

CHAPTER III

MATERIALS AND METHODS

3.1. Experiment 1: Effects of Fe toxicity on Laos rice variety (cv. Thardokkam1; TDK 1).

The rice (*Oryza sativa* L.) variety TDK1 (a high yielding, modern Lao rice) was used in this study. The experiment was conducted in pots in the glasshouses at the Experimental Station of the Multiple Copping Center and Department of Agronomy, Faculty of Agriculture, Chiang Mai University, Thailand. The trial commenced in September, 2007 and ended in November, 2007.

This experiment aimed to evaluate the effect of Fe levels on rice growth. Thirty day old seedlings were transplanted to plastic pots containing 6 kg soils, at two plants per pots. The soil was kept flooded to depth of 5 cm above the surface. One week before transplanting, basal fertilizers 0.63 g P₂O₅/pot and 0.81 g N/pot were applied, with another application of 0.67 g N/pot five weeks later. The pots were arranged in a completely randomized design (CRD) with 4 replicates. The treatments were 3 levels of added Fe: 0(Fe₀), 1000(Fe₁₀₀₀), 2000(Fe₂₀₀₀) mg Fe₂SO₄ per pot. Plants were harvested at one month after transplanting. Growth parameters measured were plant height, tiller number, leaf number, root length, and total dry weight.

3.2. Experiment 2: Screening Fe toxicity tolerance in different rice varieties.

Seven Lao rice varieties TDK1 TDK5, TDK6, TDK7, TDK10, TDK11, Muamngna and RD10 (modern Thai rice variety observed to be tolerant to Fe

toxicity) and IR70617-B4-B-19-2-3-1-1 (an Fe tolerant line from IRRI) were used in this study. The experiment was conducted in the stagnant solution (0.1% agar w/v) (Weingweera et al., 1997) in the greenhouse at Chiang Mai University, Thailand. The trial commenced in December, 2007 and ended in January, 2008

This experiment was conducted to investigate to the effect of a range of iron supply response to iron toxicity tolerance in modern rice varieties from Lao PDR. Seed of the 9 rice varieties were germinated and grown on full strength, still nutrient solution (Insalud, 2006). Subsequently, 14-day-old seedlings were transplanted to plastic pots containing 10 liter of stagnant (0.1% agar w/v), complete nutrient solution (Weingweera et al., 1997), with two rates of added Fe (20 and 150 mg Fe (III)-EDTA L⁻¹). There were two plants per pot, and the pots arranged in randomized complete block design (RCB) with four replicates. Growth parameters measured were plant height, tillering, leaf number, thin root length, thick root length, shoot dry weight and %LBI at 8 and 15 days after transplanting.

3.3. Experiment 3: Growth and yield of rice varieties with different sensitivity to Fe toxicity in the field with Fe toxicity problem in Vientiane, Laos.

Three modern Lao rice varieties, TDK5, TDK7 and TDK10, were used in this study. The experiment was conducted in the field at the Experimental Station of the Rice and Commercial Crop Research Center (RCCRC), National Agriculture and Forestry Research Institute, Lao PDR. The trial commenced in July, 2008 and ended in November, 2008.

