

## Enhancing the fertility of an acid sulfate soil for rice cultivation using lime in combination with bio-organic fertilizer

### ABSTRACT

The acid sulfate soils contain pyrite ( $\text{FeS}_2$ ) which is due to oxidation results in the production of high amount of acidity, aluminum and iron significantly affecting rice growth. A glasshouse study was arranged to determine the effect of ground magnesium limestone (GML) in combination with bio-organic fertilizer (JITUTM) application on the chemical properties of soils and rice yield. Three rice seedlings were transplanted in pots which were previously amended with 0, 2, 4, 6 and 8 t/ha GML with or without bio-organic fertilizer. The common rice varieties (MR 219 and MR 253) were cultivated for two seasons in the same pots. The critical  $\text{Fe}^{2+}$  and  $\text{Al}^{3+}$  activities for MR 219 were 14.45 and 4.23  $\mu\text{M}$ , while for MR 253 were 7.45 and 5.53  $\mu\text{M}$ , respectively. However, without applying the amendments, rice grown on the soils was affected severely by the high acidity ( $\text{Fe}^{2+}$  and  $\text{Al}^{3+}$  toxicity). The soil pH increased to 5 and the higher grain yield of MR 219 (99.77 and 121.38 g/pot) and MR253 (98.63 and 112.60 g/pot) was in first and second season with the application of 2 t GML application combined with 0.25 t JITU-/ha respectively. In addition, 1000 grain weight, number of panicle, number of spikelets panicle<sup>-1</sup> and the percentage of filled spikelet, were also higher than without the soil amendments. Hence, the infertility of acid sulfate soils for sustainable rice cultivation in Malaysia can be improved by applying 2 t GML/ha combined with 0.25 t JITU-/ha for two seasons in long run.

**Keyword:** Acid sulfate soil; Aluminum and iron toxicity; Lime; Bio-organic fertilizer and rice