCE AT SEEDLING STAGE USING THE RICE DIVERSITY PANEL

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INTRODUCTION

Rice (*Oryza sativa* L.) is a major food crop considered as the staple food for more than half of the human population. Over 3.5 billion people worldwide depend on rice for their energy source, which accounts for more than 20% of their daily human calorie needs (Tonini and Cabrera, 2011). Approximately sixty-five (65) kilos of rice is consumed by an individual per year (Mohanty *et al.*, 2013).

The fast-paced increase in population and the environmental stresses accompanied to rice production challenged rice breeders to develop rice varieties with tolerance to several environmental stresses. These environmental stresses include submergence, drought, heat and salinity which significantly aggravate the condition of poor farmers particularly in local rice-growing areas.