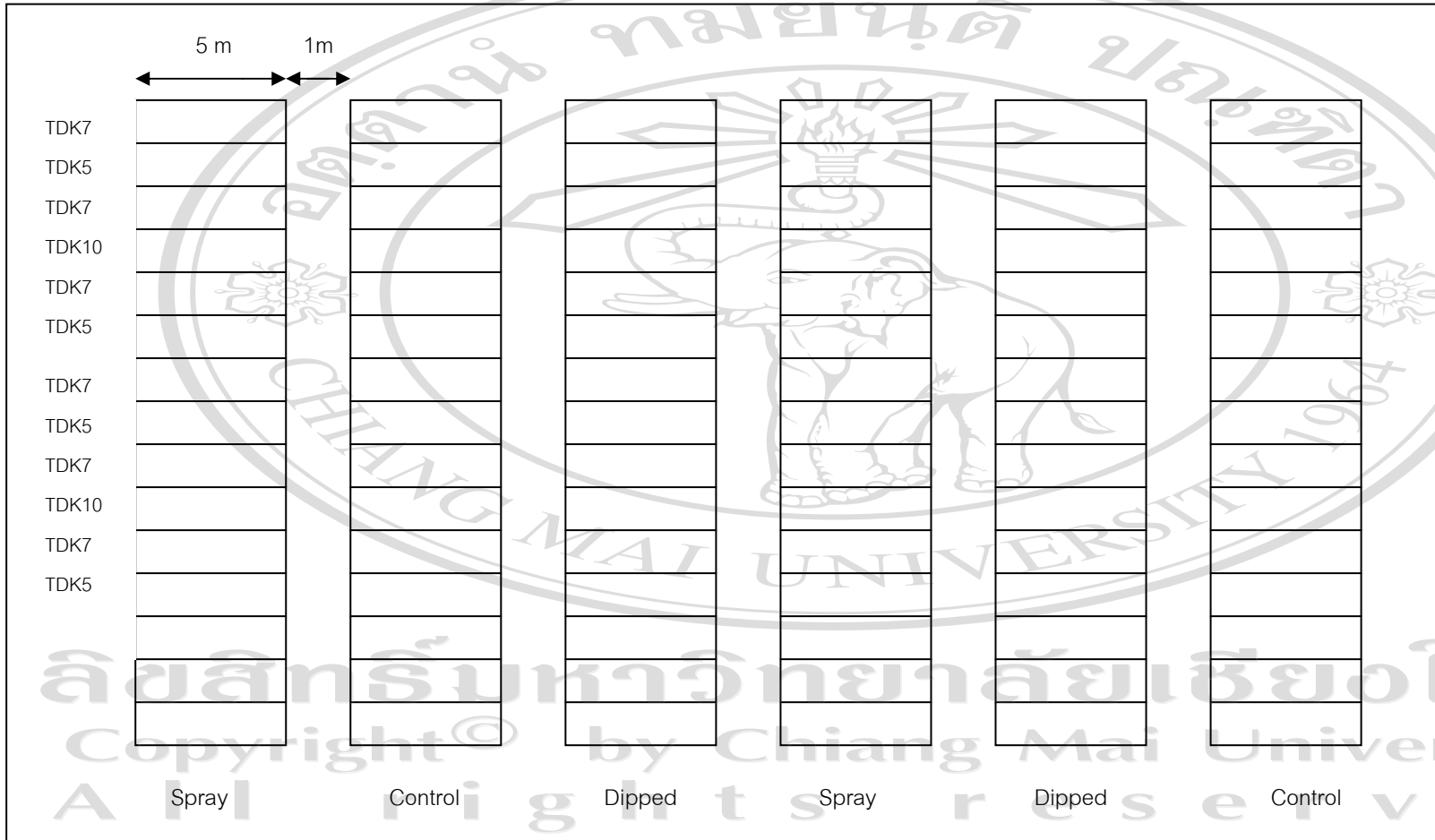
This experiment investigated the performance of Fe tolerant (TDK5 and TDK10) and sensitive (TDK7) identified in Experiment 2 in the field on a soil prone

