EFFECTS OF SALINITY ON SUBMERGENCE TOLERANCE OF RICE

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Thesis

Submitted in partial fulfilment of the requirements

for the degree of

MASTER OF PHILOSOPHY

in

Agriculture

in the

POSTGRADUATE INSTITUTE OF AGRICULTURE

of the

UNIVERSITY OF PERADENIYA, SRI LANKA

Approved.

Examination Committee

ABSTRACT

KEELITHA JAYAWEERA, Post Graduate Institute of Agriculture, Peradeniya, May 1984. Effects of salinity on submergence tolerance of rice. IRRI Advisor: Dr. Benito. S. Vergara. Local Advisor: Dr. Mohan R. Thiagarajah.

In many flood prone lowlying areas, the farmers generally practice early seeding in dry soil to escape from floods. However, in coastal lowlying areas during early seeding the soils are generally saline due to previous intrusion of sea water and subsequent drying of the soil. Thus early seeded rice experiences both soil moisture stress and salt stress and is later affected by submergence. Submergence tolerance is an important plant trait for varieties in flood prone areas. Several experiments were conducted in the International Rice Research Institute from January 1983 to January 1984 to determine the effect of salinity on submergence tolerance at seedling stage.

Five rice varieties with varying salinity and submergence tolerance were grown at different NaCl levels and tested for submergence tolerance.

Submergence tolerance was evaluated on percent survival after 7 days of recovery from submergence. The percent survival of seedlings after 6 days of submergence increased at 0.2% NaCl and decreased at 0.4% NaCl as compared to the unsalinized control. However, after 8 days of submergence,

0.2% NaCl in the soil increased percent survival remarkably.

The seedling height before submergence decreased with increasing salinity. During submergence, the plant heights increased. The percent increase in height during submergence increased with increasing salinity. However, plants in salinized treatments were still shorter than those in the unsalinized treatment after submergence.

The lengths of leaf sheath and leaf blade of the second leaf before submergence decreased with increasing salinity. During submergence, the leaf sheath continued to increase in length at all salt levels but plants in salinized treatments had shorter leaf sheaths than those in unsalinized treatments. There was no increase in length of leaf blade during submergence.

The dry weights before and after submergence decreased with increasing salt levels. With 0% and 0.2% NaCl in the soil, there was an increase in dry weight after submergence. In 0.4% NaCl except for Pokkali all other varieties showed a decrease in dry weight after submergence.

With increasing salt levels, N, Na, Ca and Mg content increased while P, K and Si content of seedlings before submergence decreased. Manganese content before submergence increased at 0.2% NaCl compared to the control. This trend was reversed in Fe content. However, during submergence N,

Mg, Mn and Si content increased while K and Ca content decreased at all salt levels.

Seed pre-treatment studies were conducted to devise a method to utilize the finding that 0.2% NaCl in the soil was beneficial for submergence tolerance. Seed pre-treatment with 0.8% NaCl on non saline soils increased submergence tolerance significantly over the untreated seeds.

Seed pre-treatment with $CaCl_2$ showed that in 0% and 0.2% NaCl in the soil, increasing $CaCl_2$ pre-treatment levels increased submergence tolerance. The beneficial effect of 0.2% NaCl in the soil for submergence tolerance was enhanced by $CaCl_2$ pre-treatment.