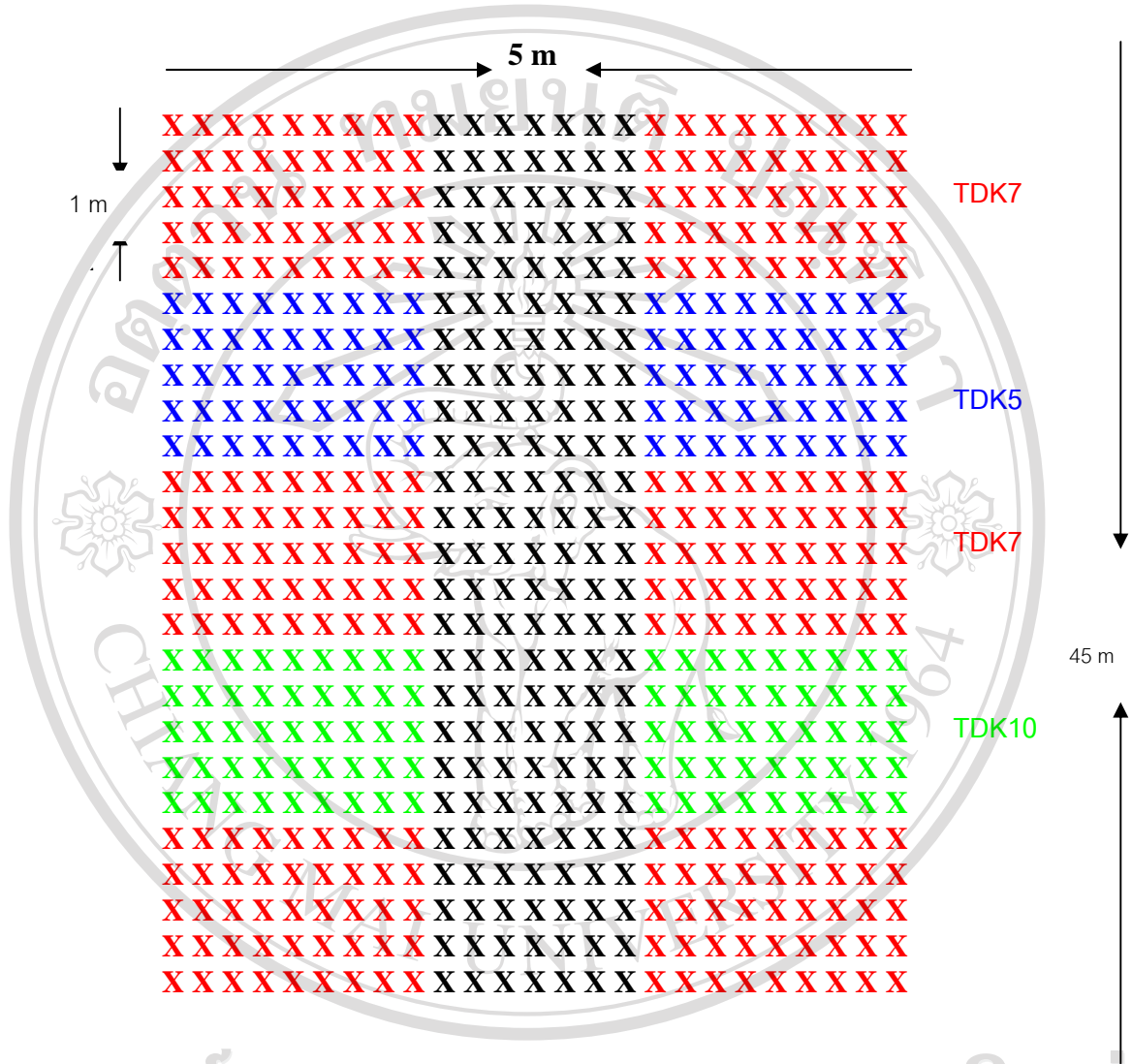
to Fe toxicity at the RCCRC. The soil at the RCCRC is described as subsurface layer with higher clay content than the surface soil layer, the pH was lower than 5.5. (Lao-IRRI, 2001). Treatments of Zn fertilizer were also evaluated. Because of the high variability of the field, the 3 rice varieties were planted (30-day-old seedlings) in strips in a 45 x 45 m field. The varieties were planted alternately in 6 strips, 5 x 45m with 1m between strips and 20 x 20 cm between plants in a row. There were 2 alternated strips of the 3 varieties, and the pots arranged in strip plots design representing 4 replications each treatment. Three zinc treatments were applied in 5 m wide area across the strips, and consisted of control (no Zn: Zn0), Zn1: dipping roots seedling in 1% solution of $ZnSO_4 \cdot 7H_2O$ (10 g L^{-1}) and Zn2: foliar spraying 0.5% $ZnSO_4 \cdot 7H_2O$ at the two times as tillering stage and flowering stage. Data was recorded at 45 days after transplanting and at grain maturity. Growth parameters measured were shoot length, leaf number, tiller number and %LBI. At maturity yield components and seed yield was determined and the seed was analyzed for Fe contents.

Statistical analysis

Data were processed for analysis of variance (ANOVA) for all parameters measured was carried out to determine the treatment effects using commercial software (Statistx V.8, Analytical Software, Inc.) When the treatment effects were significant, the least significant difference (LSD) and standard errors (SE) were used for mean comparisons.

Subplot





Red colour: TDK7

Blue colour: TDK5

Green colour: TDK10

Black color = Zn1 (dipping roots seedling)